PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN LIGHT-BASED PHYSIOLOGICAL MEASUREMENT DEVICES AND COMPONENTS THEREOF**	**Inv. No. 337-TA-1276**

FINAL INITIAL DETERMINATION ON VIOLATION OF SECTION 337

Administrative Law Judge Monica Bhattacharyya

(January 10, 2023)

Appearances:

For Complainants Masimo Corporation and Cercacor Laboratories, Inc.:

Stephen C. Jensen, Joseph R. Re, Irfan A. Lateef, Sheila N. Swaroop, Ted M. Cannon, Brian C. Claassen, Alan G. Laquer, Kendall M. Loebbaka, Daniel C. Kiang, and Douglas B. Wentzel of Knobbe, Martens, Olson & Bear, LLP in Irvine, CA; William R. Zimmerman and Jonathan E. Bachand of Knobbe, Martens, Olson & Bear, LLP in Washington, DC; Carol Pitzel Cruz of Knobbe, Martens, Olson & Bear, LLP in Seattle, WA; and Karl W. Kowallis and Matthew S. Friedrichs of Knobbe, Martens, Olson & Bear in New York, NY.

For Respondent Apple Inc.:

Mark D. Selwyn of Wilmer Cutler Pickering Hale and Dorr LLP in Palo Alto, CA; Joseph J. Mueller, Richard Goldenberg, and Sarah R. Frazier of Wilmer Cutler Pickering Hale and Dorr LLP in Boston, MA; and Michael D. Esch and David Cavanaugh of Wilmer Cutler Pickering Hale and Dorr LLP in Washington, DC.

Pursuant to the Notice of Investigation (EDIS Doc. ID 749538), 86 Fed. Reg. 46275-76 (Aug. 18, 2021), and Commission Rule 210.42, this is the administrative law judge's final initial determination on violation in the matter of *Certain Light-Based Physiological Measurement Devices and Components Thereof*, Commission Investigation No. 337-TA-1276. 19 C.F.R. § 210.42(a)(1)(i).

For the reasons discussed herein, it is the undersigned's final initial determination that there has been a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain wearable electronic devices with light-based pulse oximetry functionality and components thereof by reason of infringement of certain claims of U.S. Patent No. 10,945,648.

It is also the undersigned's final initial determination that there has been no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain wearable electronic devices with light-based pulse oximetry functionality and components thereof with respect to U.S. Patent Nos. 10,912,501, U.S. Patent No. 10,912,502, U.S. Patent No. 10,687,745, and U.S. Patent No. 7,761,127.

TABLE OF CONTENTS

The following abbreviations may be used in this Initial Determination:

Tr.	Hearing Transcript
Dep. Tr.	Deposition Transcript
JX	Joint Exhibit
CX	Complainants' exhibit
CPX	Complainants' physical exhibit
CDX	Complainants' demonstrative exhibit
RX	Respondents' exhibit
RPX	Respondents' physical exhibit
RDX	Respondents' demonstrative exhibit
CPHB	Complainants' pre-hearing brief (EDIS Doc. ID 770786)
CIB	Complainants' corrected initial post-hearing brief (EDIS Doc. ID 775422)
CRB	Complainants' post-hearing reply brief (EDIS Doc. ID 775058)
RPHB	Respondents' corrected pre-hearing brief (EDIS Doc. ID 770874)
RIB	Respondents' second corrected initial post-hearing brief (EDIS Doc. ID 779376)
RRB	Respondents' corrected post-hearing reply brief (EDIS Doc. ID 779379)

I. BACKGROUND

A. Procedural History

The Commission instituted this investigation in response to a complaint filed by Complainants Masimo Corporation and Cercacor Laboratories, Inc. on June 30, 2021, with an amended complaint filed on July 12, 2021 (the "Amended Complaint," EDIS Doc. ID 746186), and supplemented on July 19, 2021. Notice of Investigation at 1, EDIS Doc. No. 749538 (Aug. 13, 2021); 86 Fed. Reg. 46275-76 (Aug. 18, 2021). The complaint, as amended, alleges violations of section 337 of the Tariff Act of 1930, as amended, by reason of infringement of certain claims of U.S. Patent No. 10,912,501 ("the '501 patent"), U.S. Patent No. 10,912,502 ("the '502 patent"), U.S. Patent 10,945,648 ("the '648 patent"), U.S. Patent No. 10,687,745 ("the '745 patent"), and U.S. Patent No. 7,761,127 ("the '127 patent"). *Id*. The Commission ordered institution of this investigation to determine "whether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain products . . . by reason of infringement of one or more of claims 1-9 and 11-30 of the '501 patent; claims 1-2, 4-6, 8-12, 14-22, 24-26, and 28-30 of the '502 patent; claims 1-17 and 19-30 of the '648 patent; claims 1-6, 8-9, 11, 14, 20-24, and 26-27 of the '745 patent; and claims 7-9 of the '127 patent; and whether an industry in the United States exists as required by subsection (a)(2) of section 337." *Id.* at 2. The investigation was instituted upon publication of the Notice of Investigation in the *Federal Register* on Monday, August 18, 2021. 86 Fed. Reg. 46275-76.

