UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WHOOP, INC.,
Petitioner,

v.

OMNI MEDSCI, INC.,
Patent Owner.

Patent No. 12,193,790

Post Grant Review No. PGR2026-00003

PETITION FOR POST GRANT REVIEW

Mail Stop **PATENT BOARD**
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

TABLE OF CONTENTS

I. INTRODUCTION 1

II. MANDATORY NOTICES 3

- A. Real Party-in-Interest 3
- B. Related Matters 3
- C. Lead and Backup Counsel 7
- D. Service Information 9

III. PAYMENT OF FEES 9

IV. REQUIREMENTS FOR POST GRANT REVIEW 9

- A. Standing 9
- B. Identification of Challenge and Relief Requested 14
  - 1. Lisogurski 15
  - 2. Carlson 15
  - 3. Lamego 15
  - 4. Soller 16
  - 5. Grounds 16
- C. How the Challenged Claim Should Be Construed Under 37 C.F.R. § 42.204(b)(3) 17
- D. How the Challenged Claims are Unpatentable Under 37 C.F.R. § 42.204(b)(4) 18
- E. Supporting Evidence under 37 C.F.R. § 42.204(b)(5) 18

V. THRESHOLD REQUIREMENT FOR POST GRANT REVIEW 19

VI. PATENT OVERVIEW 19

- A. Person of Ordinary Skill in the Art 19
- B. State of the Art 19
  - 1. Photoplethysmography 20
  - 2. Market Trends for Wearable Sensors 21
- C. Alleged Invention of the ’790 Patent 24
- D. Prosecution History of The ’790 Patent 25

VII. GROUNDS OF UNPATENTABILITY 26
A. Collateral Estoppel 26
B. Ground 1: Claim 7 would have been obvious over Lisogurski in view of Carlson. 32
1. Overview of Ground 1 32
2. Analysis of Ground 1 37
C. Ground 2: Claim 7 would have been obvious over Lisogurski in view of Carlson and Lamego. 72
1. Overview of Ground 2 72
2. Analysis of Ground 2 77
D. Ground 3: Claim 7 would have been obvious over Lisogurski in view of Carlson and Soller. 83
1. Overview of Ground 3 83
2. Analysis of Ground 3 85
E. Ground 4: Claim 7 would be indefinite applying Omni's understanding of "identify an object." 90
F. Ground 5: The Challenged Claim Is Not Enabled. 93
VIII. NO SECONDARY CONSIDERATIONS EXIST 95
IX. CONCLUSION 95
APPENDIX A: CHALLENGED CLAIM LISTING 97

TABLE OF AUTHORITIES

Page(s)

Cases

Apple Inc. v. Omni MedSci, Inc.,
IPR2019-00916 (P.T.A.B.) ..... *passim*

Apple Inc. v. Omni MedSci, Inc.,
IPR2021-00453 (P.T.A.B.) ..... *passim*

Apple Inc. v. Omni MedSci, Inc.,
No. 23-1034, 2024 WL 3084509 (Fed. Cir. Jun. 21, 2024) 5

Auto Techs. Int'l, Inc. v. BMW of N. Am., Inc.,
501 F.3d 1274 (Fed. Cir. 2007) 95

Google LLC v. Hammond Dev. Int'l,
54 F.4th 1377 (Fed. Cir. 2022) 30, 31

MicroSurgical Tech., Inc. v. Regents of the University of Colorado,
PGR2021-00026, 2021 WL 2460802 (P.T.A.B. June 16, 2021)..9, 10, 11, 13, 14

Nautilus, Inc. v. Biosig Instruments, Inc.,
572 U.S. 898 (2014) 90

Ohio Willow Wood Co. v. Alps S., LLC,
735 F.3d 1333 (Fed. Cir. 2013) 29, 30

Omni MedSci, Inc. v. Apple Inc.,
No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022) 5

Omni MedSci, Inc. v. Apple Inc.,
No. 25-1646 (Fed. Cir.) 6

Omni MedSci, Inc. v. Apple Inc.,
No. 4:19-cv-05924 (N.D. Cal.) 4

Omni MedSci, Inc. v. Samsung Elecs., et al.,
No. 2:24-cv-01070 (E.D. Tex.) 3

Omni MedSci, Inc. v. WHOOP, Inc.,
No. 1:25-cv-00140 (D. Del.) 3

Pac. Biosciences of California, Inc. v. Oxford Nanopore Techs., Inc.,
996 F.3d 1342 (Fed. Cir. 2021) 94

Papst Licensing GmbH & Co. KG v. Samsung Elecs. Am., Inc.,
924 F.3d 1243 (Fed. Cir. 2019) 3, 29

Rockwool Int'l A/S v. Knauf Insulation, Inc.,
PGR2022-00022, 2022 WL 2521671 (P.T.A.B. July 6, 2022) 12

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
IPR2025-01250, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 6

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
IPR2025-01251, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 6

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
IPR2025-01252, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 7

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
IPR2025-01253, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 6

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
IPR2025-01254, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 7

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
PGR2025-00063, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 7

Samsung Elecs. Co. et al. v. Omni MedSci, Inc.,
PGR2025-00064, Paper No. 1 (P.T.A.B. Aug. 5, 2025) 6

Samsung Elecs. Co., Ltd. v. Netlist, Inc.,
IPR2025-00002, Paper 17, 17-24 (P.T.A.B. May 15, 2025) 29

Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt.,
LLC, 778 F.3d 1311 (Fed. Cir. 2015) 30

Team Worldwide Corp. v. Intex Recreation Corp.,
No. 2020-1975, 2021 WL 4130634 (Fed. Cir. Sept. 9, 2021) 11

Statutes

35 U.S.C. § 102 15

35 U.S.C. § 103 ..... 1, 14, 16

35 U.S.C. § 112 ..... 1, 2, 90

35 U.S.C. § 132(a) 10, 12

35 U.S.C. § 311(c) 9

35 U.S.C. § 321(c) 9

35 U.S.C. § 324(a) 19

America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) 10, 13, 14

Other Authorities

MPEP § 2159.02 ..... 10, 14

MPEP § 2159.04 ..... 10, 13

Regulations

37 C.F.R. § 1.55 12
37 C.F.R. § 42.8 7
37 C.F.R. § 42.10 ..... 7, 8
37 C.F.R. § 42.15(b) 9
37 C.F.R. § 42.63(e) 18
37 C.F.R. § 42.73(d) 2, 3
37 C.F.R. § 42.200(b) 17
37 C.F.R. § 42.204(a) 9
37 C.F.R. § 42.204(b) 14, 17, 18
83 F.R. 51358-59 (2018) 17

TABLE OF EXHIBITS

Exhibit #	Reference Name
1001	U.S. Patent No. 12,193,790
1002	File History, U.S. Patent No. 12,193,790
1003	Declaration of Patrick Mercier, PhD
1004	U.S. Patent No. 9,651,533
1005	U.S. Patent No. 10,517,484
1006	Docket Sheet, *Omni MedSci, Inc. v. WHOOP, Inc.*, No. 1:25-cv-00140 (D. Del.)
1007	Docket Sheet, *Omni MedSci, Inc. v. Samsung Elecs.*, et al., No. 2:24-cv-01070 (E.D. Tex.)
1008	*Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 39 (P.T.A.B. Oct. 14, 2020) (Final Written Decision, '533 IPR)
1009	*Omni MedSci, Inc. v. Apple Inc.*, No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022) (summary affirmance, '533 IPR)
1010	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Patent Owner's Notice of Appeal (P.T.A.B. Apr. 11, 2025)
1011	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Paper No. 22 (P.T.A.B. Aug. 3, 2022) (First Final Written Decision, '484 IPR)
1012	*Apple Inc. v. Omni MedSci, Inc.*, No. 23-1034, 2024 WL 3084509 (Fed. Cir. Jun. 21, 2024) (First Federal Circuit Decision, '484 IPR)
1013	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Paper No. 26 (P.T.A.B. Feb. 14, 2025) (Second Final Written Decision, '484 IPR)
1014	Docket Sheet, *Omni MedSci, Inc. v. Apple Inc.*, No. 25-1646 (Fed. Cir.) (Docket Sheet, Second Federal Circuit Appeal, '484 IPR)

Exhibit #	Reference Name
1015	*Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 1 (P.T.A.B. Apr. 10, 2019) (Petition, '533 IPR)
1016	*Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 10, (P.T.A.B. Oct. 18, 2019) (Patent Owner's Preliminary Response, '533 IPR)
1017	*Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 16, (P.T.A.B. Oct. 18, 2019) (Institution Decision, '533 IPR)
1018	RESERVED
1019	RESERVED
1020	RESERVED
1021	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Paper No. 1, (P.T.A.B. Jan. 22, 2021) (Petition, '484 IPR)
1022	RESERVED
1023	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Paper No. 7 (P.T.A.B. Aug. 6, 2021) (Institution Decision, '484 IPR)
1024	*Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Paper No. 10 (P.T.A.B. Nov. 12, 2021) (Patent Owner Response, '484 IPR)
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	U.S. Patent No. 6,304,767 ("Soller")
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) (Apple Ex. 1019)
1034	Patel, et al., A review of wearable sensors and systems with application rehabilitation, *Journal of Neuroengineering & Rehabilitation* (2012) (Apple Ex. 1021)
1035	A. Omre, Bluetooth Low Energy: Wireless Connectivity for Medical Monitoring, *Journal of Diabetes Science & Technology* (Mar. 2010) (Apple Ex. 1024)
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, JRC *Scientific and Policy Reports of European Commission* (2013) (Apple Ex. 1027)
1037	M. Kranz, et al., The mobile fitness coach: Towards individualized skill assessment using personalized mobile devices, *Pervasive and Mobile Computing* (June 2012) (Apple Ex. 1020)
1038	M. Swan, Senior Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0, *Journal of Sensor and Actuator Networks* (2012) (Apple Ex. 1029)
1039	RESERVED
1040	"The Usage of Tablets in the HealthCare Industry," by Rauf Adil (Aug. 2, 2012), 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

Exhibit #	Reference Name
1043	Docket Sheet, *Omni MedSci, Inc. v. Apple Inc.*, No. 4:19-cv-05924 (N.D. Cal.)
1044	RESERVED
1045	Webster, J. G. (1997) Design of Pulse Oximeters, IOP Publishing
1046	RESERVED
1047	RESERVED
1048	RESERVED
1049	RESERVED
1050	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01250, Paper No. 1 (P.T.A.B. Aug. 5, 20215) (533 IPR Petition)
1051	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01251, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (304 IPR Petition)
1052	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01252, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (455 IPR Petition)
1053	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01253, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (790 IPR Petition)
1054	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, PGR2025-00064, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (790 PGR Petition)
1055	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01254, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (475 IPR Petition)
1056	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, 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

Exhibit #	Reference Name
1059	RESERVED
1060	12,268,475
1061	*Omni MedSci, Inc. v. Apple Inc.*, No. 25-1646, Dkt. 17 (Fed. Cir. Sept. 11, 2025) (Omni's Corrected Opening Brief)
1062	U.S. Patent App. Pub. No. 2011/0237911 ("Lamego")
1063	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, PGR2025-00064-1021, Ex. 1021 (P.T.A.B. Aug. 5, 2025) (Ex. 1021 to Samsung's '790 PGR Petition)
1064	*Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, PGR2025-00064-6 (P.T.A.B. Aug. 5, 2025) (Samsung's Petition Ranking and Explanation of Parallel Petitions)
1065	Wu, et al., *A new generation of sensors for non-invasive blood glucose monitoring*, Am. J. of Translational Research 2023;15(6):3825-3827 (Jun. 30, 2023)
1066	*WHOOP, Inc. v. Omni MedSci, Inc.*, IPR2025-01583, Paper No. 1 (P.T.A.B. Sept. 26, 2025) (WHOOP '533 IPR Petition)
1067	*WHOOP, Inc. v. Omni MedSci, Inc.*, IPR2025-01584, Paper No. 1 (P.T.A.B. Sept. 26, 2025) (WHOOP '304 IPR Petition)
1068	*WHOOP, Inc. v. Omni MedSci, Inc.*, IPR2025-01583, Paper No. 1 (P.T.A.B. Sept. 26, 2025) (WHOOP '455 IPR Petition)
1069	*WHOOP, Inc. v. Omni MedSci, Inc.*, 1:25-cv-140-WCB, D.I. 11-12 (D. Del. May 5, 2025) (Ex. 12 to Delaware action Amended Complaint)
1070	U.S. Pat. Provisional App. No. 61/747,472 (Dec. 31, 2012)
1071	U.S. Pat. Provisional App. No. 61/747,477 (Dec. 31, 2012)
1072	U.S. Pat. Provisional App. No. 61/747,487 (Dec. 31, 2012)

Exhibit #	Reference Name
1073	U.S. Pat. Provisional App. No. 61/747,553 (Dec. 31, 2012)
1074	U.S. Pat. Provisional App. No. 61/754,698 (Dec. 31, 2012)

I. INTRODUCTION

WHOOP, Inc. ("Petitioner" or "WHOOP") respectively petitions for post grant review of claim 7 (the "Challenged Claim") of U.S. Patent No. 12,193,790 (the "'790 patent") (EX1001), assigned to Omni MedSci, Inc. ("Omni" or "Patent Owner") and seeks cancellation of the Challenged Claim because it is unpatentable under 35 U.S.C. §§ 103 and 112.

The Challenged Claim is materially identical to—and, in fact, *entirely overlaps with*—claims the Board already held unpatentable as obvious following IPRs of two related (parent) patents of the '790 patent (U.S. Patent Nos. 9,651,533 (the "'533 patent") (EX1004) (the "'533 IPR") and 10,517,484 (the "'484 patent") (EX1005) (the "'484 IPR")). Not a single challenged claim in those parent patents (claims 1-23 of the '484 patent and claims 5, 7-10, 13 and 15-17 of the '533 patent) survived IPR. And the Federal Circuit has affirmed the unpatentability of all but a handful of these related claims (Omni's appeal as to claims 3-6 and 8-14 of the '484 patent remains pending and challenges just a single substantive limitation relevant here). EX1009; EX1012 n.2. Furthermore, the prior IPRs asserted (among others) the exact same prior art references asserted in this Petition as "Ground 1," and the Federal Circuit has twice affirmed that a POSITA would have been motivated to combine those two references.

Notably, in the related IPRs, Omni did not dispute that the prior art disclosed nearly all of the claims' limitations (including limitations identical or materially identical to *twelve of the thirteen* limitations in the Challenged Claim), nor did Omni challenge that there was a motivation to combine the two primary prior art references (which, again, overlap with the references in Ground 1 of this Petition). As for the thirteenth limitation, the Board—applying Omni's own construction (affirmed by the Federal Circuit)—determined that it, too, was taught or rendered obvious by the same references in Ground 1. Omni has appealed that decision, but its arguments before the Federal Circuit—if accepted—would *still* render the limitation unpatentable, either in view of additional prior art references or because the limitation would be invalid under § 112 if understood in the manner advanced by Omni on appeal.

Thus, based on Omni's positions in the related IPRs and the complete overlap of the Challenged Claim with the claims at issue in those IPRs, Omni has effectively conceded the Challenged Claim is unpatentable and is collaterally estopped from challenging such unpatentability. Yet despite the unfavorable rulings Omni received, 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 '790 Patent (and even the parent patents that received the unfavorable IPR decisions) 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).

Petitioner therefore respectfully requests the Board institute PGR proceedings and cancel the Challenged Claim.

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 PGR.

B. Related Matters

The '790 patent is the subject of multiple patent litigation suits brought by Patent Owner Omni MedSci, Inc., including against Petitioner:

- *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").

In addition, as mentioned, the ’790 patent is a child of the related ’484 and ’533 patents through a series of continuations.[1] The ’790 patent is also a child of U.S. Patent Nos. 10,874,304 (the “’304 patent”) (EX1057) and 11,160,455 (the “’455 patent”) through the same series of continuations.

Petitioner here, WHOOP, Inc., filed petitions for *inter partes* review of the ’533, ’304, and ’455 patents on September 26, 2025. EX1066 (WHOOP’s ’533 IPR Petition); EX1067 (WHOOP’s ’304 IPR Petition); EX1068 (WHOOP’s ’455 IPR Petition).

These related patents, and other related patents, have been subject to previous and ongoing litigation and Patent Office challenges.

- Omni asserted the ’533 and ’484 patents in previous litigations against Apple Inc. *See Omni MedSci, Inc. v. Apple Inc.*, No. 4:19-cv-05924 (N.D. Cal.) (EX1043).
- As mentioned above, *supra* § I, the ’533 patent was subject to IPR in *Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 39 (P.T.A.B. Oct. 14, 2020) (EX1008), in which the Board held all challenged claims (claims 5, 7-

---

[1] The ’533 patent is asserted in both the Delaware and Texas actions. The ’484 patent was recently dismissed from the Delaware action but remains asserted in the Texas action. EX1006, 5 (Dkt. 20).

10, 13, and 15-17) unpatentable as obvious. The Federal Circuit affirmed. *Omni MedSci, Inc. v. Apple Inc.*, No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022) (EX1009).

- As further discussed, *supra* § I, the '484 patent is the subject of an ongoing IPR 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 Board initially held that claims 1, 2, 7, and 15-23 are unpatentable as obvious, but that the Petitioner had not shown claims 3-6 and 8-14 are unpatentable. *Id.*, Paper No. 22, 2 (P.T.A.B. Aug. 3, 2022) (EX1011). Apple appealed the Board's decision as to claims 3-6 and 8-14,[2] and the Federal Circuit vacated and remanded for the Board to consider whether those claims are unpatentable as obvious under an alternative argument Apple had raised. *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 are 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

[2] Omni did not cross-appeal the claims held to be unpatentable (1, 2, 7, and 15-23). EX1012, n.2.

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, including against the '790 patent, which are listed below:

- *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 the '790 patent;S
- *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.*, IPR2025-01250, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1050) – challenging certain claims of the '533 patent;
- *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 the '304 patent;

- *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 the ’455 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), a child patent to the ’790 patent; and
- *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), 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	**First Back-Up Counsel** 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 **Additional Backup Counsel** 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. § 42.15(b), 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 FOR POST GRANT REVIEW

A. Standing

Petitioner certifies that the '790 patent is available for PGR and Petitioner is not barred or estopped from requesting PGR of the claims on the grounds identified herein. *See* 37 C.F.R. § 42.204(a).