Respondent Apple Inc. filed a response to the Amended Complaint and Notice of Investigation on September 7, 2021 (the "Response to Complaint"), disputing Complainants'

allegations with respect to infringement and domestic industry and asserting affirmative defenses of invalidity and unenforceability. *See* EDIS Doc. ID 752521.[1]

Pursuant to Order No. 3 (Sept. 1, 2021), the target date of this investigation was set to be December 16, 2022. On September 13, 2021, the investigation was assigned by then Chief Administrative Law Judge Bullock to the undersigned. *See* Notice to the Parties, EDIS Doc. ID 751531 (Sept. 13, 2021). Pursuant to Order No. 5 (Sept. 22, 2021), the target date was extended to January 16, 2023. *See* Comm'n Notice (Oct. 12, 2021), EDIS Doc. ID 754020.

A technology tutorial and *Markman* hearing was held on February 17, 2022. *See* *Markman* Tr., EDIS Doc. ID 763489.[2]

Pursuant to Order No. 25 (Mar. 23, 2022), Complainants withdrew their allegations of infringement with respect to claims 2, 4, 5, 7, 11, 16, 19, 20, and 22-30 of the '501 patent, claims 1-2, 4-6, 8-12, 14-18, 20, 25, and 26 of the '502 patent, claims 3, 4, 6, 7, 9, 10, 13-17, 19, 22, and 25-28 of the '648, and claims 1, 3-6, 8, 11, 14, 20-24, and 26 of the '745 patent. *See* Comm'n Notice, EDIS Doc. ID 768023 (Apr. 12, 2022). Pursuant to Order No. 33 (May 20, 2022), Complainants withdrew their allegations of infringement with respect to claims 1, 3, 6, 8, 9, 13-15, 17, 18, and 21 of the '501 patent, claims 19, 21, 24, 29, and 30 of the '502 patent, claims 1, 2, 5, 8, 11, 20, 21, 23, and 29 of the '648, and claim 2 of the '745 patent. *See* Comm'n Notice, EDIS Doc. ID 772826 (Jun. 10, 2022).

[1] The affirmative defenses based on inequitable conduct were stricken pursuant to Order No. 9 (Dec. 20, 2021), and Respondent was subsequently granted leave to add certain inequitable conduct defenses pursuant to Order No. 23 (Mar. 23, 2022).

[2] All of the claim construction disputes raised at the *Markman* hearing were subsequently mooted by the withdrawal of asserted claims or by agreement of the parties. *See infra*.

An evidentiary hearing was held on June 6-10, 2022. The parties filed initial post-hearing briefs on June 27, 2022, and filed post-hearing reply briefs on July 11, 2022. Additional exhibits were admitted pursuant to Order No. 50 (Jun. 16, 2022) and Order No. 56 (Aug. 31, 2022). The hearing transcript was amended pursuant to Order No. 51 (Jun. 23, 2022) and Order No. 52 (Jun. 27, 2022). The parties' post-hearing briefs were amended pursuant to Order No. 54 (Jul. 14, 2022), Order No. 55 (Jul. 14, 2022), and Order No. 57 (Aug. 31, 2022).

Pursuant to Order No. 58 (Sept. 12, 2022), Order No. 59 (Oct. 24, 2022), and Order No. 61 (Dec. 9, 2022), the target date was extended to May 10, 2023. *See* Comm'n Notice, EDIS Doc. ID 787448 (Jan. 6, 2023).

B. The Parties

1. Complainants

The Complainants are Masimo Corporation ("Masimo") and Cercacor Laboratories, Inc. ("Cercacor") (collectively, "Complainants"). Notice of Investigation at 2. Masimo and Cercacor are both Delaware corporations having their principal places of business in Irvine, California. Complaint ¶ 9. Masimo is the owner of the '501 patent (JX-0001), '502 patent (JX-0002), '648 patent (JX-0003), and '745 patent (JX-0009). *Id*. ¶ 4. Cercacor is the owner of the '127 patent (JX-0007). *Id*. Masimo and Cercacor have rights to each of the asserted patents through a cross-licensing agreement. *Id*. ¶¶ 4, 77; CX-1612C.

2. Respondent

The Respondent is Apple Inc. ("Apple"). Notice of Investigation at 2. Apple is a California corporation having its principal place of business in Cupertino, California. Response to Complaint ¶ 21.

C. Asserted Patents

The ’501 patent, ’502 patent, and ’648 patent share a common specification, claiming priority to an application filed on July 3, 2008. JX-0001; JX-0002; JX-0003. These patents are entitled “User-Worn Device for Noninvasively Measuring a Physiological Parameter of a User,” naming inventors Jeroen Poeze *et al.*, and are referenced herein as the “Poeze patents.” *Id.*

The ’745 patent is entitled “Physiological Monitoring Devices, Systems, and Methods,” and claims priority to an application filed on June 28, 2016, naming inventor Ammar Al-Ali. JX-0009.

The ’127 patent is entitled “Multiple Wavelength Sensor Substrate” and issued from an application filed on March 1, 2006, naming inventors Ammar Al-Ali *et al.* JX-0007.

D. Products at Issue

The products at issue are “wearable electronic devices with light-based pulse oximetry functionality and components thereof.” Notice of Investigation at 2.

1. Accused Products

Complainants accuse Apple Watch products of infringing the asserted patents, including the Apple Watch Series 6, the Apple Watch Series 7, and certain prototype Apple Watch products [redacted] (“Next Generation Apple Watches”). CIB at 37-39. Apple has stipulated to the importation of the Apple Watch Series 6, Apple Watch Series 7, and Next Generation Apple Watches (collectively, the “Accused Products”). *See* CX-0128C (Stipulation Regarding Importation and Inventory) at ¶¶ 2-4; CX-1259C (Stipulation Relating to Next-Generation Watches) at ¶¶ 5-6. The parties have stipulated that the Accused Products are materially identical for the purposes of infringement in this investigation. *See* Joint Stipulation of Facts at ¶¶ 11-13, EDIS Doc. ID 770692 (May 13, 2022); CX-1259C at ¶¶ 7-8.

2. Domestic Industry Products

With respect to the ’501, ’502, ’648, and ’745 patents, Complainants rely on certain “Masimo Watch” products. CIB at 26-35. These Masimo Watch products include certain prototypes identified as the “Circle Sensor” (CPX-0021C), the “Wings Sensor” (CPX-0029C), the “RevA sensor” (CPX-0052C), the “RevD sensor” (CPX-0058C), the “RevE sensors” (CPX-0019C, CPX-0020C, CPX-0065C), and a product identified as the Masimo W1 Watch (CPX-0146C). CIB at 30-35. With respect to the ’127 patent, Complainants rely on certain of Masimo’s rainbow® sensors. *Id*. at 36.

E. Witness Testimony

The undersigned received testimonial evidence in this investigation in the form of live testimony and deposition designations.

1. Fact Witnesses

The first witness at the hearing was Joe Kiani, the chairman and chief executive officer of Masimo and Cercacor. Tr. at 79-189. Complainants also presented testimony from Mohamed Diab, an engineer at Masimo, *id*. at 190-246; Ammar Al-Ali, who oversees technology development at Masimo, *id*. at 247-340; and Bilal Muhsin, who is the chief operating officer of Masimo. *Id*. at 341-89. Complainants further presented testimony from Stephen Scruggs, the director of sensor design at Masimo, *id*. at 390-479; Micah Young, who is Masimo’s chief financial officer and executive vice president, *id*. at 481-520; and Jeroen Hammarth, the chief financial officer of Cercacor. *Id*. at 521-33.

Apple presented testimony from several of its employees, including Vivek Venugopal, an optical engineer, *id*. at 816-49; Saahil Mehra, who manages product design for the Apple Watch health sensors, *id*. at 850-94; Ueyn Block, who worked on the optical architecture for the Apple

Watch health sensors, *id*. at 895-917; Stephen Waydo, who is the director of a human interface device (HID) health group at Apple, *id*. at 918-51; Brian Land, who leads a health sensing hardware group at Apple, *id*. at 952-92; and Paul Mannheimer, a sensor architect and scientist at Apple, *id*. at 993-1025. Apple's counsel also examined Scott Cromar, the prosecuting attorney for the '501 patent, '502 patent, and '648 patent. *Id*. at 1026-41. Apple further presented testimony from Robert Rowe, who was the named inventor of certain asserted prior art. *Id*. at 1141-53; *see id*. at 1174:3-1175:7 (no cross-examination for Mr. Rowe).