The '790 patent issued on January 14, 2025, which is less than nine months ago. EX1001. Accordingly, whether Petitioner may challenge the patentability of the '790 patent in an *inter partes* review or a post grant review depends on whether the '790 patent is considered an AIA patent and therefore subject to AIA law. *See* 35 U.S.C. §§ 311(c), 321(c).

Patent applications filed after the AIA was in effect, but claiming the benefit of an earlier application, are referred to as "transition applications." *MicroSurgical*

Tech., Inc. v. Regents of the University of Colorado, PGR2021-00026, 2021 WL 2460802, at *5-7 (P.T.A.B. June 16, 2021). For patents that issue from "transition applications" to be subject to the PGR provisions of the AIA, they must "contain" or have "contained at *any time*" at least one claim subject to post-AIA law. America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA") §3(n)(1) (emphasis added); *MicroSurgical*, 2021 WL 2460802, at *5 ("[F]or a patent issuing from a transition application, eligibility for post-grant review depends on whether the patent contains or *contained at any time* a claim that lacks written description and enabling support in a priority application filed before March 16, 2013.") (emphasis added); *see also* MPEP §§ 2159.02, 2159.04.

The sole exception to this rule occurs when an application filed on or after March 16, 2013, "discloses and claims *only* subject matter" entitled to a pre-AIA priority date, and the applicant later files an amendment "seeking to add a claim that is directed to new matter" in violation of 35 U.S.C. § 132(a). MPEP § 2159.02 (emphasis added). The reason for this is because "35 U.S.C. 132(a) prohibits the introduction of new matter into the disclosure, [so] an application may not contain a claim to a claimed invention that … []is directed to new matter[]." *Id.* "Therefore, an amendment (other than a preliminary amendment filed on the same day as such application) seeking to add a claim to a claimed invention that is directed to new

matter would not change the later filed application from a pre-AIA application into an AIA application." *Id.*

Applying these principles, because the '790 patent "was filed after March 16, 2013, post-grant review is available unless *each of its claims*," including claims that were included in the application leading to the '790 patent, "is supported by the [provisional] applications[s] from which it claims priority," such that the application leading to the patent "contain[ed]" only pre-AIA claims at all times. *Team Worldwide Corp. v. Intex Recreation Corp.*, No. 2020-1975, 2021 WL 4130634, at *2, n.2 (Fed. Cir. Sept. 9, 2021) (emphasis added); *MicroSurgical*, 2021 WL 2460802, at *6 (eligibility for post-grant review "turns on whether the application for patent (not simply the issued patent) ever contained, at any time, a qualifying claim").

Here, Omni asserted in the Texas action that the '790 patent is entitled to a (pre-AIA) priority date of December 31, 2012, the date of the earliest provisional applications in the chain of continuations leading to the '790 patent. EX1063, 21-22. Accordingly, the defendants in the Texas action filed dual PGR and IPR petitions, ranking the IPR petition above the PGR petition, and assuming a 2012 (pre-AIA) priority date. EX1064, 4. But during prosecution of the '790 patent, the applicant certified that the application leading to the '790 patent "contains, *or contained at any time*, a claim … that has an effective filing date on or after March

16, 2013," and acknowledged that "[b]y providing this statement under 37 CFR 1.55 or 1.78," the application would be "examined under the first inventor to file provisions of the AIA." EX1002, 246 (emphasis added).

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☒	This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

EX1002, 246.

Indeed, the application leading to the '790 patent was prosecuted as an AIA patent. *E.g.*, EX1002, 271 ("AIA (First Inventor to File Status)" marked as "Yes"), 305 (AIA status marked as "Yes"), 306 ("The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA."). Furthermore, the application that issued as the '790 patent was issued without any rejections and without any amendments to the claims, including rejections and amendments directed to improper addition of new subject matter under 35 U.S.C. § 132(a). *See* EX1002, 306-10 (notice of allowance), 273 (showing that the claims were all allowed as written in the application); *cf. Rockwool Int'l A/S v. Knauf Insulation, Inc.*, PGR2022-00022, 2022 WL 2521671, at *3-4 (P.T.A.B. July 6, 2022) (holding that "claims added by amendment, and then cancelled after being rejected for containing new matter d[oes] not convert a transition application

to an application eligible for post-grant review"). Thus, the '790 patent therefore necessarily issued with at least one claim that Omni certified was subject to the AIA, which makes the '790 patent eligible for post-grant review. AIA §3(n)(1); MPEP §§ 2159.02, 2159.04*; MicroSurgical*, 2021 WL 2460802, at *6-7.

For example, none of the provisional applications (EX1002, 254-55) to which the '790 patent claims priority provide adequate written description support for several claim limitations, including but not limited to the limitations requiring a "wearable device adapted to be placed on the wrist of the user" (and particularly such a wearable device that meets each limitation of claims 1-15) and a "plurality of detectors arranged along an arc" (claim 3). Indeed, none of the provisional applications use the word "wearable device" or "arc" or otherwise provide written description support for these and other limitations, rendering at least claims 1-15 ineligible to claim the 2012 priority date and thus subject to the AIA.[3] EX1070; EX1071; EX1072; EX1073; EX0174. As further evidence that the '790 patent is an AIA patent (and PGR eligible), Omni conceded in the Apple IPRs that both the '533 and '484 patents—which predate and significantly overlap with the '790 patent, *see infra* § VII.A—are subject to the AIA. *See* EX1016, 15-16 ("Patent Owner accepts

---

[3] The next-earliest claimed priority date in the chain of continuations is December 17, 2013, which is a PGR/AIA priority date. EX1002, 254-55.

Petitioner's assertion that the '533 Patent's priority date for all challenged claims is December 17, 2103 [sic]."); EX1024, 8 ("Omni does not contest that the '484 Patent is an AIA patent.").

Accordingly, even accepting that certain claims of the '790 patent are entitled to the priority date of the 2012 provisional applications (*i.e.*, a pre-AIA priority date), the applicant acknowledged during prosecution that at least one claim lacks (or lacked *at any time*) entitlement to that date and the '790 patent was therefore prosecuted under the AIA. EX1002, 246. Under the circumstances, the '790 patent is subject to AIA law, so the '790 patent is PGR-eligible, regardless of whether the priority date of the Challenged Claim is December 31, 2012. AIA §3(n)(1); MPEP §§ 2159.02, 2159.04*; MicroSurgical*, 2021 WL 2460802, at *6-7.

B. Identification of Challenge and Relief Requested

Pursuant to 37 C.F.R. § 42.204(b), Petitioner requests the Board institute PGR of claim 7 of the '790 patent under 35 U.S.C. §§ 103 and 112 on the prior art references[4] and grounds described below:

---

[4] Regardless of whether the '790 patent is a pre-AIA or AIA patent, the art described below pre-dates the earliest alleged priority date (December 31, 2012). The analysis under §§ 103 and 112 would not change even if the Challenged Claim is entitled to a December 31, 2012 priority date.

1. Lisogurski

U.S. Patent No. 9,241,676 ("Lisogurski") (EX1027) qualifies as prior art under 35 U.S.C. § 102(d) (AIA) or § 102 (e) (pre-AIA). Lisogurski was filed May 31, 2012, and published December 5, 2013. In the '533 IPR,[5] the Board found Lisogurski to be prior art based on its filing date, and the Federal Circuit affirmed that decision in full. EX1008, 2, 3 n.3, *aff'd*, EX1009. In the '484 IPR, Omni did not dispute Lisogurski is prior art to this patent family. EX1024, 8.

2. Carlson

U.S. Patent App. Pub. No. 2005/0049468 ("Carlson") (EX1028) qualifies as prior art under 35 U.S.C. §§ 102(a) and (b) (AIA and pre-AIA). Carlson was filed September 3, 2003, and published March 3, 2005. As with Lisogurski, in the '533 IPR, the Board found Carlson to be prior art, which the Federal Circuit affirmed. EX1008, 2-3, *aff'd*, EX1009. In the '484 IPR, Omni did not dispute Carlson is prior art to this patent family. EX1024, 8.

3. Lamego

U.S. Patent App. Pub. No. 2011/0237911 ("Lamego") (EX1062) qualifies as prior art under at least 35 U.S.C. §§ 102(a) and (b) (AIA or pre-AIA). Lamego was

---

[5] Henceforth, references to the "'484 IPR" or the "'533 IPR" are references to Apple's IPRs of the '533 and '484 patents, unless otherwise specified.

filed March 28, 2011, and published September 29, 2011. It therefore pre-dates references Omni has admitted (and the Federal Circuit has confirmed) are prior art to this patent family.

4. Soller

U.S. Patent No. 6,304,767 ("Soller") (EX1030) qualifies as prior art under AIA U.S.C. § 102(a) (AIA and pre-AIA). Soller was filed December 1, 1999, and issued October 16, 2001. It therefore pre-dates references Omni has admitted (and the Federal Circuit has confirmed) are prior art to this patent family.

5. Grounds

In this PGR, Petitioner applies the above references and asserts the following grounds of rejection under AIA[6] 35 U.S.C. §§ 103 and 112:

---

[6] The patentability analysis under these provisions would not change whether pre-AIA or AIA law is applied.

Ground	Claim	Basis for Rejection
1	7	Obvious over Lisogurski in view of Carlson
2	7	Obvious over Lisogurski in view of Carlson and Lamego
3	7	Obvious over Lisogurski in view of Carlson and Soller
4	7	Indefinite under § 112
5	7	Lacks enablement under § 112

C. How the Challenged Claim Should Be Construed Under 37 C.F.R. § 42.204(b)(3)

A claim subject to PGR shall be construed using the same standard applied in district court. 37 C.F.R. § 42.200(b); 83 F.R. 51358-59 (2018). Only the terms necessary to resolve the controversy must be construed. Petitioner asserts that—with the exception of the term discussed below—all other terms should be construed according to their plain and ordinary meaning, as they would have been understood by a POSITA. EX1003 ¶¶43-44.

Limitation 7[l] recites: "wherein the wearable device is at least in part configured to identify an object." EX1001, (87:32-33). The related '484 patent includes an identical limitation. *E.g.*, EX1005, cl. 3 ("wherein the wearable device is at least in part configured to identify an object"). In the First Final Written Decision in Apple's IPR of the '484 patent, the Board construed "to identify an object" to mean "to recognize or establish an object as being a particular thing," and the Federal Circuit affirmed that construction. EX1011, 8-10, *aff'd*, EX1012, *5.

Petitioner proposes adopting an identical construction to the extent a construction is necessary in this PGR. Omni's application of that construction in its appeal of the Board's Decision in the '484 IPR, however, would render the claim indefinite, as discussed further below.

D. How the Challenged Claims are Unpatentable Under 37 C.F.R. § 42.204(b)(4)

The following sections explain how the Challenged Claim is unpatentable under the statutory grounds identified above, including where each element of the claim is found in the prior art patents or printed publications.[7]

E. Supporting Evidence under 37 C.F.R. § 42.204(b)(5)

The exhibit numbers of the supporting evidence relied upon and the relevance of the evidence to the Challenged Claim, including an identification of specific portions of the evidence that support the challenge, are provided below. The technical information and grounds for unpatentability are 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).

---

[7] The full text of the Challenged Claim is set forth in **Appendix A**.

V. THRESHOLD REQUIREMENT FOR POST GRANT REVIEW

Under 35 U.S.C. § 324(a), post grant review should be instituted if "it is more likely than not that at least 1 of the claims challenged in the petition is unpatentable." 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 related Apple IPRs. EX1023, 7-8; EX1017, 8-9.

B. State of the Art

The following concepts were well-known and widely used by POSITAs by at least December 31, 2012. EX1003 ¶¶50-67. Given the overlap between the '790 Patent and the '484/'533 patents, the background below is adopted from Apple's

’484/’533 IPR petitions, so it has already been considered and accepted by the Board. *See* EX1021, 8-14; EX1015, 4-12.

1. Photoplethysmography

Photoplethysmography (PPG) is an optical sensing technique that has been used in medical monitoring systems for decades. EX1003 ¶52; EX1033, 769-76, 1346-55. PPG works by shining light through a subject’s tissue and measuring the light reflected back or transmitted through the tissue. EX1003 ¶52. Because different blood and tissue components (*e.g.*, hemoglobin) reflect different wavelengths of light, by measuring how much light is absorbed and how that amount changes over time, a PPG device can calculate the composition of the blood and tissue. EX1003 ¶52.

PPG systems use conventional optical components, like lenses, mirrors, filters, beam splitters, light sources, fiber optics, and detectors. EX1003 ¶¶51, 53; EX1033, 764-66, 771. The figure below shows a typical PPG sensor: (1) light is directed onto a sample; (2) the sample reflects or transmits light back to the device; (3) a photodetector detects and filters the received light and then outputs a signal proportionate to the measured light intensity; and (4) analog-to-digital conversion and signal processing are performed on the signal to extract data. EX1003 ¶51; EX1033, 764-66. Portable PPG devices conventionally use light-emitting diodes

(LEDs) as the light source because LEDs are small and have low power requirements. EX1003 ¶53; EX1033, 765, 771.

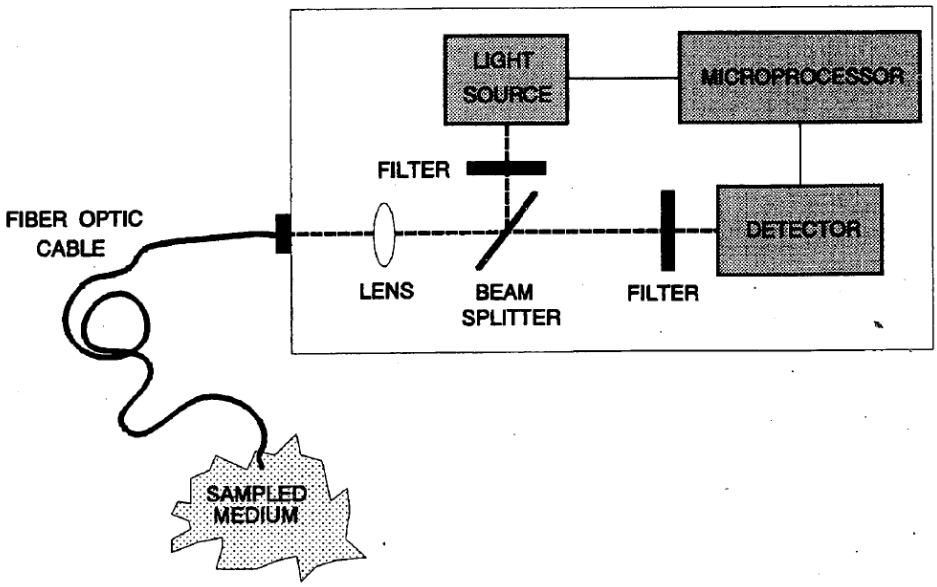


FIGURE 52.1 General diagram representing the basic building blocks of an optical instrument for optical sensor applications.

EX1033, 765.

To improve the signal-to-noise ratio (SNR) of the system, the light source is typically modulated and the detector typically uses "synchronized lock-in amplifier detection" techniques to isolate signals that occur at the modulation frequency, thereby reducing the amount of noise captured, and improving SNR. EX1003 ¶¶54-55; EX1033, 764-66.

2. Market Trends for Wearable Sensors

Market trends from 2000 to 2012 drove the medical device industry (and similar industries) to develop wearable sensors for measuring health data and

communicating that data to remote devices. EX1003 ¶¶57-67. Four examples of such trends are described below.

First, the medical device industry developed wireless monitoring technologies that a patient could wear to allow transmission of medical data remotely to a physician. EX1003 ¶¶60-62; EX1034, 2; EX1035, 462; EX1036, 15-31.

Second, a market for commercial health and fitness devices emerged. EX1003 ¶¶63-65. These devices, like "oximeters and heart rate monitors," were "formerly reserved for professional use," but by at least 2012 were "available" for consumers to "connect[] to smartphones." EX1037, 205; *see also* EX1028, [0004]; EX1038, 221; EX1032, [0003] ("growing market demand" for "personal health…monitors").

Third, the general market trend for miniaturizing electronics led to smaller, wearable monitoring systems with health and fitness applications. EX1003 ¶¶59, 63-67; EX1034, 3; EX1037, 203-04.

Fourth, the medical industry began using personal devices and "apps" to deliver care and give patients access to biomedical data. EX1003 ¶¶61-65. This trend drove smartphones and similar devices to develop miniaturized, network-connected monitoring devices that could communicate with wearable sensors, and led to the use of cloud-based transfer and storage for health and fitness data. EX1003 ¶¶57, 67; EX1036, 9-10, 40-49; EX1040, 1-2; *id.* at 5; EX1034, 4.

The figure below shows such a "remote health monitoring system." EX1034, 2; EX1003 ¶62.

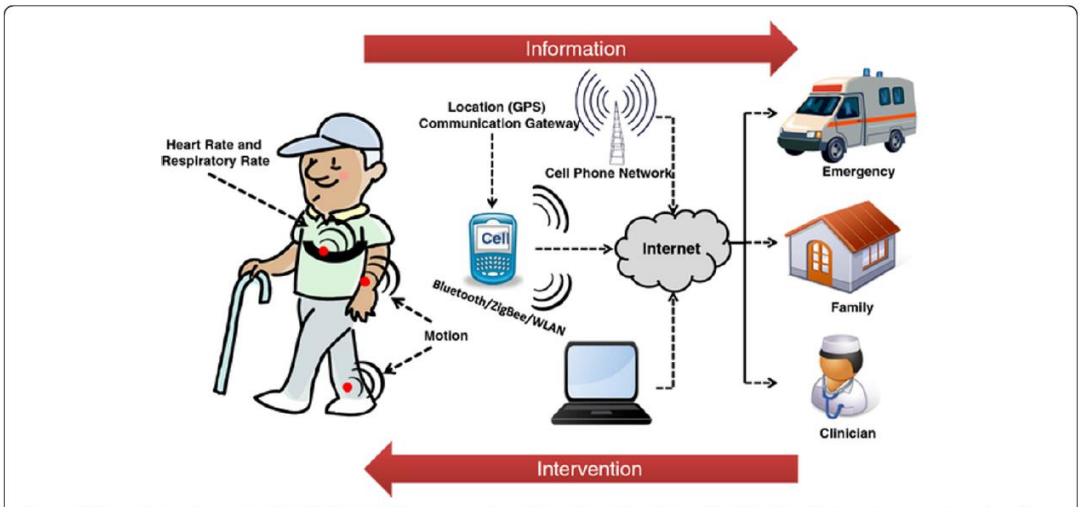


Figure 1 Illustration of a remote health monitoring system based on wearable sensors. Health related information is gathered via body-worn wireless sensors and transmitted to the caregiver via an information gateway such as a mobile phone. Caregivers can use this information to implement interventions as needed.