2. Expert Witnesses

Complainants rely on the testimony of Daniel McGavock, who was admitted as an expert in financial matters, offering testimony regarding economic domestic industry, bond, and commercial success. Tr. at 533-76 (expert qualification at 534:25-535:6), 1416-42. With respect to the '127 patent, Complainants rely on the testimony of Jack Goldberg, who was admitted as an expert in the field of physiological monitoring technologies. *Id*. at 612-63 (expert qualification at 614:3-11), 1391-1408. With respect to the '501 patent, '502 patent, '648 patent, and '745 patent, Complainants rely on the testimony of Vijay Madisetti, who was admitted as an expert in the field of physiological monitoring technologies. *Id*. at 664-813 (*voir dire* and expert qualification at 666:10-674:12). Complainants also rely on the testimony of Robert Stoll, who was admitted as an expert on Patent Office practice and procedure. *Id*. at 1409-15 (expert qualification at 1409:23-1410:4).

Apple relies on the testimony of Majid Sarrafzadeh, who was admitted as an expert in physiological monitoring technologies including the design of pulse oximetry sensors, with respect to the '745 patent and '127 patent. *Id*. at 1042-1138 (expert qualification at 1046:5-12). With respect to the '501 patent, '502 patent, and '648 patent, Apple relies on the testimony of

Steven Warren, who was admitted as an expert in biomedical engineering, medical monitoring systems, biomedical instrumentation, biomedical optics, light issue interaction, diagnostic systems, wearable sensors, and biomedical signal processing. *Id*. at 1181-1282 (expert qualification at 1187:20-1188:11). Apple also relies on the testimony of Vincent Thomas, who was admitted as an expert in the field of economics and financial analysis, with respect to the economic prong of the domestic industry requirement. *Id*. at 1282-1389 (expert qualification at 1283:11-17).

3. Deposition Designations

Complainants submitted several designated deposition transcripts that were received into evidence without a sponsoring witness: CX-0273C (Amor Dep. Tr.); CX-0281C (Block Dep. Tr.); CX-0275C (Caldbeck Dep. Tr.); CX-0283C (Charbonneau-Lefort Dep. Tr.); CX-0285C (Dua Dep. Tr.); CX-0287C (Land Dep. Tr.); CX-0289C (Mannheimer Dep. Tr.); CX-0291C (Mehra Dep. Tr.); CX-0293C (Rollins Dep. Tr.); CX-0279C (Rowe Dep. Tr.); CX-0295C (Shui Dep. Tr.); CX-0297C (Venugopal Dep. Tr.); CX-0299C (Waydo Dep. Tr.). *See* Tr. at 291:22-299:5. Apple also submitted several designated deposition transcripts that were received into evidence without a sponsoring witness: RX-1195C (Abdul-Hafiz Dep. Tr.); RX-1296C (Al-Ali Dep. Tr.); RX-1200C (Diab Dep. Tr.); RX-1201C (Hammarth Dep. Tr.); RX-1202C (Kaufman Dep. Tr.); RX-1204C (Kiani Dep. Tr.); RX-1206C (Muhsin Dep. Tr.); RX-1209C (Scruggs Dep. Tr.); RX-1210C (Scruggs 2nd Dep. Tr.); RX-1211C (Young Dep. Tr.). *See* Tr. at 1323:24-1324:20.

II. JURISDICTION AND IMPORTATION

A. Personal Jurisdiction

Apple has submitted to the personal jurisdiction of the Commission by answering the Complaint and Notice of Investigation, participating in discovery, appearing at hearings, and filing motions and briefs. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, USITC Pub. No. 1948, Initial Determination at 4, 1986 WL 379287, *1 (Oct. 15, 1986), *not reviewed in relevant part by* Comm'n Action and Order, 1987 WL 450871 (Jan. 15, 1987). Apple does not dispute the Commission's jurisdiction in this investigation. *See* RIB at 18.

B. *In Rem* Jurisdiction and Importation

The Commission has *in rem* jurisdiction over the accused products by virtue of their importation into the United States. *See Sealed Air Corp. v. U.S. Int'l Trade Comm'n*, 645 F.2d 976, 985-86 (C.C.P.A. 1981) (holding that the ITC's jurisdiction over imported articles is sufficient to exclude such articles). Apple has stipulated to the importation of the Accused Products. CX-0128C at 1-2; CX-1259C ¶¶ 5-6. Apple does not dispute the Commission's jurisdiction in this investigation. *See* RIB at 18.

III. LEGAL STANDARDS

A. Infringement

Section 337(a)(1)(B)(i) prohibits "the importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignee, of articles that – (i) infringe a valid and enforceable United States patent or a valid and enforceable United States copyright registered under title 17." 19 U.S.C. §1337(a)(1)(B)(i). The Commission has held that the word "infringe" in Section 337(a)(1)(B)(i) "derives its legal meaning from 35 U.S.C. § 271, the section of the Patent Act that defines patent infringement."

Certain Elec. Devices with Image Processing Sys., Components Thereof, and Associated Software, Inv. No. 337-TA-724, Comm'n Op. at 13-14, EDIS Doc. ID 467105 (Dec. 21, 2011).

Infringement must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). The preponderance of the evidence standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

1. Claim Construction

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996) (citation omitted). "[T]he construction of claims is simply a way of elaborating the normally terse claim language[] in order to understand and explain, but not to change, the scope of the claims." *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000) (alterations in original) (quoting *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991)). "[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). The words of a claim "'are generally given their ordinary and customary meaning,'" which is "the meaning that the term would have to a person of ordinary skill in art" as of the date that the patent application was filed. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

2. Direct and Indirect Infringement

A patent claim is directly infringed when a respondent "makes, uses, offers to sell, or sells any patented invention, within the United States, or imports into the United States any patented invention" without consent of the patent owner. 35 U.S.C. § 271(a)

In addition to direct infringement, a respondent may be liable for indirect infringement, including induced infringement, which is defined in section 271(b) of the Patent Act: "Whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b). *See DSU Med. Corp. v. JMS Co., Ltd.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (en banc) ("To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and knowingly aided and abetted another's direct infringement.") (citations omitted). "The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven." *Id.* (citations omitted). The Supreme Court has held that induced infringement "requires knowledge that the induced acts constitute patent infringement." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011). In *Suprema, Inc. v. Int'l Trade Comm'n*, the Federal Circuit upheld the Commission's interpretation of the section 337 language "articles that infringe" in the context of induced infringement, holding that the statute "covers goods that were used by an importer to directly infringe post-importation as a result of the seller's inducement." 796 F.3d 1338, 1352-53 (Fed. Cir. 2015).

Another form of indirect infringement is contributory infringement, defined in section 271(c) of the Patent Act: "Whoever offers to sell . . . or imports into the United States a component of a patented machine, . . . or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or

especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer." 35 U.S.C. § 271(c). The intent requirement for contributory infringement requires that respondent knows "that the combination for which [the] component was especially designed was both patented and infringing." *Global-Tech*, 563 U.S. at 763. A violation of section 337 based on contributory infringement requires that "the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1353 (Fed. Cir. 2010).

3. Literal Infringement and the Doctrine of Equivalents

A complainant must prove either literal infringement or infringement under the doctrine of equivalents. Literal infringement requires the patentee to prove that the accused device meets each and every limitation of the asserted claim(s). *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004). "If even one limitation is missing or not met as claimed, there is no literal infringement." *Elkay Mfg. Co. v. EBCO Mfg. Co.*, 192 F.3d 973, 980 (Fed. Cir. 1999). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008). Under the doctrine of equivalents, "a product or process that does not literally infringe upon the express terms of a patent claim may nonetheless be found to infringe if there is 'equivalence' between the elements of the accused product or process and the claimed elements of the patented invention." *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 21 (1997).

B. Invalidity

It is the respondents' burden to prove invalidity, and the burden of proof never shifts to

the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). "Under the patent statutes, a patent enjoys a presumption of validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence . . . ." *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 100-114 (2011) (upholding the "clear and convincing" standard for invalidity).

The clear and convincing evidence standard placed on the party asserting an invalidity defense requires a level of proof beyond the preponderance of the evidence. Although not susceptible to precise definition, "clear and convincing" evidence has been described as evidence that produces in the mind of the trier of fact "an abiding conviction that the truth of a factual contention is 'highly probable.'" *Price v. Symsek*, 988 F.2d 1187, 1191 (Fed. Cir. 1993) (quoting *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed. Cir. 1988)).

1. Anticipation

Pursuant to 35 U.S.C. § 102, a patent claim is invalid as anticipated if:

> (1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention; or
>
> (2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

35 U.S.C. § 102 (2012). "A patent is invalid for anticipation if a single prior art reference discloses each and every limitation of the claimed invention. Moreover, a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily

present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted).

2. Obviousness

Section 103 of the Patent Act states:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

35 U.S.C. § 103(a) (2012).

"Obviousness is a question of law based on underlying questions of fact." *Scanner Techs.*, 528 F.3d at 1379. The underlying factual determinations include: "(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness." *Id.* at 1380 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). These factual determinations are often referred to as the "*Graham* factors."

A critical inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418-21 (2007). In *KSR*, the Supreme Court rejected the Federal Circuit's rigid application of a "teaching-suggestion-motivation" test—while the Court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," it described a more flexible analysis:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue . . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

Id. at 418. Applying *KSR*, the Federal Circuit has held that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device . . . and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007).

In addition to demonstrating that a reason exists to combine prior art references, the challenger must demonstrate that the combination of prior art references discloses all of the limitations of the claims. *Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-1374 (Fed. Cir. 2010), *abrogated on other grounds by Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014) (upholding finding of non-obviousness based on substantial evidence that the asserted combination of references failed to disclose a claim limitation); *Velander v. Garner*, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (explaining that a requirement for a finding of obviousness is that "all the elements of an invention are found in a combination of prior art references").