EX1034, 2.

A similar system is illustrated below:

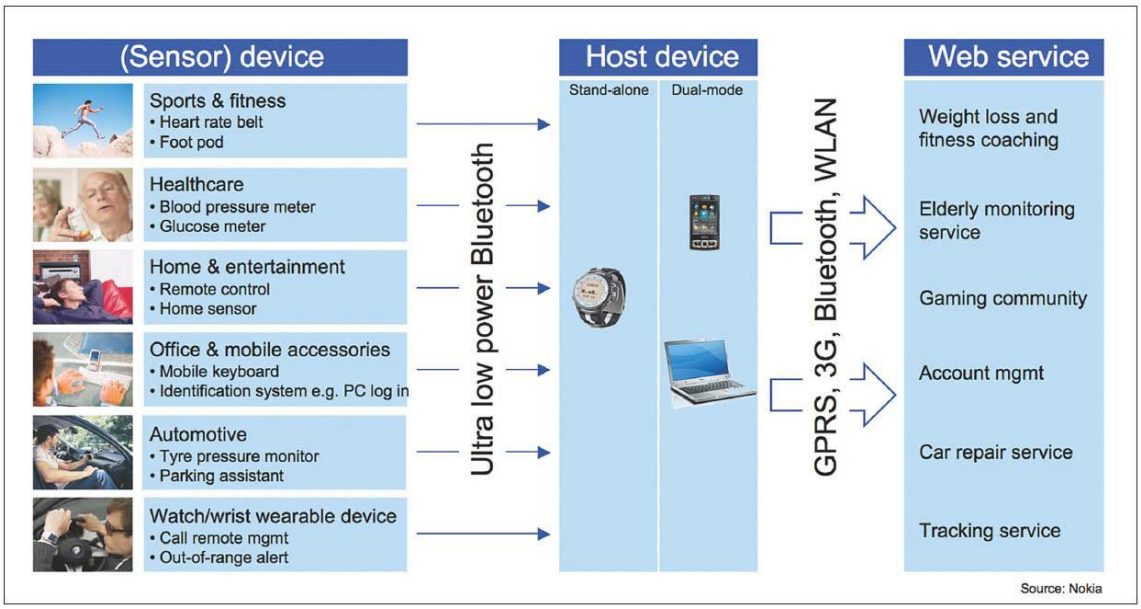


Figure 2. Bluetooth low energy will extend interoperable wireless connectivity to coin-cell-powered wireless sensors in health care, fitness, and related sectors. WLAN, wireless local area network; GPRS, general packet radio service.

EX1035, 459-60; EX1003 ¶64. Other publications from 2012 illustrate interconnected networks that use "cloud" based services to support health/fitness applications. EX1003 ¶65; *see* EX1037, 208-09. Indeed, the wireless, Internet-connected architecture for collecting, processing, and returning processed health data mirrors the analogous "wired" device architecture used for decades in optical systems. EX1003 ¶¶56; *see* EX1033, 1363.

Thus, the market trends that resulted in these emerging "cloud"-based products for personal health, sports performance, and medical monitoring provided a strong motivation for a POSITA to integrate optical sensing techniques into small, portable, and wearable consumer devices that communicate wirelessly with personal devices and remote services. EX1003 ¶67. Indeed, the Board previously found—and Omni did not dispute—that "numerous industry trends," including "improving the capabilities of wearable sensors for use in sports and personal fitness applications and wirelessly connecting wearable sensors to networks to remotely monitor patient health" would have motivated a POSITA to modify or adapt prior art systems like those discussed below. EX1008, 23-24, *aff'd*, EX1009.

C. Alleged Invention of the '790 Patent

The '790 patent purports to relate to a "wearable device for measuring one or more physiological parameters," where the device "comprises a light source with a plurality of semiconductor diodes and a detection system that measures reflected

light from tissue comprising skin." EX1001, Abstract. The wearable device is "adapted to be placed on a wrist of a user." EX1001, 9:4-7. The semiconductor diodes in the light source are "configured to generate an output optical light having 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." EX1001, 9:7-12. "The wearable device also comprises one or more lenses configured to receive at least a portion of the output optical signal and to deliver a lens output light to a tissue comprising skin." EX1001, 9:13-16. Further, the device includes a "detection system" that "receive[s] at least a portion of the lens output light reflected from the tissue" and "generate[s] an output signal having a signal-to-noise ratio." EX1001, 9:16-21. The detection system includes a plurality of detectors that are spatially separated, is "synchronized to the light source," and is configured to generate a "first signal" when the semiconductors are off and a "second signal" when the semiconductors are on, and then to increase the signal-to-noise ratio "by comparing the first signal and the second signal." EX1001, 9:16-35. Finally, the "wearable device is at least in part configured to identify an object." EX1001, 9:35-36.

D. Prosecution History of The '790 Patent

As mentioned, *supra* § IV.A, the '790 patent was prosecuted as an AIA patent, and was filed on February 9, 2024, issuing on January 14, 2025. The '790 patent is

part of a family of continuations that includes the ’533 and ’484 patents and dates back to several 2012 provisional applications. EX1001, 1-2. The ’790 patent is subject to a terminal disclaimer to some of those patents; the applicant filed the disclaimer following a conversation with the Examiner, where the Examiner noted “that the application would be in condition for allowance considering applicant agrees to file the terminal disclaimer.” EX1001, (*), EX1002, 263-65, 271.

After filing the terminal disclaimer pursuant to the Examiner’s request, the claims were allowed without any amendments and without much discussion of the prior art. EX1002, 301-10. Indeed, in the Notice of Allowance, the Examiner identified only two prior art references—U.S. Patent No. 9,430,093 (“Harrison”) and U.S. Patent No. 9,915,726 (“Bailey”)—then stated that these references were the “closest prior art” and that they did not teach the claimed invention, with a citation to a few embodiments of Harrison, but no substantive discussion of the references or mapping of each limitation to the prior art. EX1002, 306-08.

VII. GROUNDS OF UNPATENTABILITY

A. Collateral Estoppel

As demonstrated below, Claim 7 (the sole Challenged Claim in this Petition) is materially identical to the claims found unpatentable by the Board in the prior ’533 and ’484 IPRs based on the same prior art references identified in Ground 1

(Lisogurski and Carlson). A comparison of the limitations of Claim 7 against an exemplary previously invalidated claim limitation from those related IPRs is below.

Claim 7	Exemplary Related Claim(s)–Prior IPRs
7[pre]: An optical system, comprising:	A measurement system comprising: (EX1004, cl. 5)
7[a]: a wearable device for measuring one or more physiological parameters, the wearable device adapted to be placed on a wrist of a user;	a wearable measurement device for measuring one or more physiological parameters (EX1004, cl. 13) a wearable device adapted to be placed on a wrist or an ear of a user (EX1005, cl. 1)
7[b]: the wearable device including a light source comprising a plurality of semiconductor diodes that are configured to generate an output optical light having 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;	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 (EX1004, cl. 13)
7[c]: the wearable device comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens output light to tissue comprising skin;	the wearable device comprising one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue (EX1005, cl. 1)
7[d]: the wearable device further comprising a detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal having a signal-to-noise ratio,	the wearable device further comprising a detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal having a signal-to-noise ratio, wherein the

wherein the detection system is configured to be synchronized to the light source;	detection system is configured to be synchronized to the light source (EX1005, cl. 1)
7[e]: wherein the detection system comprises a plurality of detectors that are spatially separated from each other, and wherein at least one analog to digital converter is coupled to at least one of the plurality of detectors;	wherein the detection system comprises a plurality of spatially separated detectors, and wherein at least one analog to digital converter is coupled to at least one of the spatially separated detectors (EX1005, cl. 1)
7[f]: wherein the output signal is indicative of the one or more of the physiological parameters;	wherein the output signal is indicative of one or more of the physiological parameters (EX1005, cl. 1)
7[g]: the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the plurality of semiconductor diodes from an initial light intensity; and	the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the plurality of semiconductor sources from an initial light intensity (EX1005, cl. 1)
7[h]: the detection system further configured to:	the detection system further configured to (EX1005, cl. 1)
7[i]: generate a first signal responsive to light received while the semiconductor diodes are off,	generate a first signal responsive to light received while the light emitting diodes are off (EX1005, cl. 1)
7[j]: generate a second signal responsive to light received while at least one of the semiconductor diodes is on, and	generate a second signal responsive to light received while at least one of the light emitting diodes is on (EX1005, cl. 1)
7[k]: increase the signal-to-noise ratio by comparing the first signal and the second signal; and	increase the signal-to-noise ratio by comparing the first signal and the second signal (EX1005, cl. 1)

7[l]: wherein the wearable device is at least in part configured to identify an object.	wherein the wearable device is at least in part configured to identify an object (EX1005, cl. 3).

Notably, the Federal Circuit has affirmed the unpatentability of *all* these limitations, either directly or by Omni's failure to cross-appeal on these findings in the '484 IPR, with the exception of 7[l], for which the Board's finding of unpatentability is currently under review. EX1009; EX1012, n.2. Moreover, the Board has twice held that a POSITA would have been motivated to combine Lisogurski and Carlson, and the Federal Circuit affirmed those findings. EX1008, 22-25, *aff'd*, EX1009; *see also* EX1011, 22, 28, 36-43, *aff'd in relevant part*, EX1012, n.2.

Thus, Omni is collaterally estopped from challenging the unpatentabilty of claim 7 (and motivation to combine Lisogurski and Carlson), at least as to limitations 7[pre]-7[k]. *Papst*, 924 F.3d at 1251 ("[T]he issue preclusion doctrine can apply … to the Patent Trial and Appeal Board's decision in an IPR once it becomes final."); *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1342 (Fed. Cir. 2013) ("Our precedent does not limit collateral estoppel to patent claims that are identical. … If the differences between the unadjudicated patent claims and adjudicated patent claims do not materially alter the question of invalidity, collateral estoppel applies."); *Samsung Elecs. Co., Ltd. v. Netlist, Inc.*, IPR2025-00002, Paper 17, 17-

24 (P.T.A.B. May 15, 2025). All four requirements for collateral estoppel to apply are present here.

First, the issues presented by WHOOP's obviousness challenge under Ground 1 are identical to those presented in the '533 and '484 IPRs. The Challenged Claim recites 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*, 735 F.3d at 1342 (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."). Only the question of whether Lisogurski and Carlson render limitation 7[l] obvious remains a live issue in Omni's appeal of the Second Final Written Decision in the '484 IPR. *See* EX1061, 25-30.[8]

---

[8] Omni also challenges whether the Board had substantial evidence to support its finding of a motivation to combine a set of prior art references that are not relevant to this Petition. *See* EX1061, 30-38.

Second, the unpatantability of these materially identical claim limitations was "actually litigated" by Omni in the '533 and '484 IPRs. *Google*, 54 F.4th at 1381; EX1008, *aff'd*, EX1009; EX1011, *aff'd in part rev'd in part*, EX1012 n.2; EX1013. Despite having two opportunities to litigate the overlapping limitations in the '533 and '484 patents in the respective Apple IPRs, Omni *chose* not to challenge Apple's contentions that Lisogurski and Carlson taught or rendered obvious nearly all of the challenged claim limitations in those IPRs. *E.g.*, EX1011, 5-6, 23-27, 43-44 (finding that Omni presented no argument as to why Lisogurski and Carlson do not teach or render obvious fourteen of fifteen elements in representative claim 1 of the '484 patent); EX1008, 24-25 (finding Omni did not challenge motivation to combine Lisogurski and Carlson in the '533 IPR). Indeed, Omni has not disputed in the prior IPRs that Lisogurski and Carlson teach or render obvious limitations in the '533 and '484 patents that are identical or materially identical to *twelve of the thirteen* elements in the Challenged Claim. EX1008, 25-26; EX1011, 5-6, 23-27, 43-44.

Third, the Board's findings that Lisogurski and Carlson taught or rendered obvious the overlapping claim limitations were "essential" to the findings of unpatentability, and have become final, as they were affirmed by the Federal Circuit. *Google*, 54 F.4th at 1381-82; EX1009; EX1012, n.2.

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

Decision in the ’533 IPR to the Federal Circuit, and the Federal Circuit affirmed the decision in full. EX1009. And Omni *chose* not to cross-appeal the Board’s first Final Written Decision in the ’484 IPR finding the majority of the challenged claims unpatentable, tacitly conceding their unpatentability. EX1012, n.2. Thus, the only limitation in the previous IPRs (and in the Challenged Claim) for which Omni has not received a final judgment of unpatentability is element 7[l], which relates to whether the claimed measurement device can “identify an object.” EX1061, 25-30.

Accordingly, Omni is collaterally estopped from challenging the patentability of the Challenged Claim, at least as to limitations 7[pre]-7[k], and further collaterally estopped from challenging a POSITA’s motivation to combine Lisogurski and Carlson, or reasonable expectation of success in doing so. Further, to the extent the Board’s findings as to element 7[l] are affirmed (or the appeal is dismissed) during the pendency of this petition, collateral estoppel would likewise apply as to that limitation.

B. Ground 1: Claim 7 would have been obvious over Lisogurski in view of Carlson.

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, 3:62-4:8; EX1003 ¶¶90-92. 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 on various body parts, is battery powered, and can wirelessly communicate with the monitor. EX1027, 3:62-4:8, 4:15-20, 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, 10:48-64; *see also* EX1027, 4:42-48, 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, 7:13-19, 8:4-8, 11:38-41, 50-54, 12:3-9; EX1003 ¶94. As a higher current is applied to a particular LED, its emitted light intensity increases. EX1027, 7:13-31, 12:3-22; EX1003 ¶94. Lisogurski teaches that the LEDs can be modulated, and that, depending on various conditions, the system can change the modulation parameters and the light drive cycle, EX1027, 1:10-25, 1:60-2:3, 5:48-54, 8:4-8, 8:27-35, 16:25-32. The drive cycle parameters that can be controlled include "light intensity, duty cycle, [and] light source firing rate." EX1027, 1:60-2:3; *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, 9:46-60, 14:40-55, 26:1-14; *id.*, 5:55-6:6, 8:46-52, 27:44-49; EX1003 ¶94.

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 sensor. 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. EX1027, 11:20-27; EX1003 ¶¶92-93. The sensor can be connected to the monitor with or without a wire. EX1027, 17:54-59, Fig. 3; EX1003 ¶¶90-91. Either way, the device applies signal processing techniques to the detected signal to isolate the signal from the reflected light. EX1027, 7:16-21, 12:45-49, 13:7-14:55; EX1003 ¶93.

b) Carlson

Carlson discloses a pulse oximeter that can be worn on the ear, finger, or elsewhere. EX1028, [0003], [0052], [0078]; EX1003 ¶96. The oximeter 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 ¶96. The device is mobile and can wirelessly transmit data to, *e.g.*, a doctor or hospital. EX1028, [0072], [0077]-[0078].

Carlson seeks to "increase the technical performance of pulsoximetry in terms of quality and robustness of the measurement signal versus environmental

disturbances and energy consumption." EX1028, [0002]. 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].

c) Motivation to Combine

As mentioned, in the '533 and '484 IPRs, the Board twice held (and the Federal Circuit affirmed) that a POSITA would have been motivated to combine the Lisogurski system with Carlson. EX1008, 22-25, *aff'd*, EX1009; *see also* EX1011, 22, 28, 36-43, *aff'd in relevant part*, EX1012, n.2.

To the extent Omni is not collaterally estopped from challenging this issue, 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), such that a POSITA would have considered the two systems together. EX1008, 22-25; EX1011, 22, 28, 36-43; EX1003 ¶107. 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 ¶108. 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 ¶108. 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 ¶108.

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 ¶109. 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 ¶110. A POSITA, therefore, would have considered these two references together when implementing a system based on Lisogurski's teachings. EX1003 ¶110. 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 ¶110. For example, modifying Lisogurski's system to include the "beam shaping element" (*e.g.*, a lens) disclosed by Carlson would have been a routine modification, because elements like lenses are considered "building blocks" of optical measurement systems used to focus the light of LEDs. EX1003 ¶110.

2. Analysis of Ground 1

a) 7[pre]: An optical system, comprising:

In the '533 IPR, the Board found (and the Federal Circuit affirmed) that Lisogurski teaches a "measurement system" and a "wearable measurement device for measuring one or more physiological parameters." EX1008, 25, *aff'd*, EX1009. The substitution of "optical" for "measurement" does not save the Challenged Claim here from unpatentability. Indeed, a POSITA would have considered an "optical

system" to be a system that measures particular constituents using optical methods, like those discussed above. EX1003 ¶122; *supra* § VI.B.1.

To the extent Omni is not collaterally estopped from challenging this limitation and to the extent the preamble is limiting, Lisogurski discloses 7[pre]. Lisogurski describes "an **optical** physiological monitoring **system**," which includes a sensor and a monitor, that "may be used to determine[] physiological parameters such as blood oxygen saturation, hemoglobin …, [and] pulse rate." EX1027, 1:10-25; *id.*, 3:43-46; *see also id.*, 3:61-4:5, 4:22-25, 15:30-35. Lisogurski therefore teaches "[a]n optical system." EX1003 ¶¶120-122.

b) 7[a]: a wearable device for measuring one or more physiological parameters, the wearable device adapted to be placed on a wrist of a user;

The Board previously determined (and Omni did not dispute) that Lisogurski discloses materially identical limitations to claim 7[a], and the Federal Circuit affirmed these findings. *See* EX1008, 7-8, 25 (finding Lisogurski teaches "a wearable measurement device" "for measuring blood oxygen saturation" that can be "mounted on a user's fingertip, toe, earlobe, wrist, or thigh"), *aff'd*, EX1009; EX1011, 5-6, 23, 26-27 (finding Lisogurski teaches "[a] system for measuring one or more physiological parameters….the system comprising" "a wearable device adapted to be placed on a wrist or an ear of a user"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is

materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A.

To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[a] for the reasons below.

"Wearable device for measuring one or more physiological parameters." To the extent the Board reaches the issue, Lisogurski discloses a "wearable device for measuring one or more physiological parameters." Lisogurski teaches "an optical physiological monitoring system" that "may be used to determine physiological parameters such as blood oxygen saturation, hemoglobin, blood pressure, pulse rate, other suitable parameters, or any combination thereof." EX1027, 1:10-25; *id.*, 3:43-46, 3:61-4:5, 4:22-25, 15:30-35. Lisogurski therefore describes a sensor for "measuring one or more physiological parameters." EX1003, ¶¶124-126.

"Wearable device adapted to be placed on a wrist of a user." Lisogurski discloses that its sensor may be worn on various parts of a person's body, and specifically, may be worn on "the wrist to monitor radial artery pulsatile flow." EX1027, 4:6-20, *id.*, 1:10-25, 3:43-46. Thus, Lisogurski's sensor comprises "a wearable device…adapted to be placed on a wrist of a user." EX1003, ¶¶127-128.

c) 7[b]: the wearable device including a light source comprising a plurality of semiconductor diodes that are configured to generate an output optical light having 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 Board previously determined (and Omni did not dispute) that Lisogurski discloses materially identical limitations to claim 7[b], and the Federal Circuit affirmed these findings. *See* EX1008, 7-8, 25 (finding Lisogurski teaches "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"), *aff'd*, EX1009; EX1011, 5-6, 23, 26-27 (finding Lisogurski teaches "[a] light source comprising a plurality of semiconductor sources that are light emitting diodes, each of the light emitting diodes configured to generate an output optical light having one or more optical wavelengths"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A.

To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[b] for the reasons below.

<u>"A light source comprising a plurality of semiconductor diodes configured to generate an output optical light having one or more optical wavelengths.</u>" Lisogurski discloses a wearable sensor with a light source comprising multiple LEDs, *i.e.*, "semiconductor sources." EX1027, 17:42-45 ("[S]ensor unit 312 may include multiple light sources and detectors."); 10:48-64 ("light source 130 may include any number of light sources with any suitable characteristics"); Fig. 1 (130); Fig. 3 (316); EX 1003 ¶¶123, 192, 206. The light source may include, *e.g.*, multiple IR and red LEDs. EX1027, 7:58-8:3, 10:58-63, 17:37-45, 19:25-39. It was well-known at the time of the '790 patent that LEDs are semiconductors. EX1003, ¶131. Therefore, Lisogurski discloses that the wearable sensor includes "a light source comprising a plurality of semiconductor diodes." EX1003, ¶¶130-131.

Lisogurski specifies each of the LEDs in the light source is configured to output an "optical light" with "one or more optical wavelengths." EX1027, 10:49-52 (the LEDs are "configured to emit photonic signals having **one or more wavelengths of light** (e.g., Red and IR) into a subject's tissue"), 7:38-8:3; *see also id.* 4:42-45. Lisogurski discloses that the LEDs create light that is transmitted to a particular location in space—the "subject's tissue," thus creating an "output optical light having one or more optical wavelengths." EX1027, 10:49-52; EX1003 ¶132.

"Wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers." Lisogurski teaches that the "IR wavelength" of the optical light emitted by the semiconductor sources/LEDs "may be between about 800 nm and 1000 nm." EX1027, 10:48-64. This range falls within the claimed range of "700 nanometers and 2500 nanometers." Furthermore, a POSITA would have understood the "IR wavelength" in Lisogurski corresponding to this range to be a "near-infrared wavelength" based on the light spectrum and a POSITA's understanding of infrared and near-infrared light. EX1003 ¶133. A POSITA would have also understood Lisogurski's disclosure of a 800–1000 nm wavelength to be a non-limiting example. EX1003 ¶133. It would have been an obvious modification for a POSITA, and within a POSITA's knowledge and skill, to select an LED capable of emitting light in the 700–800 nm band, or in the 1000–2500 nm band. EX1003 ¶133. Accordingly, Lisogurski teaches or renders obvious "at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers." EX1003 ¶¶133-134.

d) 7[c]: the wearable device comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens output light to tissue comprising skin;

The Board previously determined (and Omni did not dispute) that Lisogurski (alone or in view of Carlson) discloses materially identical limitations to claim 7[c],

and the Federal Circuit affirmed these findings. *See* EX1008, 7-8, 35-37 (finding Lisogurski in view of Carlson teaches "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"), *aff'd*, EX1009; EX1011, 5-6, 23-24, 26-27 (finding Lisogurski or Lisogurski in view of Carlson teaches "the wearable device comprising one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski (alone or in view of Carlson) teaches or renders obvious 7[c] for the reasons below.

Lisogurski Alone. Lisogurski teaches a wearable device (*e.g.*, Lisogurski's sensor 102/312, *see* EX1027, Fig. 1, Fig. 3) comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens output light to tissue comprising skin. EX1003 ¶¶136-140. Lisogurski further teaches that its measurement device (sensor 102/312) can include LEDs (EX1027, 7:38-8:3, 10:52-56, 19:25-31; EX1003 ¶131 and is configured to receive a portion of the output optical light via, *e.g.*, an encapsulant or a lens system that captures and

focuses the emitted light. EX1003 ¶¶139-140. Specifically, a POSITA would have understood that a conventional LED (like those on Lisogurski's sensors) includes a light-emitting semiconductor that creates an outputted optical light. EX1003 ¶¶136-137.

A POSITA would also have known there are three types of LEDs: (i) LEDs with no encapsulant; (ii) LEDs with an optically inert encapsulant; and (iii) LEDs with an optically active encapsulant that functions as, *e.g.*, a lens. EX1003 ¶139. A POSITA would have understood that the first type of LED is rarely used in optical systems. EX1003 ¶139. A POSITA would have understood that the third type of LED can increase efficiency of the device by focusing and directing more light produced toward the tissue, which can be important in mobile, battery-powered devices. EX1003 ¶¶139-140. A POSITA would have found it obvious, therefore, to select an LED for Lisogurski's system that uses an encapsulant as a lens, which would have been a common configuration with known benefits. EX1003 ¶140. Indeed, a POSITA would have recognized that a lens is a "basic building block[]" of an optical sensor. EX1033, 765; EX1003 ¶140.

In such a configuration of Lisogurski, each of the LEDs would emit at least a portion of the output optical light, which would be received, captured, and focused by that LED's encapsulant lens, then delivered to the tissue as a lens output light. EX1003 ¶¶136-141. Lisogurski also discloses that the "lens output light" would be

delivered to "tissue comprising skin." EX1003 ¶136. For example, Lisogurski discloses that the light sensor may be "placed at a site on a patient, typically a fingertip, toe, forehead or earlobe, or in the case of a neonate, across a foot," and that "a light source[]…pass[es] light thought blood perfused tissue and photoelectrically sense[s] the absorption of the light in the tissue." EX1027, 4:6-11; *see also id.*, 3:61-62, 4:31-45, 10:48-56, 11:13-25, 12:9-22, 17:37-42, 19:48-50, 22:58-60, 26:34-36. Lisogurski also discloses that the "Red and IR light emitting diodes…emit[] **light into the tissue of subject** to generate physiological signals," and that the resulting "red waveforms may be 25% of the intensity of the IR waveform, as may occur in patients with dark **skin** pigmentation." EX1027, 10:52-56, 44:43-45.

Lisogurski + Carlson. To the extent Omni argues that this limitation would not have been obvious in view of Lisogurski alone, it would have been obvious to a POSITA to modify Lisogurski in view of Carlson to satisfy 7[c]. EX1003 ¶¶142-145. Carlson identifies the benefits of using "**at least one beam shaping optical element** to direct the emitted light," *i.e.*, Carlson teaches focusing the **optical output light** to create a **lens output light** that is then delivered to a **sample/tissue, such as skin**. EX1028, [0011]-[0013], EX1003 ¶143. Carlson teaches that the "**beam shaping element**" can be "**diffractive or refractive lenses**, to **direct the emitted optical radiation** of**, e.g., the LED light source into the human or animal**

tissue…." EX1028, [0014], [0024], [0062]. Figure 4 (below) of Carlson shows two lenses 21 that receive light beams 8 emitted by LEDs 15 ("***a portion of the output optical light***") and deliver **light bundles or beams 12** to **sample 2** ("***deliver a lens output light to tissue comprising skin***"). EX1028, [0054], [0062].

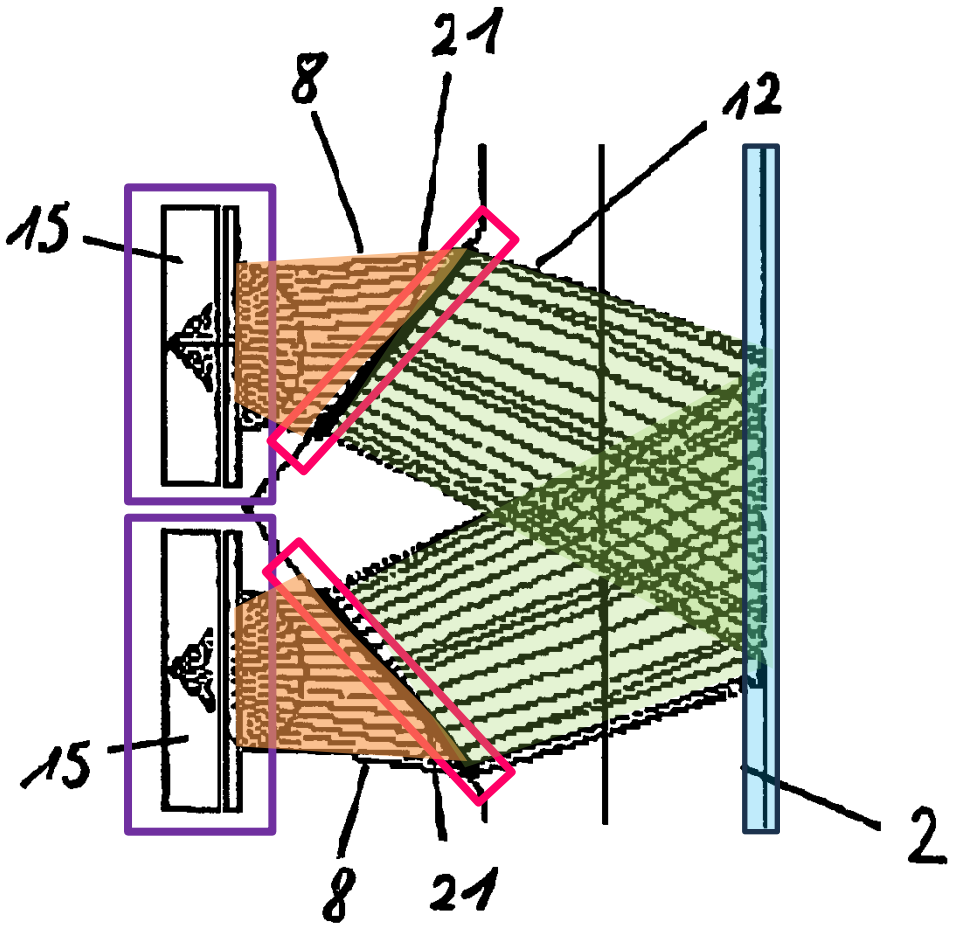


Figure 4

EX1028, Fig.4 (annotated); *id.*, [0054] ("in Fig. 4, using the **beam shaping optics 21**, **the two initial light beams 8** are guided in **the form of bundled beams 12**").

Including the lens from Carlson in the wearable device of Lisogurski would have been obvious to a POSITA due to the improvements to Lisogurski's system enabled by such a combination. EX1003 ¶144. For example, Carlson teaches that lenses can be included in optical sensors to increase the optical signal power without increasing the actual power used by the system. EX1028, [0014] ("The basic idea…is **to use a beam-shaping element, such as e.g.… lenses**…,in order to increase the optical signal power…, thus increasing the Signal/Noise … ratio."); *id.*, [0010]; EX1003 ¶144. Lisogurski identifies as one of its objectives to improve the power consumption efficiency of optical sensing devices, including via techniques that improve SNR of the measured optical signal. EX1027, 6:3-6, 9:49-60, 13:60-14:10, 14:40-55, 37:6-20; EX1003 ¶144. A POSITA would have had a reasonable expectation of success in making this combination because a lens is a "basic building block" of optical systems and could have been integrated into Lisogurski's system with routine skill and effort. EX1003 ¶144. Thus, a POSITA would have found it obvious to add Carlson's beam-shaping element/lens to Lisogurski to receive at least a portion of the output optical light and to deliver a lens output light to tissue comprising skin, as required by 7[c]. EX1003 ¶¶144.

e) 7[d]: the wearable device further comprising a detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal having a signal-to-

noise ratio, wherein the detection system is configured to be synchronized to the light source;

The Board previously determined (and Omni did not dispute) that Lisogurski discloses materially identical limitations to claim 7[d], and the Federal Circuit affirmed these findings. *See* EX1008, 7-8, 37-39 (finding Lisogurski teaches "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"), *aff'd*, EX1009; EX1011, 5-6, 23-24, 26-27 (finding Lisogurski teaches or renders obvious a limitation identical to 7[d]), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski (alone or in view of Carlson) teaches or renders obvious 7[d] for the reasons below.

"The wearable device further comprising a detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal " Lisogurski's sensor (a wearable device) includes a **detector** (140/318) that **receives** "the light that is reflected by or has traveled through the subject's tissue." EX1027, 17:39-42; *id.*, 11:9-10; Fig. 1 (140); Fig. 3 (318);

EX10039 ¶¶147-48. Lisogurski teaches the detector is coupled to front end processing circuitry. EX1027, 12:42-45; Fig. 1 (150). A POSITA would have understood Lisogurski's detector and front end processing circuitry to collectively be a "detection system." EX1003 ¶149.

To the extent the claims require that the detection system is integrated into the sensor (the wearable device), this would have been an obvious modification to Lisogurski. EX1003 ¶¶149-51. Lisogurski teaches the front end processing circuitry in the detection system may be integrated directly with the sensor, rather than in a separate monitor. EX1003 ¶149. Specifically, Lisogurski suggests integrating the front end processing circuitry with the detection system in the manner depicted below. EX1027, 11:20-25, 17:55-59 ("Sensor unit 312 may be powered by an internal power source, e.g., a battery (not shown)…. [T]he sensor may be wirelessly connected to monitor 314 (not shown)."), 18:23-25; *see also id.*, 17:32-35.

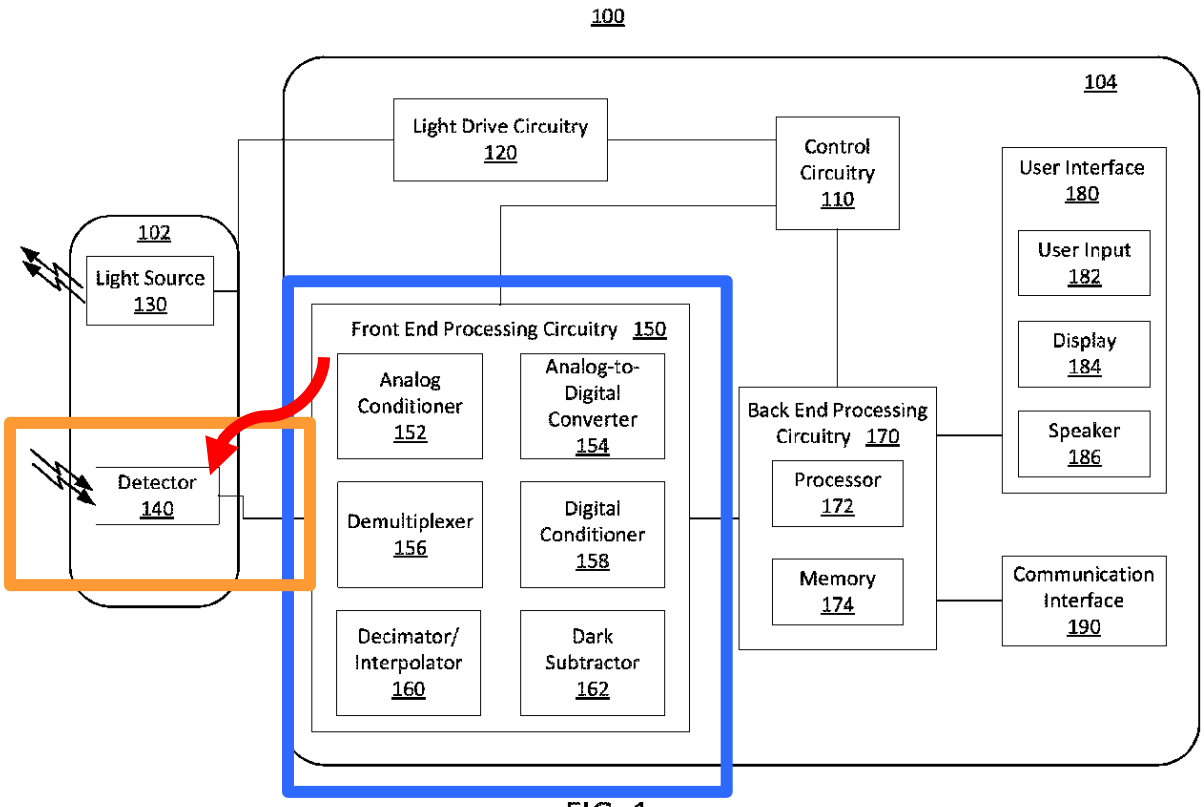


FIG. 1

EX1027, Fig. 1 (annotated).