3. Indefiniteness

"The Patent Act requires that a patent specification 'conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as [the] invention.'" *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014)

(quoting 35 U.S.C. § 112, ¶ 2). "[T]he second paragraph of § 112 contains two requirements: first, [the claim] must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc*,. 299 F.3d 1336, 1348 (Fed. Cir. 2002) (citation and internal quotation marks omitted) (alteration in original). A claim does not satisfy the second requirement and is thereby indefinite "if read in light of the specification delineating the patent, and the prosecution history, [the claim] fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 534 U.S. at 901. Indefiniteness is a question of law, subject to a determination of underlying facts. *Akzo Nobel Coatings, Inc. v. Dow Chem. Co.*, 811 F.3d 1334, 1343-44 (Fed. Cir. 2016). The party challenging the validity of a claim bears the burden of establishing indefiniteness. *Id*.

4. Written Description

Under 35 U.S.C. § 112, ¶ 1, the specification must provide a written description of the claimed invention that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharm., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*). Determining whether the written description requirement has been satisfied "requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art" to determine whether the specification "show[s] that the inventor actually invented the invention claimed." *Id.*

5. Enablement

The enablement requirement is set forth in 35 U.S.C. § 112, ¶ 1 and provides in pertinent part that the specification shall describe "the manner and process of making and using [the

invention], in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the [invention]." The "enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation." *AK Steel Corp. v. Sollac & Ugine*, 344 F.3d 1234, 1244 (Fed. Cir. 2003). Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

C. Inequitable Conduct

A patent containing a claim obtained through inequitable conduct is unenforceable. *Therasense, Inc. v. Becton, Dickinson & Co.*, 649 F.3d 1276, 1288-89 (Fed. Cir. 2011) (en banc). "Moreover, the taint of a finding of inequitable conduct can spread from a single patent to render unenforceable other related patents and applications in the same technology family." *Id.* (*citing Consol. Aluminum Corp. v. Foseco Int'l Ltd.*, 910 F.2d 804, 808-12 (Fed. Cir. 1990)).

"To prevail on the defense of inequitable conduct, the accused infringer must prove that the applicant misrepresented or omitted material information with the specific intent to deceive the PTO." *Id*. at 1287. The failure to disclose a reference to the PTO constitutes inequitable conduct only if "the applicant *made a deliberate decision* to withhold a known material reference." *Id.* at 1290 (quoting *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1182 (Fed. Cir. 1995)) (internal quotation marks omitted; emphasis in original). "In other words, the accused infringer must prove by clear and convincing evidence that the applicant knew of the reference, knew that it was material, and made a deliberate decision to withhold it." *Id.* Inequitable conduct based on the failure to disclose a reference requires a showing of "but for" materiality for the reference. *Id.* at 1291. The "but for" materiality requirement is satisfied "if the PTO

would not have allowed a claim had it been aware of the undisclosed prior art." *Id.* In determining whether "but for" materiality requirement is satisfied, the "the court should apply the preponderance of the evidence standard and give claims their broadest reasonable construction." *Id.* at 1291-92.

While deceptive intent may be inferred solely from circumstantial evidence, "[t]o meet the clear and convincing evidence standard, the specific intent to deceive must be 'the single most reasonable inference able to be drawn from the evidence.'" *Id.* (quoting *Star Scientific Inc. v. R.J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1366 (Fed. Cir. 2008)).

D. Domestic Industry

In patent-based proceedings under section 337, a complainant must establish that an industry "relating to the articles protected by the patent . . . exists or is in the process of being established" in the United States. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement of section 337 consists of a "technical prong" and an "economic prong." *See, e.g., Alloc, Inc. v. Intl Trade Comm'n,* 342 F.3d 1361, 1375 (Fed. Cir. 2003).

To meet the technical prong, the complainant must establish that it practices at least one claim of the asserted patent. *Certain Point of Sale Terminals and Components Thereof,* Inv. No. 337-TA-524, Order No. 40 at 17-18, EDIS Doc. ID 230409 (Apr. 11, 2005). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims." *Alloc*, 342 F.3d at 1375.

With respect to the "economic prong," subsection (3) of Section 337(a) provides:

> For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned –

> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3).