A POSITA would have considered it a routine and obvious modification to Lisogurski to integrate the front end processing circuitry in the monitor into the same device as the detector(s) based on these teachings in Lisogurski, as well in view of the market trends discussed above—in fact, existing wearable devices (*e.g.*, Nonin finger clip sensors) had this functionality. EX1003 ¶¶149-151. A POSITA would have understood the functional relationship between the detector and the monitor; specifically, the signal received by the detector would preferably be converted from analog to digital form in order to be wirelessly transmitted to the monitor. EX1003 ¶150. A POSITA would have understood, and indeed, Lisogurski teaches, that the

front end processing circuitry can perform analog-to-digital conversion and other initial signal processing. EX1003 ¶150. A POSITA would have understood that adding this additional necessary circuitry in the sensor would not affect the device's operation, because such circuitry is small and power efficient, and would have been straightforward to integrate into the wearable sensor. EX1003 ¶151. Furthermore, a POSITA would have understood this variation of Lisogurski to be consistent with Lisogurski's disclosure that "[i]n some embodiments the functionality of some of the components may be combined in a single component… [or] the functionality of some of the components of monitor 104… may be divided over multiple components." EX1027, 16:2-9; EX1003 ¶151.

Lisogurski also discloses that the detector(s) processes at least a portion of the light reflected from the tissue by "converting the intensity of the received light," *i.e.*, the analysis output beam from the tissue, "into an electrical signal." EX1027, 11:6-27, Fig. 1 (102), Fig. 3 (312); EX1003 ¶¶147-50, 153. The detection system generates a "detector signal" (output signal) from reflected light by "convert[ing] the intensity of the received light into an electrical signal." EX1027, 11:14-16, 17:39-42; *see also id.*, 11:9-10; Fig. 1 (140); Fig. 3 (318); Fig 2B, 2:17-19 (showing illustrative plot of "a detector signal that may be generated by a sensor"); 12:50-51 ("One suitable detector signal that may be received by front end processing circuitry 150 is shown in Fig. 2B"), 12:52-13:6; EX1003 ¶¶153, 157. "After converting the

received light to an electrical signal, detector 140 may send the detection signal to monitor 104" directly (EX1027, 11:20-22), or the sensor may further process the electrical signal before transmitting the detection signal to the monitor (EX1027, 11:25-27).

Accordingly, Lisogurski teaches or renders obvious a "detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal." EX1003 ¶¶147-155.

"[A]n output signal having a signal-to-noise ratio." Lisogurski discloses that the output signal has a signal-to-noise ratio. EX1027, 14:40-55 (referring to the "**signal-to-noise ratio of the detection signal"**), 9:46-52 (noting the detected signal may include "background noise" and that the light drive parameters of the LEDs may be modified to "improve the signal-to-noise ratio"). Lisogurski teaches altering "parameters" of the semiconductors/LEDs to mitigate the effect of noise, motion, or ambient light and thereby increase the signal-to-noise ratio. EX1027, 1:19-21, 9:46-52; *id.*, 5:57-61, 9:57-60, 14:40-55, 35:5-9; EX1003 ¶¶156-158. The "[p]arameters [of the LEDs] that may be varied include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof," where "light intensity" corresponds to brightness, frequency corresponds to "firing rate," and pulse width (*i.e.*, the duration of each pulse of light from the LED) corresponds to "duty cycle." EX1027, 1:19-21; EX1003 ¶159. For example, Lisogurski teaches "the intensity of

light source 130 and the timing of when light source 130 is turned on and off" is controlled by a light drive signal that "increase[s] the brightness of the light sources in response to…noise to improve the **signal-to-noise ratio**." EX1027, 9:46-60, 11:50-54; *see also id.*, 1:44-48, 11:38-54 (signal modulation techniques are controlled by control and light drive circuitry, which generate a light drive signal for activating and controlling the sensors of the light source(s)), Fig. 2B; EX1003 ¶¶158-159.

Accordingly, Lisogurski teaches or renders obvious a "an output signal having a signal-to-noise ratio." EX1003 ¶156.

"Wherein the detection system is configured to be synchronized to the light source." Lisogurski teaches that front end processing circuitry for its system is synchronized with the light drive circuitry that controls the modulation or pulses of the LEDs. EX1027, 11:33-49 ("front end processing circuitry 150 may… operate **synchronously** with light drive circuitry 120. For example, front end processing circuitry 150 may **synchronize** the operation of an analog-to-digital converter and a demultiplexer with the light drive signal based on the timing control signals.") (emphasis added). Thus, the front end processing circuitry and the detector ("detection system") in Lisogurski are "synchronized" to the light drive signal ("the light source"). EX1003 ¶¶161-164.

Additionally, Lisogurski discloses embodiments where the firing rate of an LED is correlated to the sampling rate of an analog-to-digital converter. EX1027, 33:47-49 ("sampling rate modulation may be correlated with light drive signal modulation"); *id.*, 2:1-2, 27:44-52 (LED firing rating modulated), 35:25-31. Lisogurski teaches an embodiment where the measurements taken by the receiver have a one-to-one correlation, with one sample taken per period. *Id.*, 35:17-19.[9] A POSITA would have understood that in this embodiment, the LEDs and the receiver are synchronized. EX1027, ¶¶163. Lisogurski's use of timing signals to synchronize the operation of the light source and the detection circuitry is consistent with embodiments in the '790 specification. EX1003, ¶163; EX1001, 58:30-32.

To the extent 7[d] requires Lisogurski's **control circuitry 110 and light drive circuitry 120** to be part of **light source 130** (rather than separately located in monitor 104, as shown in Figure 1), a POSITA would have been motivated to move this **circuitry** from the monitor to the sensor unit in the manner depicted below, as the Board previously found. EX1003 ¶181; EX1008, 22-23, EX1011, 24-25. This modification is consistent with Lisogurski's teaching that separate components in

---

[9] Lisogurski discloses different embodiments where there is not a one-to-one correlation, and instead multiple samples are taken per on period and then averaged. EX1027, 35:19-23.

the system can be integrated into a single component (EX1027, 16:2-9), consistent with the market trends discussed *supra* § VI.B.2, and would not affect Lisogurski's operation, because moving the circuitry would have been a routine modification consistent with existing products. EX1003 ¶181.

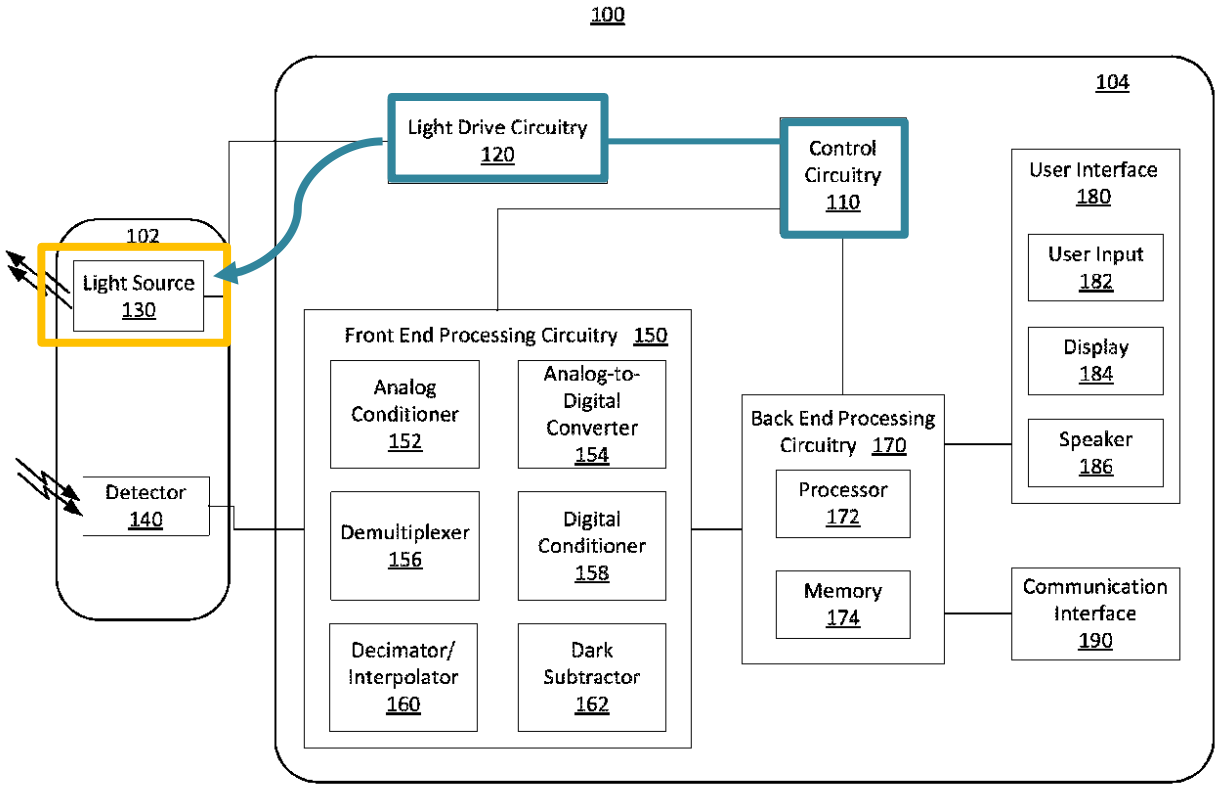


FIG. 1

EX1027, Fig. 1 (annotated); EX1003 ¶¶181-182.

Lisogurski therefore teaches or renders obvious 7[d]: "*a detection system*" that "*receives at least a portion of the lens output light*," and "*generates an output signal*" with a "*signal to noise ratio*," and that is "*synchronized*" to "*the light source*." EX1003, ¶¶146-47, 156, 164.

f) 7[e]: wherein the detection system comprises a plurality of detectors that are spatially separated from each other, and wherein at least one analog to digital converter is coupled to at least one of the plurality of detectors;

The Board previously determined (and Omni did not dispute) that Lisogurski discloses a materially identical limitation to claim 7[e], and the Federal Circuit affirmed these findings. *See* EX1011, 5-6, 25-27 (finding Lisogurski teaches or renders obvious "wherein the detection system comprises a plurality of spatially separated detectors, and wherein at least one analog to digital convertor is coupled to at least one of the spatially separated detectors"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[e] for the reasons below.

"Wherein the detection system comprises a plurality of detectors that are spatially separated from each other." Lisogurski teaches that its sensor "may include multiple…detectors, which may be spaced apart." EX1027, 17:39-45. Thus, Lisogurski teaches "a plurality of spatially separated detectors." EX1003 ¶168.

"[W]herein at least one analog to digital converter is coupled to at least one of the plurality of detectors." The electrical signals generated by Lisogurski's

detectors are received by the front end processing circuitry (to which the detectors are coupled, EX1027, 12:42-45; Fig. 1 (150)), and those electrical signals are passed between the components of the circuitry. EX1027, 13:6-59; EX1003 ¶¶169-170. The front-end processing circuitry includes an **analog-to-digital converter 154** (annotated in Figure 1 below). EX1027, 13:21-30; EX1003, ¶¶169-170.

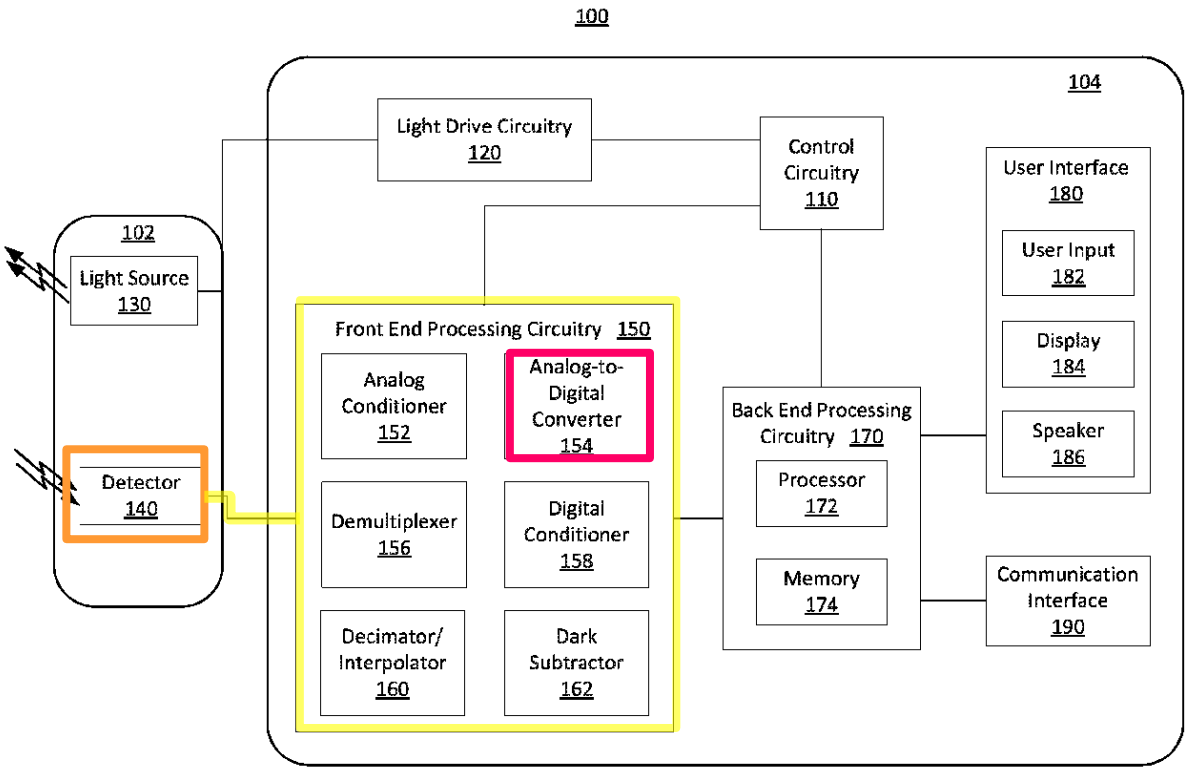


FIG. 1

As shown in Fig. 1, **the analog-to-digital converter** is coupled (yellow annotation) to at least one of **the spatially separated detectors**. EX1003 ¶170; EX1027, 11:28-32, 12:42-45, 18:16-31.

Accordingly, Lisogurski teaches or renders obvious 7[e]. EX1003 ¶171.

g) 7[f]: wherein the output signal is indicative of the one or more of the physiological parameters;

The Board previously determined (and Omni did not dispute) that Lisogurski discloses an identical limitation to claim 7[f], and the Federal Circuit affirmed. *See* EX1011, 5-6, 26-27 (finding Lisogurski teaches or renders obvious a limitation materially identical to 7[f]), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is identical to one Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[f] for the reasons below.

Lisogurski teaches measuring "various blood flow characteristics including, but not limited to, the oxygen saturation of hemoglobin in arterial blood …" and "a patient's pulse rate and blood pressure." EX1027, 3:62-4:5, 12:9:16, 14:60-64, 17:59-67. A POSITA would have understood that these blood flow characteristics would be based on data collected by the detector(s). EX1003, ¶172. Specifically, as explained above, Lisogurski teaches a processed output signal "based on the received physiological signals," *i.e.*, the physiological parameters. EX1027, 14:62-64; *supra* §§VII.B.2.e. Lisogurski teaches that the physiological data corresponding to the processed output signal can be stored, displayed, or published "to a server or website," transmitted wirelessly to other devices and monitors (via, *e.g.*, "WiFi, IR, WiMax, BLUETOOTH, UWB, or other standards"), or made available to a user

using another suitable technique. EX1027, 15:43-48, 15:53-57, 18:11-15, 18:49-53, 18:58-65, 19:1-19, 20:7-9, 20:55-60, 26:55-60. For example, Lisogurski teaches that output signal can be transmitted to a server, monitor, or remote device, like multi-parameter physical monitor 326 (MPPM). EX1027, 18:49-53; Fig. 3. (326). These devices, like MPPM 326, can be configured to calculate physiological parameters based on the received output signal, including by performing historical analysis of, *e.g.*, prior cardiac cycles, and by calculating statistical information related to the physiological parameters from the received signal. EX1027, 26:55-60, 18:49-53, 20:7-9, 19:1-19; EX1003 ¶¶172-175.

Thus, Lisogurski teaches or renders obvious an output signal that is indicative of one or more of the physiological parameters. EX1003. ¶176.

h) 7[g]: the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the plurality of semiconductor diodes from an initial light intensity; and

The Board previously determined (and Omni did not dispute) that Lisogurski discloses materially identical limitations to claim 7[g], and the Federal Circuit affirmed these findings. *See* EX1008, 7-8, 26 (finding Lisogurski teaches "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"), *aff'd*, EX1009; EX1011, 5-6, 27 (finding Lisogurski teaches "the wearable device configured to increase the signal-to-noise ratio (1) by increasing light intensity of at least one of

the plurality of semiconductor sources from an initial light intensity"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to those Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski (alone or in view of Carlson) teaches or renders obvious 7[g] for the reasons below.

Lisogurski teaches a wearable device with an LED-based light source (130/316) that is configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the semiconductor diodes from an initial light intensity. Specifically, Lisogurski teaches altering drive parameters of the LEDs in response to "the level of noise, ambient light, other suitable reasons" to mitigate the effect of noise, motion, or ambient light and thereby increase SNR. EX1027, 1:19-21, 9:46-52, 5:57-61, 9:57-60, 14:40-55, 35:4-9; EX1003 ¶178. The "[p]arameters [of the LEDs] that may be varied include **light intensity**, firing rate, [and/or] duty cycle," where "light intensity" corresponds to brightness, frequency corresponds to "firing rate," and pulse width (*i.e.*, the duration of each pulse of light from the LED) corresponds to "duty cycle." EX1027, 1:19-21; EX1003 ¶178.

For example, Lisogurski teaches "the **intensity** of light source 130 and the timing of when light source 130 is turned on and off" is controlled by a light drive

signal that "**increase[s] the brightness of the light sources** in response to…noise **to improve the signal-to-noise ratio**." EX1027, 9:46-60, 11:50-60; *id.*, 1:44-48, 11:38-41 (signal modulation techniques are controlled by control and light drive circuitry, which generate a light drive signal for activating and controlling the sensors of the light source(s)); EX1003 ¶¶179-180.

To the extent 7[g] requires Lisogurski's **control circuitry 110 and light drive circuitry 120** to be part of **light source 130** (rather than separately located in monitor 104), this would have been an obvious modification for the reasons discussed above. *Supra* § VII.B.2.e.

Thus, Lisogurski teaches or renders obvious 7[g]. EX1003 ¶182.

i) 7[h]: the detection system further configured to:

The Board previously determined (and Omni did not dispute) that Lisogurski discloses an identical limitation to claim 7[h], and the Federal Circuit affirmed. *See* EX1011, 5-6, 43-44 (finding Lisogurski teaches or renders obvious a limitation identical to 7[h]), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is identical to one Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[h] for the reasons below.

As discussed above, Lisogurski teaches or renders obvious a detection system. *Supra* § VII.B.2.d. And as discussed below, that detection system is "configured to" perform the claimed functions. *Infra* §§ VII.B.2.i-k. Accordingly, Lisogurski teaches or renders obvious 7[h].

j) 7[i]: generate a first signal responsive to light received while the semiconductor diodes are off,

The Board previously determined (and Omni did not dispute) that Lisogurski discloses a materially identical limitation to claim 7[i], and the Federal Circuit affirmed. *See* EX1011, 5-6, 43-44 (finding Lisogurski teaches or renders obvious a detection system configured to "generate a first signal responsive to light received while the light emitting diodes are off"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to one Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[i] for the reasons below.

Lisogurski teaches a "dark subtraction" technique to "remove ambient and background signals" from the measured signal corresponding to the desired physiological parameters. EX1027, 6:7-19, 13:60-14:10, 16:33-54; EX1003 ¶¶185-186. Specifically, Lisogurski teaches that "the system [may] turn[] on a first light source, followed by a 'dark' period, followed by a second light source, followed by

a ‘dark’ period.” EX1027, 6:12-15. “The system may measure the ambient light detected by the detector during the ‘dark’ period.” EX1027, 6:1-19; 13:67-14:6 (measuring a “dark signal” by “determining the amount of dark signal during [each] ‘off’ period 220.”); EX1003, ¶¶185-186.

Lisogurski teaches that the front end processing circuitry uses the electric current measured when the semiconductor sources (LEDs) are off to generate a “dark signal” (“*a first signal responsive to light received while the semiconductor diodes are off*”). EX1027, 13:35-41 (“Demultiplexer 156 may… generate… a first dark signal…, and a second dark signal…”), 12:59-13:6, 11:14-16 (detectors “convert the intensity of the received light into an electrical signal”); EX1003 ¶¶185-186. The dark signal 222 (also called dark current 222) is measured during dark period 220, and is depicted in Figures 2A and 2B of Lisogurski (annotated below according to Apple’s IPR of the ’484 patent):

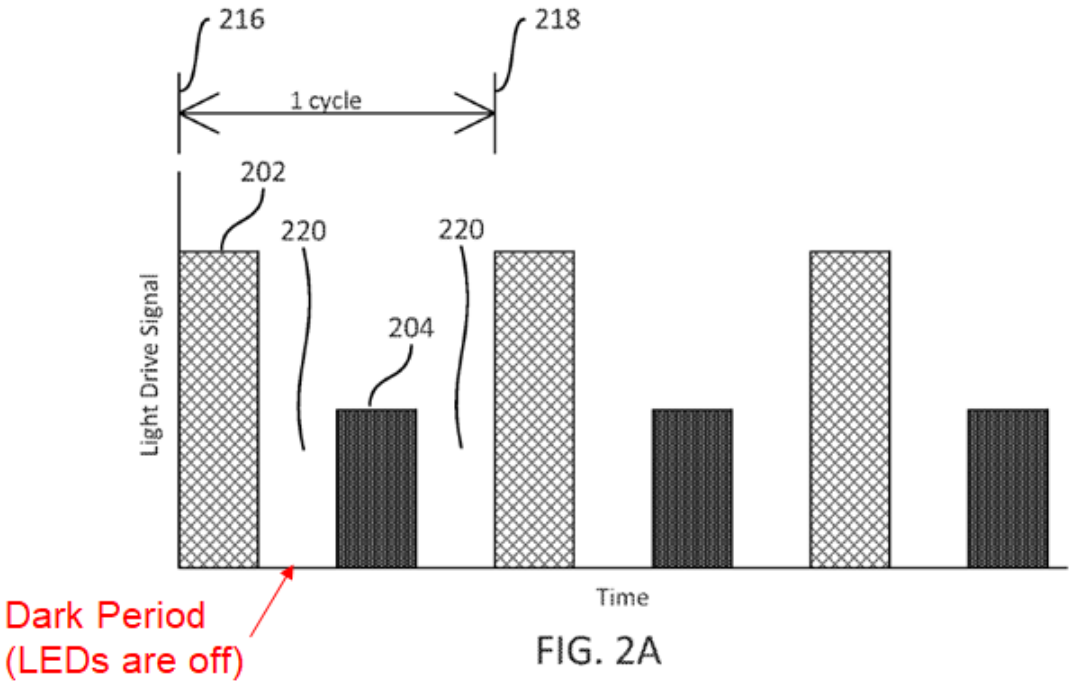


FIG. 2A

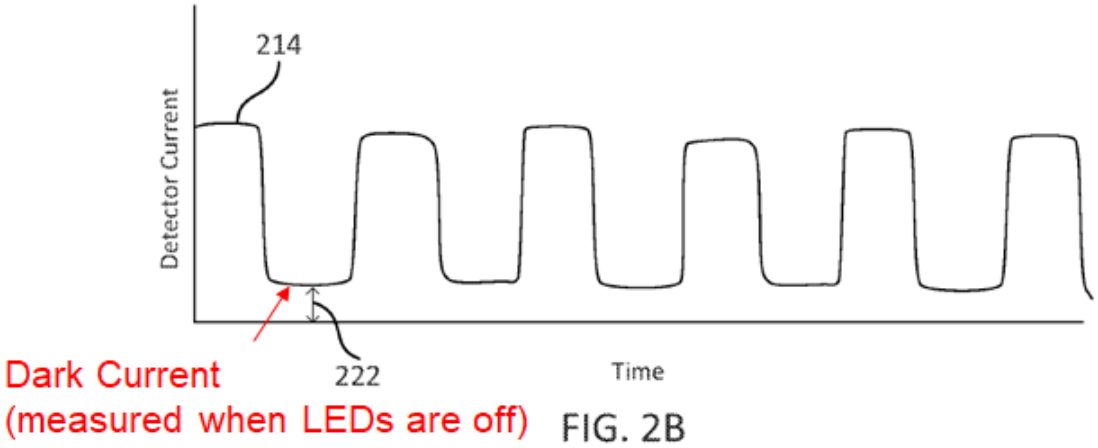


FIG. 2B

EX1021, 54-56; EX1003 ¶186; EX1027, Figs. 2A (current used to illuminate the LEDs), 2B (current output by detector); *see also* EX1027, 12:64-13:6, 13:67-14:6.

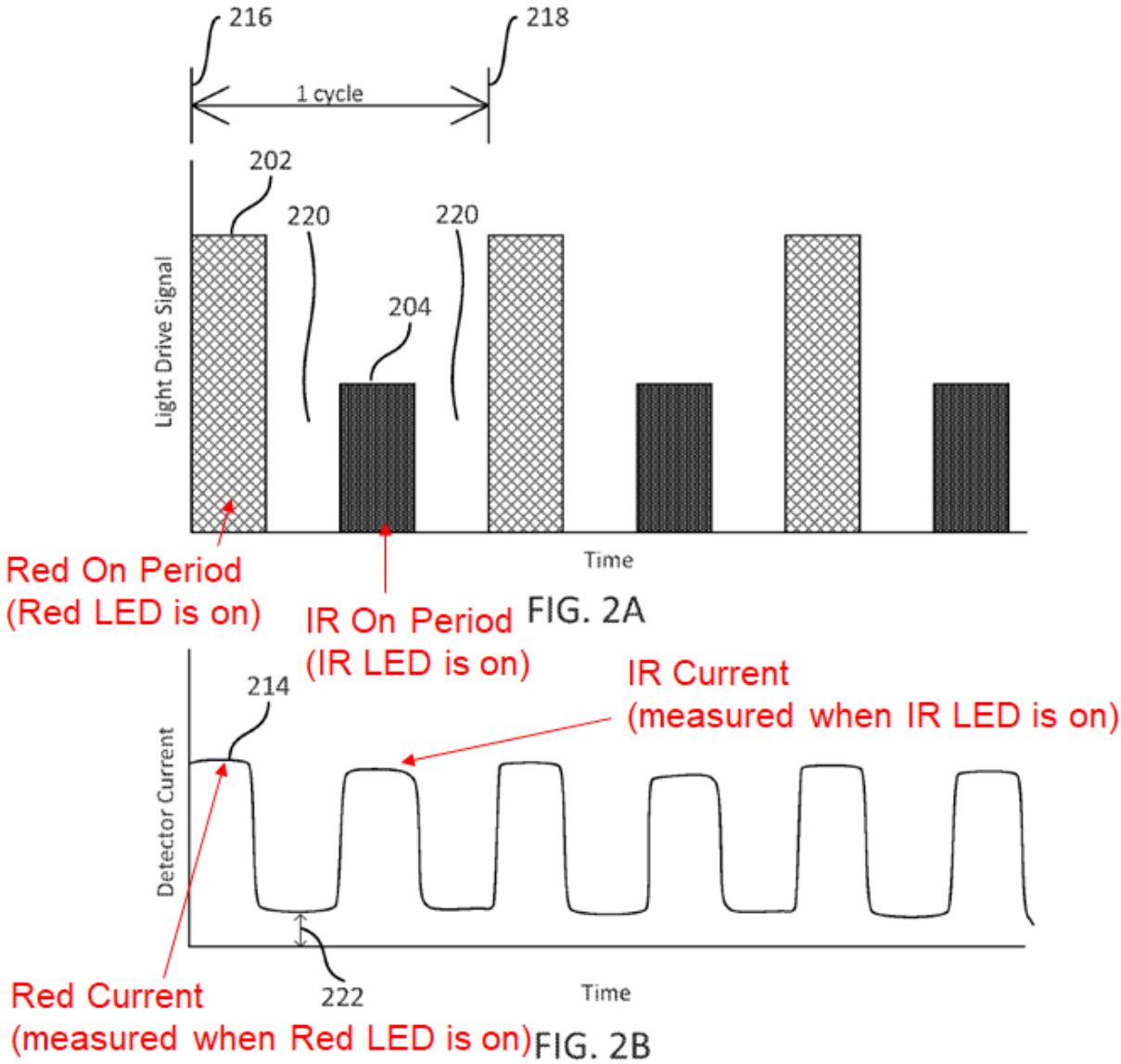
Accordingly, Lisogurski teaches or renders obvious 7[i]. EX1003 ¶187.

k) 7[j]: generate a second signal responsive to light received while at least one of the semiconductor diodes is on, and

The Board previously determined (and Omni did not dispute) that Lisogurski discloses a materially identical limitation to claim 7[j], and the Federal Circuit affirmed. *See* EX1011, 5-6, 43-44 (finding Lisogurski teaches or renders obvious a detection system configured to "generate a second signal responsive to light received while at least one of the light emitting diodes is on"), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is materially identical to one Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[j] for the reasons below.

Lisogurski's dark subtraction process (*supra* § VII.B.2.j) also teaches that its detector(s) and front end processing circuitry are configured to receive (*i.e.*, "capture") light reflected by a user's tissue while at least one LED is turned on. EX1003 ¶¶188-189; *see also* EX1027, 17:39-42 (light received by the detectors includes "light that is reflected by or has traveled through the subject's tissue"); *id.*, 11:12-20. Specifically, Lisogurski states that its system "may measure… the signals received during the first and second 'on' periods." EX1027, 6:12-19.

Lisogurski's system will generate a "red" signal and an "IR" signal ("second signal") when the respective LED is "on." EX1027, 13:67-14:6, 16:33-53, 11:14-16; *id.*, 13:35-41, 17:8-10; EX1003 ¶¶190-191. This system is depicted in Figures 2A and 2B of Lisogurski (annotated below according to Apple's IPR of the '484 patent):



EX1021, 54-56; EX1003 ¶¶190-191; EX1027, Figs. 2A, 2B, 12:52-13:6.

Accordingly, Lisogurski teaches or renders obvious 7[j]. EX1003 ¶192.

l) 7[k]: increase the signal-to-noise ratio by comparing the first signal and the second signal; and

The Board previously determined (and Omni did not dispute) that Lisogurski discloses an identical limitation to claim 7[k], and the Federal Circuit affirmed. *See* EX1011, 5-6, 43-44 (finding Lisogurski teaches or renders obvious a limitation identical to 7[k]), *aff'd in relevant part*, EX1012, n.2. Omni therefore is collaterally estopped from challenging this limitation, as it is identical to one Omni has already litigated and otherwise satisfies the requirements of collateral estoppel for the reasons discussed above. *Supra* § VII.A. To the extent the Board reaches the issue, Lisogurski teaches or renders obvious 7[k] for the reasons below.

As mentioned above, Lisogurski teaches a "dark subtraction" technique. *Supra* § VII.B.2.j. The dark signal subtraction process removes noise (which Lisogurski refers to as "ambient light") from an analog signal. EX1027, 6:7-19, 14:46-55; EX1003 ¶193. Specifically, the dark subtractor subtracts the dark signal (captured while the semiconductor sources are off) from each of the red and IR signals (captured while the semiconductor sources are on) to generate "adjusted Red and IR signals." EX1027, 13:60-14:10, 16:33-54 ("The system may subtract the…dark level from the levels received during red [or IR] 'on' period[s]"). Thus, Lisogurski teaches subtracting ("*comparing*") the dark level ("*first signal*") from the IR or red level ("*second signal*"), which a POSITA would understand increases SNR

("*increase the signal-to-noise ratio*"). EX1003 ¶194. This is because SNR is calculated by dividing signal power by noise power, and decreasing noise necessarily increases SNR. EX1003 ¶194.

m) 7[l]: wherein the wearable device is at least in part configured to identify an object.

The Board has considered (and found unpatentable) a materially identical limitation to 7[l], a determination currently pending appeal.

Specifically, in the First Final Written Decision in the '484 IPR, the Board construed "identify[ing] an object" to mean "to recognize or establish an object as being a particular thing," a construction affirmed by the Federal Circuit. EX1011, 10, *aff'd* EX1012, *5. The Federal Circuit further agreed with the Board that this construction was not synonymous with "detecting" the presence of an object, and therefore Apple failed to show that Lisogurski met this limitation by teaching that Lisogurski can "distinguish when it [(the device)] has fallen off." EX1011, 50-51, *aff'd*, EX1012, *4-5.[10] The Federal Circuit further held, however, that Apple had

---

[10] WHOOP notes that, in the Delaware action, Omni now contends that "identify an object" is satisfied by a feature of a wearable device that "detects when you're wearing it and when you're not." EX1069, 119-21. Omni's position as to the meaning of "identify an object" in the district court litigation is therefore at odds

preserved an argument that Lisogurski teaches or renders obvious "identify[ing] an object" because it teaches measuring blood oxygen saturation, which necessarily requires identifying the levels of oxygenated and deoxygenated hemoglobin in a sample. EX1011, 51; EX1012, *5-7. Accordingly, the Federal Circuit remanded for the Board to consider whether Lisogurski teaches "identifying an object" according to Apple's alternative argument. EX1012, *6-7.

In its Final Written Decision on Remand (or "Second" Final Written Decision), the Board found that "Lisogurski discloses a method of measuring oxygen saturation that uses different wavelengths to distinguish hemoglobin from oxygen carrying hemoglobin, *i.e.*, oxyhemoglobin," and thus "teaches identifying an object, *i.e.*, the blood constituent oxyhemoglobin." EX1013, 7. Omni has appealed that determination. EX1061. The Board correctly determined that Lisogurski teaches or renders obvious 7[l] for the reasons below.

First, Lisogurski teaches techniques for measuring blood oxygen saturation and other blood constituents. EX1027, 4:36-62 ("The light intensity or the amount of light absorbed may then be used to calculate…an amount of a blood constituent (e.g., oxyhemoglobin)"), 9:38-42, 24:41-57, 37:2-12. To take blood oxygen as an

---

with its position in the '484 IPR (and the Board's prior construction of the term, affirmed by the Federal Circuit).

example, measuring blood oxygen saturation requires selecting oxygenated and deoxygenated hemoglobin from among other blood constituents, and then **identifying** and quantifying both components, which Lisogurski does by measuring reflected light at particular wavelengths known to be associated with each substance. EX1003 ¶¶197-198; EX1027, 4:42-51. The '790 patent discloses the same technique for measuring components of a substance. EX1001, 21:7-28.

Omni argues in its appeal brief that hemoglobin is "a single blood constituent" that "can be either oxygenated or deoxygenated" (*i.e.*, oxygen has "two forms"), but that Lisogurski (and pulse oximeters generally) do not distinguish between the two forms of hemoglobin when measuring blood oxygen saturation, so they fail to "identify" an object. EX1061, 26-27. First, even if hemoglobin is a single "constituent," in order to calculate blood oxygen saturation, a pulse oximeter, like the one taught by Lisogurski, necessarily must distinguish between the different *forms* of hemoglobin—oxygenated and deoxygenated. EX1003 ¶200. Indeed, Omni concedes that a pulse oximeter is "designed to use specific color**s** of light (*e.g.*, red and infrared), having specific wavelengths … to *correlate with the ratio of the two forms* of hemoglobin—oxygenated and deoxygenated." EX1061, 27 (emphasis added). A system that can calculate a measurement using "two forms" of hemoglobin obtained with two different wavelengths must necessarily "recognize or establish an object as being a particular thing," specifically, a particular form of

hemoglobin. EX1003 ¶200. This understanding is consistent with the '790 patent, which refers to the different forms of hemoglobin—for example, "hemoglobin, and hemoglobin A1c," *i.e.*, glycosylated hemoglobin—as "different blood constituents." EX1001, 10:21-24; *see also id.*, 76:37-52 (describing using "markers from oxy and deoxygenated hemoglobin…to improve the diagnostics and/or therapeutics for breast and other types of cancer" while discussing "tissue constituents" with specific "spectral signatures"); EX1003 ¶201. Accordingly, Lisogurski teaches identifying an object—various "forms" (EX1061, 27) of hemoglobin, including oxy- and deoxyhemoglobin. EX1003 ¶¶196-201.