Expenditures may be counted toward satisfaction of the domestic industry requirement "as long as those investments pertain to the complainant's industry with respect to the articles protected by the asserted IP rights." *Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, Inv. No. 337-TA-910, Comm'n Op. at 68, 2015 WL 6755093, at *36 (Oct. 30, 2015); *accord, e.g.*, *Certain Marine Sonar Imaging Devices, Including Downscan and Sidescan Devices, Prods. Containing the Same, and Components Thereof*, Inv. No. 337-TA-921, Comm'n Op., 2016 WL 10987364, at *40 (Jan. 6, 2016) ("Navico's allocation methodology reasonably approximates the warranty and technical customer support expenditures relating to the LSS-1 product.") (*citing Certain Ground Fault Circuit Interrupters and Prods. Containing Same*, Inv. No. 337-TA-739, Comm'n Op. at 74-75, 79-81 (June 8, 2012)). Subsections (A), (B), and (C) are listed in the disjunctive, and accordingly, the domestic industry investments in plant and equipment or labor and capital can include expenditures that relate to engineering or research and development. *Certain Solid State Storage Drives, Stacked Electronics Components, and Products Containing Same*, Inv. No. 337-TA-1097, Comm'n Op. at 14, EDIS Doc. ID 649139 (June 29, 2018) ("[T]he text of the statute, the legislative history, and Commission precedent do not support narrowing subsections (A) and (B) to exclude non-manufacturing activities, such as investments in engineering and research and development.").

Whether a complainant satisfies the economic prong is not analyzed according to a rigid mathematical formula. *Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op.

at 39, EDIS Doc. ID 279161 (Aug. 1, 2007). The decision is made on a case-by-case basis and requires "an examination of the facts in each investigation, the article of commerce, and the realities of the marketplace." *Id.* Although Section 337(a)(3) describes the economic activities as "significant" and "substantial," a complainant does not need to show any "minimum monetary expenditure," and a complainant does not "need to define or quantify the industry itself in absolute mathematical terms." *Stringed Musical Instruments & Components Thereof* ("*Stringed Musical Instruments*"), Inv. No. 337-TA-586, Comm'n Op. at 26, EDIS Doc. ID 300615 (May 16, 2008). "A precise accounting [of the complainant's domestic investments] is not necessary, as most people do not document their daily affairs in contemplation of possible litigation." *Id*. at 17.

The Commission has held that "[o]rdinarily, the relevant date at which to determine if the domestic industry requirement of section 337 is satisfied is the filing date of the complaint." *Certain Thermoplastic-Encapsulated Electric Motors, Components Thereof, and Products and Vehicles Containing the Same*, Inv. No. 337-TA-1073, Comm'n Op. at 6-7, EDIS Doc. ID 684974 (Aug. 12, 2019). In *Stringed Musical Instruments*, the Commission held that a domestic industry is in the process of being established when (1) a complainant takes "the necessary tangible steps to establish such an industry in the United States," and (2) there is a "significant likelihood that the industry requirement will be satisfied in the future." Inv. No. 337-TA-586, Comm'n Op. at 14-17, EDIS Doc. ID 300615 (May 16, 2008).

IV. POEZE PATENTS

The '501 patent, '502 patent, and '648 patent are entitled "User-Worn Device for Noninvasively Measuring a Physiological Parameter of a User," sharing a common specification and naming inventors Jeroen Poeze *et al.* JX-0001; JX-0002; JX-0003. These patents are

collectively referred to herein as the "Poeze patents." The Poeze patents issued from applications filed on September 24, 2020, claiming priority to earlier patent applications, with the earliest provisional application filed on July 3, 2008. *See Id.*

A. Specification

The Poeze patents' specification describes non-invasive physiological sensors for measuring blood constituents or analytes using multi-stream spectroscopy. JX-0001 at 7:18-26. These sensors use an emitter that can uses optical radiation at different wavelengths to measure blood analytes like glucose, hemoglobin, or oxygen saturation. *Id*. at 12:13-13:58. The sensors are connected to handheld or portable monitoring devices that can be attached to a patient's body. *Id*. at 16:31-17:19. In one embodiment, the housing is designed to receive a patient's finger, which can be placed on a protrusion (305) that includes openings or windows (320, 321, 322, and 323) that allow light from the emitter to reach photodetectors. *Id*. at 19:13-20:15.

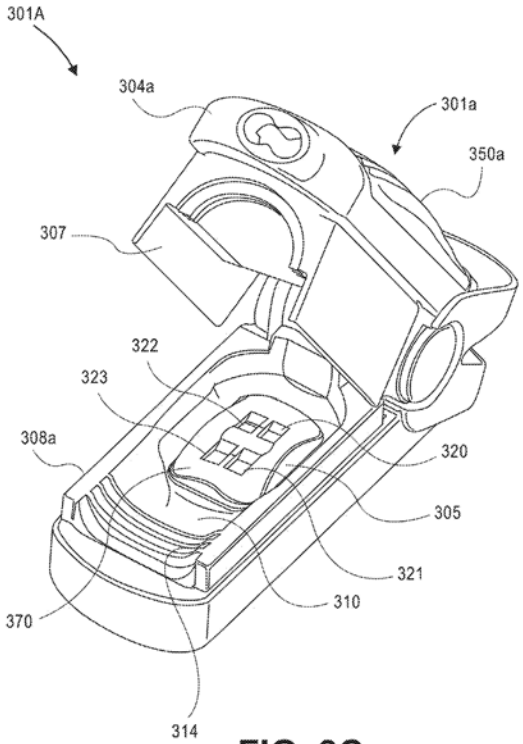

FIG. 3C

Id. at Fig. 3C. One portion of the housing may include LEDs that emit optical radiation passing through a finger before being received by the photodetectors on the other portion of the housing. *Id*. at 26:30-27:41.