Second, although the Board's Second Final Written Decision focused on the identification of oxygenated and deoxygenated hemoglobin, the Board acknowledged that Lisogurski's technique could be used to identify and measure other blood constituents as well. EX1013, 4-7. Thus, a POSITA would have understood that—even if oxygenated and deoxygenated hemoglobin are not identified "objects"—Lisogurski teaches that other wavelengths may be used that can identify other blood constituents using the spectral signatures of those constituents. EX1003 ¶202; EX1027, 1:22-25 ("The generated signals may be used to determine[] physiological parameters such as blood oxygen saturation, hemoglobin, blood pressure, pulse rate, *other suitable parameters*, or any combination thereof"); 4:36-41 ("The light intensity or the amount of light absorbed

may be used to *calculate any number of physiological parameters*, including an amount of a blood constituent…") (emphases added).

Therefore, Lisogurski teaches or renders obvious 7[l].

C. Ground 2: Claim 7 would have been obvious over Lisogurski in view of Carlson and Lamego.

1. Overview of Ground 2

a) Lamego

Lamego discloses a physiological monitor for determining blood oxygen saturation and other blood constituents that includes a sensor, a signal processor, and a display. EX1062, Abstract, Fig. 3, [0039]; EX1003 ¶¶99-104. The sensor includes at least three LEDs, each of which is adapted to emit light at a different wavelength. *Id.*, Abstract, [0041]. The sensor further includes a detector, which receives light emitted from the three LEDs after being attenuated by tissue. *Id.* Light may be propagated through the tissue, or reflected by the tissue. *Id.*, [0024]. Lamego's sensor may be applied in various parts of the body, including the finger and earlobe. *Id.*, [0024], [0027]-[0029], [0041].

Lamego teaches that unlike traditional physiological monitors that utilize only two light sources, a "multi-wavelength" monitor, which uses at least three or more light sources, can determine levels and/or concentrations of constituents such as "methemoglobin (MetHb), carboxyhemoglobin (COHb), low hemoglobin levels, high hemoglobin levels, bilirubin, methylene blue, deoxyhemoglobin, and lipids."

Id., [0036]. By determining these physiologically-related parameters, (*i.e.*, "blood constituent concentrations" and/or "levels"), Lamego explains that the physiological monitor is capable of compensating for these parameters to provide a more accurate blood oxygen saturation (S_pO_2) calculation. *Id.*; *see also id.*, [0038]-[0039]. For example, Lamego explains that certain drugs may cause levels of MetHb in a patient's blood to increase, thereby leading to reduced (and inaccurate) readings of blood oxygen concentration in a two-wavelength monitor. *Id.*, [0037]. However, Lamego explains that by using a multi-wavelength monitor, the monitor can "not only identify the cause of decreased S_pO_2 readings, but also … compensate for such cause when calculating the patient's S_pO_2 level." *Id.* Thus, Lamego teaches using multiple wavelengths to improve the accuracy and signal-to-noise ratio of blood oxygen concentration measurements. *Id.*, [0028]-[0029], [0034], [0040] ("A multi-wavelength physiological monitor provides improved accuracy as well as an improved signal-to-noise ratio at lower perfusion levels.").

In addition to identifying and measuring blood constituents such as, *e.g.*, MetHb, COHb, and bilirubin to improve the accuracy of blood oxygen concentration measurements, Lamego also explains that its multi-wavelength system can be used to measure the concentrations of these other constituents themselves. *Id.*, [0039] ("In addition to improving the accuracy of blood oxygen saturation level readings, using multiple wavelengths can also provide relatively more accurate measurements

of other parameters, including, for example, the concentrations of any of the blood constituents or other parameters mentioned herein.”).

b) Motivation to Combine

As discussed for Ground 1, a POSITA would have found it obvious to combine Lisogurski and Carlson to, *e.g.*, incorporate one or more lenses into the measurement system of Lisogurski, as Carlson teaches that doing so optimizes power consumption and increases the signal-to-noise ratio of measured signals. *Supra* § VII.B.1.c. Furthermore, both Lisogurski and Carlson teach techniques for improving the signal-to-noise ratio of blood oxygen saturation measurements. EX1027, 9:46-60; EX1028, [0002], [0010]. A POSITA reading Lisogurski and Carlson would have looked to other references that disclosed additional techniques for improving the operation of pulse oximetry devices, particularly the accuracy and signal-to-noise ratio of blood saturation measurements. EX1003 ¶¶112-15. It would have been part of a POSITA’s ordinary design process to look for ways to improve the operation of a device by looking to complementary designs and techniques. *Id.*

Lisogurski, Carlson, and Lamego are also analogous references, each describing optical sensing devices, including techniques for improving measurements taken by optical sensing, such as pulse oximeters. EX1003, ¶112. A POSITA would have considered the references together when implementing a system based on Lisogurski’s teachings. *Id.*

For example, Lisogurski recognizes that variation in the constituents found in the human body, such as variation in skin pigmentation, may affect the quality of measurement of physiological parameters. EX1027, 19:42-50 ("The interaction of the emitted light with the subject may cause the light to become attenuated …. [T]he attenuation or the light may depend on … the tissue with which the light interacts."); *id.*, 44:43-48 ("The red waveforms may be 25% of the intensity of the IR waveforms, as may occur in patients with dark skin pigmentation"). Lisogurski discloses that when "cardiac signal modulation is properly selected," the accuracy of the monitoring functions of the physiological monitoring system may be enhanced. *Id.*, 44:45-50. Indeed, Lisogurski further discloses that using this cardiac signal modulation scheme, (*i.e.*, by "align[ing] the peak of the modulated light drive signal with a particular point in the cardiac cycle"), the monitor can improve the "quality of the determined physiological parameter," including blood oxygen saturation. *Id.*, 6:41-44. Further, Lisogurski expressly describes its light source as being configurable to include "any number of light sources" that emit "one or more wavelengths of light," which can be selected based on the sensitivity of those wavelengths to the physiological parameter to be measured. *Id.*, 7:61-66, 10:48-64. Lisogurski and Carlson also both seek to mitigate the effects of patient motion on signal-to-noise ratio and measurement accuracy. E1027, 9:46-50; EX1030 [0002], [0010].

Lamego describes an optical measurement system that uses multiple wavelengths of light in the sensor to increase the accuracy of measurements of physiological parameters. EX1062, [0034]-[0045], [0037]-[0040]; EX1003, ¶114. Lamego discloses selecting wavelengths of light that are sensitive to certain blood constituents of interest, whose presence and variation in the blood may affect oxygen saturation readings. EX1062, [0035], [0037]-[0039]. The multi-wavelength solution can likewise compensate for noise introduced by patient motion. EX1062, [0028]-[0029], [0040]. Lamego expressly recognizes that its multi-wavelength technique can be used to improve the accuracy and signal-to-noise ratio of blood oxygen saturation measurements. EX1062, [0028]-[0029], [0034], [0040].

Thus, a POSITA would have looked to Lamego to implement and obtain more accurate readings and increase signal-to-noise ratio from Lisogurski's physiological monitor because a POSITA would have looked for ways to improve the operation of a device by looking to complementary designs and techniques. EX1003, ¶¶112, 115. As described above, Lisogurski already contemplates the selection of multiple light sources and wavelengths based on the physiological parameters of interest—the solution taught by Lamego. EX1003, ¶115.

A POSITA further would have had a reasonable expectation of success implementing Lamego's multi-wavelength sensor with Lisogurski's system, as modified by Carlson, because such modifications would be a routine part of a

POSITA's ordinary design process and within the POSITA's skill. EX1003, ¶115. For example, it was well-known to use a plurality of LED light sources emitting light at different wavelengths in order to determine the presence and levels of blood constituents to improve S_pO_2 readings, and so a POSITA would have a reasonable expectation of success implementing Lamego's teachings in Lisogurski's system. EX1003, ¶115. Indeed, Lisogurski itself contemplates the use of "any number of light sources with any suitable characteristics," including "one or more wavelengths of light." EX1027, 10:48-64.

2. Analysis of Ground 2

a) Claims 7[pre]-7[k]

Limitations 7[pre]–7[k] would have been obvious over Lisogurski and Carlson for the reasons discussed above, and Omni is collaterally estopped from challenging these limitations. *Supra* §§ VII.A, VII.B.2.a-l.

b) Claim 7[l]

To the extent the Board finds that Lisogurski and Carlson alone do not teach or render obvious claim 7[l], as Omni argues in its appeal of the '484 IPR, *see* EX1061, claim 7[l] would have been obvious in further view of Lamego.

First, as discussed (*supra* § IV.C), with respect to the related '484 patent, the Board previously construed the term "to identify an object" to mean "to recognize or establish an object as being a particular thing," which the Federal Circuit affirmed. EX1011, 10, *aff'd*, EX1012, *5. Omni claims in its appeal brief for the '484 IPR

that pulse oximeters do not satisfy this limitation by measuring oxy- and deoxyhemoglobin because oxygen saturation measurements do not require distinguishing between two separate "objects." EX1061, 27. Instead, Omni argues, "identify an object" read in light of the '484 specification (which overlaps with the '790 specification) requires that the wearable device employ "spectral techniques that 'identify and distinguish between spectrally similar materials'" with "only subtle signature differences." EX1061, 28 (quoting EX1005 (7:21-24)). As an example, Omni offers the fact the '484 patent teaches measuring "a multitude of blood constituents such as glucose, triacetin, ascorbate, lactate, alanine, and urea" and using "mathematical methods, pattern identification, and spectral signature libraries" to identify these constituents. EX1061, 28-29. Applying Omni's own understanding of the Federal Circuit's construction, Lamego teaches or renders obvious 7[l]. EX1003 ¶¶206-207.

Lamego discloses a physiological monitor comprising a multi-wavelength sensor with at least three LEDs, each LED emitting light at a different wavelength. EX1062, Abstract, [0036], [0041]; EX1003 ¶208. Lamego teaches that a benefit of a multi-wavelength monitor is its ability to determine levels and/or concentrations of constituents (including constituents not inherently present in the body), such as "methemoglobin (MetHb), carboxyhemoglobin (COHb), low hemoglobin levels, high hemoglobin levels, bilirubin, methylene blue, deoxyhemoglobin, and lipids."

EX1062, [0035]-[0036]; EX1003 ¶208. Lamego explains that these constituents, along with other factors, may impact the accuracy of oxygen saturation (S_pO_2) measurements taken by the physiological monitor. EX1062, [0034]-[0035], [0037]-[0039]. When the presence and levels of these blood constituents are known, Lamego explains, the physiological monitor can "compensate" for these blood constituents to provide a more accurate S_pO_2 reading. EX1062, [0035], [0037]-[0038], [0040]; EX1003 ¶209.

As an example, Lamego explains that "many drugs cause the level of MetHb within a patient's blood to increase," which can lead to inaccurate and lower than actual blood oxygen saturation readings. EX1062, [0037]; EX1003 ¶¶208-209. Lamego explains that while a conventional two-wavelength monitor could not "**identify** the cause for the decreased reading," a multi-wavelength monitor that can also measure MetHb "could not only **identify** the cause of decreased S_pO_2 readings, but also (or alternatively) compensate for such cause when calculating the patient's S_pO_2 level and/or signal." EX1062, [0037], EX1003 ¶¶208-209. Thus, Lamego's system can identify (recognize or establish) MetHb as an object that may cause aberrations in blood oxygen measurements. EX1003 ¶209.

Lamego's multi-wavelength monitor can also recognize "other blood constituents" using "wavelengths sensitive to the other blood constituents of interest," including but not limited to distinguishing carboxyhemoglobin from

oxyhemoglobin. EX1062, [0038]. Lamego explains that a two-wavelength monitor can mistake carboxyhemoglobin for oxyhemoglobin because the two constituents absorb similar wavelengths of light. *Id.* (referring to the subtle difference between carboxyhemoglobin and oxyhemoglobin due to the overlap in wavelengths they absorb). Through the selection of "additional wavelengths sensitive to carboxyhemoglobin," Lamego's monitor can compensate for this "variable[]," and thus, recognize or establish these two constituents (oxy and carboxyhemoglobin) as separate from one another, consistent with Omni's arguments in its appeal brief and its discussion of the '484 patent. *Id.*; EX1003 ¶210; EX1061, 26-30. Indeed, as discussed, the '790 patent recognizes that "hemoglobin, and hemoglobin A1c" (*i.e.*, glycated hemoglobin) are "different blood constituents," not simply different forms of hemoglobin. EX1001, 10:21-24; *see also id.*, 76:37-52 (describing using "markers from oxy and deoxygenated hemoglobin…to improve the diagnostics and/or therapeutics…for breast and other types of cancer," while discussing "tissue constituents" with specific "spectral signatures").

Thus, Lamego teaches or renders obvious a system that increases the accuracy of blood oxygen measurements by **identifying** the cause of an aberrant S_pO_2 reading (*e.g.*, the presence and/or levels of certain blood constituents in the patient's body), and then compensates for the identified presence and/or levels of those blood constituents in the patient's body. EX1003 ¶210. Furthermore, Lamego is not

limited to improving blood oxygen saturation measurements; it can be used to improve the measurement of "any of the blood constituents," including, *e.g.*, lipids. EX1062, [0036], [0039]; EX1003 ¶211. A POSITA would have understood that Lamego therefore teaches a wearable device configured to "identify an object" because its physiological monitor "recognizes or establishes" aberrant or elevated constituents as a particular thing, consistent with the construction advanced by Omni on appeal. EX1003 ¶216.

To the extent Omni is suggesting that "mathematical methods, pattern matching algorithms, and spectral signature libraries, among other tools," are required to satisfy the Board's construction of "identify an object" (which does not follow from the construction itself), EX1061, 29, Lamego discloses multiple "statistical" methods for signal processing the measurements obtained by its multi-wavelength device and determining which wavelength corresponds to which constituent. EX1003 ¶212. For example, Lamego discloses "utilizing multiple wavelengths" to provide "a multi-dimensional calibration curve," which helps the system compensate for additional "absorbers" (*i.e.*, objects) in the patient's tissue. EX1061, [0035] (considering, as an example, an eight-dimensional calibration curve produced from an eight wavelength monitor). EX1003 ¶¶212-213. Lamego teaches how data from multi-wavelength signals is separated, processed, and analyzed. EX1061, [0064]-[0065] (explaining that demodulation "separates each of the multi-

wavelength signals" to provide "raw data" that is then processed and "subjected to statistics and saturation transform operations"); EX1003 ¶213. Through cross-correlation and modeling techniques, Lamego utilizes the multi-wavelength data to compensate for noise and/or interference (from, *e.g.*, other blood constituents) in the measurement of a patient's blood oxygen saturation. EX1061, [0070], [0073], [0077]-[0082] (explaining how the "ratio of the intensity of different light wavelengths may be used to determine the oxygen saturation" of a subject, including through the use of cross-correlation matrices), [0090]-[0105] (describing ratiometric model used to estimate blood oxygen saturation incorporating the number of wavelengths, "n," utilized in the optical system); EX1003 ¶¶213-214. Thus, Lamego teaches identifying an object through "mathematical" methods, as urged by Omni. EX1003 ¶216.

Finally, a POSITA would have been motivated to combine the teachings of Lisogurski (in view of Carlson) with Lamego to improve the optical measurement of, *e.g.*, blood oxygen concentration, consistent with Lisogurski's stated goals of reducing noise and improving accuracy. EX1003 ¶215; *supra* § VII.C.1.b. A POSITA would have had a reasonable expectation of success in this combination because Lamego's multi-wavelength monitor is comprised of conventional components that would have been consistent with Lisogurski's operation and with

its teaching that the sensor can measure one or more wavelengths of light. EX1003 ¶215; *supra* § VII.C.1.b.

Accordingly, Lisogurski in view of Carlson and Lamego renders obvious 7[l].

D. Ground 3: Claim 7 would have been obvious over Lisogurski in view of Carlson and Soller.

1. Overview of Ground 3

a) Soller

Soller describes a measurement system for non-invasively monitoring the volume of red blood cells (hematocrit) using optical sensors that measure the components of those cells, including oxygenated and deoxygenated hemoglobin, methemoglobin, carboxyhemoglobin, and sulfhemoglobin. EX1030, 1:19-44, 5:33-37, Abstract. Soller teaches a measuring device with an "illumination component" that emits beams of light of multiple wavelengths in the "visible and near-infrared spectral region[s]" to measure the optical properties of the sample. EX1030, 11:44-12:2, 13:13-28, 18:18-23. The device may have between 5 and 20 LEDs, each emitting a different wavelength. EX1030, 13:13-28, 13:39-40. The LEDs are "evenly spaced and arranged in a circular pattern" and "preferably tilted inward," which Soller teaches "increase[es] the accuracy of the measurement." EX1030, 13:35-49; 16:39-48 (a "ring-like pattern" for the LEDs "maximize[s] the amount of radiation" directed to the sample). The light is delivered to the skin with a probe "in close proximity to the skin," such as via a "hand-held unit." EX1030, 12:30-38. The

device also includes interior and exterior detectors for capturing the light received from the tissue. EX1030, 13:50-63. Soller teaches that "[b]ecause of its small size," the device is "portable, handheld, and easily manipulated," which allows the measurement of hematocrit in "remote locations." EX1030, 15:50-56, 15:31-40; EX1003 ¶¶105-106.

b) Motivation to Combine

A POSITA would have considered Lisogurski, Carlson, and Soller together; they are analogous optical measurement systems with common applications and utility. EX1003 ¶116. All three describe techniques for improving the performance of wearable, optical devices that are portable and used to continuously and remotely monitor physiological parameters, including blood oxygen. EX1003 ¶¶116-117; EX1030, 6:18-21 ("Non-invasive measurements can be made continuously or intermittently by health care workers in remote areas with minimal technical training."); *id.* 5:41-58. Lisogurski specifically teaches increasing SNR while minimizing power consumption. *Supra* §§ VII.B.1.c. These teachings would have motivated a POSITA to look to techniques used by other systems achieving the same objectives—part of the POSITA's natural design process. EX1003 ¶¶117-118. Thus, a POSITA would have looked to Soller, which describes configuring an optical sensor to maximize the accuracy of a physiological measurement by using multiple wavelengths of light to measure the various components of blood, and

increasing signal-to-noise ratio by applying various mathematical techniques well known in the art. EX1003 ¶118; EX1030, 7:38-42, 5:55-67, 5:33-41.

The application of Soller's teachings to Lisogurski's optical system, in view of Carlson, would have required routine modifications for which a POSITA would have had a reasonable expectation of success. EX1003 ¶118. Implementing Soller's light source modifications, including the arrangement and number of LEDs and detectors and the number of wavelengths emitted by the LEDs, into Lisogurski would have been routine because the use of different configurations of light sources was a well-known technique and consistent with Lisogurski's own disclosures. EX1003 ¶118; EX1030, 5:55-67. Furthermore, Lisogurski is not limited to measuring oxygenated and deoxygenated hemoglobin, and a POSITA would have understood that it could have been modified to measure, *e.g.*, the hematocrit components disclosed by Soller with routine skill and modification. EX1003 ¶118.

Specific reasons why a POSITA would have added these features from Soller and Carlson to Lisogurski are discussed below.

2. Analysis of Ground 3

a) Claim 7[pre]-7[k]

Limitations 7[pre]-7[k] would have been obvious over Lisogurski and Carlson for the reasons discussed above, and Omni is collaterally estopped from challenging these limitations. *Supra* §§ VII.A, VII.B.2.a-l.

b) Claim 7[l]

To the extent the Board finds that Lisogurski and Carlson alone do not teach or render obvious claim 7[l], as Omni argues in its appeal of the '484 patent, *see* EX1061, claim 7[l] would have been obvious in further view of Soller.

As discussed above, Omni argues on appeal that measuring blood oxygen saturation does not qualify as identifying an object because hemoglobin is a single blood constituent, and Lisogurski does not distinguish between hemoglobin's oxygenated and deoxygenated forms in measuring and calculating the ratio between the two. EX1061, 25-30; *supra* § VII.C.2.b. Omni further suggests that the limitation would be satisfied by an optical system that distinguishes between blood constituents with overlapping spectral wavelengths, such as "glucose, triacetin, ascorbate, lactate, alanine, and urea," using, *e.g.*, "mathematical methods, pattern matching algorithms, and spectral signature libraries." EX1061, 28-29; *supra* § VII.C.2.b. Soller teaches 7[l] under Omni's understanding of "identify an object."

Soller teaches a non-invasive, optical method for measuring the volume of red blood cells (hematocrit) using a portable device with LEDs and photodiodes (detectors). EX1030, 1:17-21, 15:50-16:38; EX1003 ¶221. Soller explains that "[h]emoglobin constitutes approximately 90% of the red blood cell, and is mostly present in oxygenated and deoxygenated forms," and that conventionally, the "concentrations of oxygenated and deoxygenated hemoglobin are directly measured

by absorption or reflection using 2 to 4 wavelengths of light in the near-infrared region of the hemoglobin spectrum." EX1030, 5:33-35, 1:40-44. Soller explains that to "accurately measure" hematocrit, the additional forms of hemoglobin (including methemoglobin, carboxyhemoglobin and sulfhemoglobin) must be "accounted for," and "so must the remaining 10% of the cellular components, such as the nucleus and cell membranes, which do not contain hemoglobin." EX1030, 5:33-41. Soller therefore teaches a "small and easy-to-use hematocrit monitoring device" capable of "quantifying all of the components of red blood cells" "by using a larger set of wavelengths in the measurement and by using a multivariate calibration technique." EX1030, 5:41-58. For example, Soller teaches an optical device emitting "7 or more wavelengths" to "account[] for all forms of hemoglobin as well as the additional cellular components that both absorb and scatter light and for changes in blood volume." EX1030, 5:55-67.[11]

---

[11] Soller characterizes, *e.g.*, carboxyhemoglobin and methemoglobin, as "forms" of hemoglobin, whereas Lamego characterizes them as separate "blood constituents." *Compare* EX1030, 5:55-67 *with* EX1062 [0038]. Regardless, a POSITA would have understood the various hemoglobin components identified in Soller and Lamego to be "objects" within the scope of the claim. EX1003 ¶228.

Soller then explains that—from these measurements—a "mathematical model" can be applied to "relate[] actual blood hematocrit to optical data." EX1030, 6:42-59. This model "is generated by taking optical spectra for a range of wavelengths affected by the plurality of red blood cell constituents from a number of samples at known hematocrit values, and then processing the spectra and the hematocrit values with a multivariate calibration procedure, e.g., a Partial Least Squares (PLS) fitting algorithm. The model is then used to determine the blood hematocrit of a blood sample, e.g., tissue containing blood." EX1030, 6:42-59 *id.*, 7:3-25 ("[O[ptical data taken over a range of wavelengths, e.g., wavelengths affected by the plurality of red blood cell constituents, are generated from blood samples having varying blood hematocrit."). Soller further teaches using the "signature" of the components, *e.g.*, the signature of hemoglobin, for the "determination of hematocrit and the other blood components." EX1030, 20:36-47.

Specifically, Soller teaches that the "actual blood hematocrit" is calculated using a "statistical analysis" method (*e.g.*, "regression" techniques) that can "determine[] small hematocrit-related changes in the reflection spectra and correlate[] these to the hematocrit value." EX1030, 6:63-11:4; Fig. 1; *see also* EX1030, 22:26-36 ("If a spectrum was **identified** as an outlier, the spectrum was removed and a new model was created with the outliers eliminated."). Soller teaches

that these statistical methods—including "well-known smoothing algorithms"—can be used to improve signal-to-noise ratio. EX1030, 7:38-42.

A POSITA would have understood from these disclosures that Soller teaches or renders obvious a portable, optical device that establishes or recognizes the various constituents of hematocrit (including those that do not contain hemoglobin) using multiple optical wavelengths to measure these constituents, and then applies statistical and spectral methods to determine hematocrit concentration. EX1003 ¶¶222-227. Thus, Soller teaches identifying an object—hematocrit and its various constituents. EX1003 ¶¶220, 227.

A POSITA would have been motivated to combine the teachings of Soller in Lisogurski's system and would have had a reasonable expectation of success in doing so. EX1003 ¶229. Both Lisogurski and Soller teach comparing two or more wavelengths to determine the presence and amount of physiological parameters. EX1003 ¶229. As Soller explains, and as a POSITA would have readily recognized, "using a larger set of wavelengths for analysis… compensates for variations in blood volume by accounting for factors relating to blood volume," and thus yields a more accurate measurement. EX1030, 5:50-54; EX1003 ¶229. A POSITA therefore would have been motivated to use Soller's technique involving three or more wavelengths to yield a more accurate measurement, and could have implemented

this technique with reasonable expectation of success into Lisogurski, because such a technique would be within the POSITA's knowledge of the art. EX1003 ¶229.

E. Ground 4: Claim 7 would be indefinite applying Omni's understanding of "identify an object."

Omni's position as to the scope of "identify an object" in its appeal of the '484 IPR, if accepted, would render the Challenged Claim unpatentable as indefinite.

A claim is sufficiently definite only if "particularly point[s] out and distinctly claim[s] the subject matter which the inventor…regards as the invention." 35 U.S.C. § 112(b); *see also* pre-AIA U.S.C. § 112, ¶ 2. Specifically, a claim, "viewed in light of the specification and prosecution history," must "inform those skilled in the art about the scope of the invention with reasonable certainty" to be sufficiently definite. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 909-11 (2014).

Here, Omni's application of "identify an object" in the '484 IPR would not inform a POSITA of the scope of the term with reasonable certainty. The '790 patent (like the related '484 patent) uses the word "object" primarily to refer to the target upon which the device is directed for measuring particular parameters. *E.g.*, EX1001, 9:46-47 ("Also, at least a portion of the light generated by the array is configured to be directed to an object"), 9:51-62 (referring to the light directed to and reflected from the target object), 48:34-43 (describing "remote sensing" as "measuring [the] properties of an object from a distance, without physically sampling the object"); Fig. 65B (dead fish is labelled as the "target object" being

measured in the spectroscopy system). Correspondingly, the '790 patent refers to the "identification" of objects as establishing the presence of a *particular* target, *e.g.*, distinguishing "building materials such as gypsum, painted structures, plywood, and concrete of various sorts" from "plaint life, soil and trees," EX1001 54:54-59; *see also id.*, 58:40-45 ("In an alternate embodiment, change detection systems may be used, where the detection system captures the signal with the light source on and the light source off. … [C]hange detection systems may help to **identify objects that change in the field of view**."), 70:39-52 (similar). Read in light of the specification, "identify an object" therefore refers to the identification of *any* material or constituent by the wearable device as a particular thing. This understanding of "identify an object" is consistent with the construction adopted by the Board and affirmed by the Federal Circuit, and does not exclude a system that targets (and thus also identifies) oxygenated and deoxygenated hemoglobin. EX1003 ¶¶232-234.

Omni, however, attempts to draw a distinction between a pulse oximetry device that measures "a single blood constituent," such as hemoglobin (in both its oxygenated and deoxygenated "forms"), and a device that "consider[s] a sample with an array of unidentified constituents." EX1061, 25-30. The former, Omni contends, does not "identify" an object because it is "configured to know from the outset precisely what it [is] measuring," specifically, blood oxygen saturation. EX1061, 27. Meanwhile, Omni also contends that the latter determines the content of a

sample from among "unidentified constituents," and thereby identifies an object. EX1061, 27-30. Omni's argument finds no support in the specification and would render the scope of the term indefinite. EX1003 ¶235.

Specifically, Omni's argument requires accepting the premise that oxygenated and deoxygenated hemoglobin are not separately identified "objects" in a blood sample, whereas other components of blood are separate objects that are "identified" based on, *e.g.*, their spectral signatures. EX1061, 27-30. But a POSITA reading the '790 patent would not have understood this arbitrary distinction between (a) identifying different forms of hemoglobin from one another and (b) identifying a particular blood constituent out of an array of other "blood constituents," particularly because the patent describes using different wavelengths of light to "identify" objects—including oxy as distinct from deoxyhemoglobin—in precisely the same manner as for identifying other objects as distinct from one another. EX1003 ¶237; EX1001, 76:37-49 (describing using "markers from oxy and deoxygenated hemoglobin…to improve the diagnostics and/or therapeutics…for breast and other types of cancer," while discussing "tissue constituents" with specific "spectral signatures").

Omni's understanding of "identify an object" would therefore render the Challenged Claim indefinite because a POSITA would not be able to ascertain with reasonable certainty the targets of an optical system that qualify as separate "objects"

from targets that are merely sub-components of a target (*e.g.*, the oxygenated and deoxygenated forms of hemoglobin) that apparently would not qualify as objects (despite having their own spectral signatures). EX1003 ¶238.

F. Ground 5: The Challenged Claim Is Not Enabled.

The Challenged Claim is also unpatentable for non-enablement, particularly in view of Omni's understanding of the scope of "identify an object," as evidenced by its positions in the appeal of the '484 IPR.

In its appeal brief, Omni lists a variety of "blood constituents," and explains that the '484 patent teaches "advantageously using mathematical methods, pattern matching algorithms, and spectral signature libraries, among other tools, to 'identify' the various constituents in the sample." EX1061, 27-29. The specific constituents ("objects") that Omni argues are "identified" by the device described in the '484 patent (and that are also discussed in the '790 patent) are "glucose, triacetin, ascorbate, lactate, alanine, and urea." *Id.*; *see also* EX1001, 18:3-27. Of these, the patent focuses primarily on the measurement of glucose—multiple columns of the '790 patent are devoted to describing "[n]on-[i]nvasive glucose monitoring," and the patent in fact recognizes an "unmet need for non-invasive glucose monitoring." *E.g.*, EX1001, 2:60-3:30, 15:12-18:27.

But if, as Omni urges, "identify an object" refers to a non-invasive, wearable device that can distinguish *any* spectral signature of a blood constituent, including

glucose signatures, from that of other blood constituents, then the Challenged Claim is not enabled. EX1003 ¶¶240-242. To take glucose as an example, non-invasively monitoring glucose levels with a wearable or optical device—particularly to a level of specificity that allows the device to distinguish between glucose and various blood constituents with "only subtle [spectral] signature differences" (EX1061, 28 (quoting EX1005 (7:23-24))—is something that has *still* not been achieved to any degree of certainty in practical applications, let alone by the '790 patent's purported priority date. EX1003 ¶¶242-243. Indeed, a scientific article published as recently as 2023 remarked: "Specificity remains one of the most important challenges in non-invasive blood glucose measurement," and that "*accurate detection of blood glucose concentration is not feasible without stable measurement conditions*." EX1065, 3834 (emphasis added). Similarly, the other "constituents" identified by the '790 (triacetin, ascorbate, lactate, alanine, and urea) are blood constituents that still cannot be measured with any degree of certainty using the type of non-invasive, optical device contemplated by the '790 patent. EX1003 ¶244.

Accordingly, the '790 patent is not enabled across the full scope of the claim because a POSITA would not have been able to create a device that can "identify" the exemplary "objects" listed in the patent with any degree of certainty and without undue experimentation. EX1003 ¶245; *Pac. Biosciences of California, Inc. v. Oxford Nanopore Techs., Inc.*, 996 F.3d 1342, 1352 (Fed. Cir. 2021) (upholding

finding of non-enablement where "relevant artisans did not know how to perform nanopore sequencing for more than a narrow range of the full scope of nucleic acids covered by the asserted claims"); *Auto Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274, 1285 (Fed. Cir. 2007) (rejecting patentee's argument "that because the specification enables one mode of practicing the invention, … the enablement requirement is satisfied," where the claim scope encompassed multiple inoperable embodiments).

VIII. NO SECONDARY CONSIDERATIONS EXIST

Grounds 1-3 asserted above render *prima facie* obvious the Challenged Claim of the '790 patent. No secondary indicia of non-obviousness exist having a nexus to the putative "invention" of the '790 patent contrary to that conclusion. EX1003 ¶87. WHOOP reserves its right to respond to any assertion of secondary indicia of non-obviousness advanced by Omni.

IX. CONCLUSION

Petitioner respectfully submits that the evidence presented in this Petition establishes it is more likely than not that Petitioner will prevail in demonstrating that the Challenged Claim is unpatentable, and therefore requests that PGR proceedings be instituted.

Dated: October 13, 2025

Respectfully Submitted,

/s/ *Jaysen S. Chung*
Jaysen S. Chung, *Lead Counsel*
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

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

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

Counsel for Petitioner WHOOP, Inc.

APPENDIX A: CHALLENGED CLAIM LISTING

Claim	Claim Language
7[pre]	An optical system, comprising:
7[a]	a wearable device for measuring one or more physiological parameters, the wearable device adapted to be placed on a wrist of a user;
7[b]	the wearable device including a light source comprising a plurality of semiconductor diodes that are configured to generate an output optical light having 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;
7[c]	the wearable device comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens output light to tissue comprising skin;
7[d]	the wearable device further comprising a detection system configured to receive at least a portion of the lens output light reflected from the tissue and to generate an output signal having a signal-to-noise ratio, wherein the detection system is configured to be synchronized to the light source;
7[e]	wherein the detection system comprises a plurality of detectors that are spatially separated from each other, and wherein at least one analog to digital converter is coupled to at least one of the plurality of detectors;
7[f]	wherein the output signal is indicative of the one or more of the physiological parameters;
7[g]	the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the plurality of semiconductor diodes from an initial light intensity; and
7[h]	the detection system further configured to:
7[i]	generate a first signal responsive to light received while the semiconductor diodes are off,
7[j]	generate a second signal responsive to light received while at least one of the semiconductor diodes is on, and
7[k]	increase the signal-to-noise ratio by comparing the first signal and the second signal; and
7[l]	wherein the wearable device is at least in part configured to identify an object.

CERTIFICATE OF COMPLIANCE

I hereby certify that this brief complies with the type-volume limitations of 37 C.F.R. § 42.24(a)(ii), because it contains 18,364 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.

Dated: October 13, 2025

Respectfully Submitted,

/s/ *Jaysen S. Chung*
Jaysen S. Chung, *Lead Counsel*
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

CERTIFICATE OF SERVICE

I hereby certify that on this 13th day of October, 2025, copies of this Petition for Post Grant Review, Attachments and Exhibits have been served in its entirety by Federal Express at the correspondence address of record for the ’790 patent in the USPTO Patent Center:

109543 - Brooks, Kushman P.C./Cheetah Omni MedSci
150 W 2nd St., Suite 400N
Royal Oak, MI 48067
United States

A courtesy copy was also sent via electronic mail to Patent Owner’s litigation counsel at the following addresses:

Daniel S. Stringfield
dstringfield@nixonpeabody.com
Timothy P. Maloney
tmaloney@nixonpeabody.com
Daniel D. Georgiev
dgeorgiev@nixonpeabody.com
Peter Krusiewicz
pkrusiewicz@nixonpeabody.com
Corey T. Leggett
cleggett@nixonpeabody.com
Elizabeth M. Chiaviello
echiaviello@nixonpeabody.com
Benjamin R. Holt
bholt@nixonpeabody.com

NIXON PEABODY LLP

Stephen B. Brauerman
sbrauerman@bayardlaw.com
Ronald P. Golden III
rgolden@bayardlaw.com
Emily L. Skaug
eskaug@bayardlaw.com

BAYARD, P.A.

Ty Wilson
twilson@davisfirm.com
William E. Davis , III
bdavis@davisfirm.com

DAVIS P.C.

DATED: October 13, 2025

Respectfully Submitted,

/s/ Jaysen S. Chung

Jaysen S. Chung, *Lead Counsel*
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

Attorney for Petitioner WHOOP, Inc