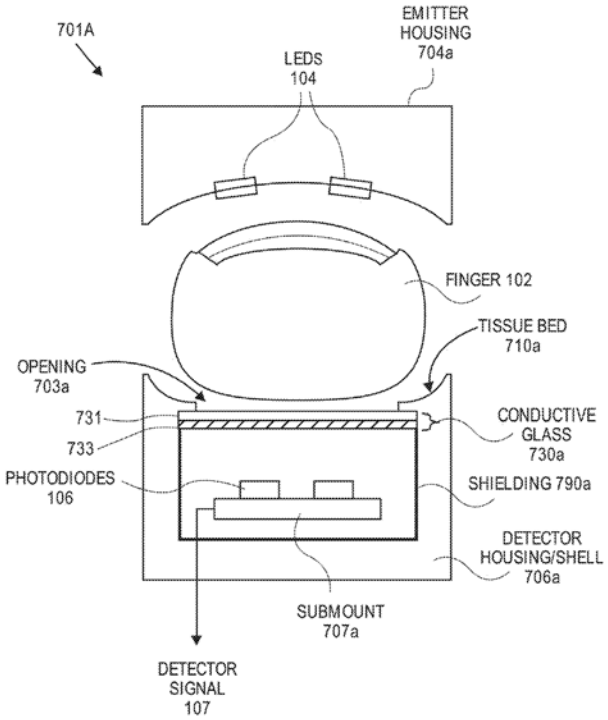

FIG. 7A

Id. at Fig. 7A.

B. Asserted claims

Masimo asserts claim 12 of the ’501 patent, which depends from claim 1. *See* CIB at 53-66. Claims 1 and 12 of the ’501 patent are recited below:

> 1. A user-worn device configured to non-invasively measure a physiological parameter of a user, the user-worn device comprising:
>
> at least three light emitting diodes (LEDs);
>
> at least three photodiodes arranged on an interior surface of the user-worn device and configured to receive light attenuated by tissue of the user;

a protrusion arranged over the interior surface, the protrusion comprising a convex surface and a plurality of openings extending through the protrusion and positioned over the three photodiodes, the openings each comprising an opaque lateral surface, the plurality of openings configured to allow light to reach the photodiodes, the opaque lateral surface configured to avoid light piping through the protrusion; and

one or more processors configured to receive one or more signals from the photodiodes and calculate a measurement of the physiological parameter of the user.

JX-0001 at 45:2-19.

12. The user-worn device of claim 1, wherein the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape.

Id. at 46:4-8.

Masimo also asserts claim 22 of the ’502 patent, which depends from claims 19, 20, and 21, and claim 28, a separate independent claim. *See* CIB at 66-77. These claims of the ’502 patent are recited below:

19. A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user-worn device comprising:

a plurality of emitters configured to emit light, each of the emitters comprising at least two light emitting diodes (LEDs);

four photodiodes arranged within the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user;

a protrusion comprising a convex surface including separate openings extending through the protrusion and lined with opaque material, each opening positioned over a different one associated with each of the four photodiodes, the opaque material configured to reduce an amount of light reaching the photodiodes without being attenuated by the tissue;

optically transparent material within each of the openings; and

one or more processors configured to receive one or more signals from at least one of the four photodiodes and output measurements responsive to the one or more signals, the measurements indicative of the oxygen saturation of the user.

20. The user-worn device of claim 19 further comprising a thermistor.

21. The user-worn device of claim 20, wherein the one or more processors are further configured to receive a temperature signal from the thermistor and adjust operation of the user-worn device responsive to the temperature signal.

22. The user-worn device of claim 21, wherein the plurality of emitters comprise at least four emitters, and wherein each of the plurality of emitters comprises a respective set of at least three LEDs.

JX-0002 at 46:22-54.

28. A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user-worn device comprising:

a first set of light emitting diodes (LEDs), the first set of LEDs comprising at least an LED configured to emit light at a first wavelength and an LED configured to emit light at a second wavelength;

a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising at least an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength;

four photodiodes arranged in a quadrant configuration on an interior surface of the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user;

a thermistor configured to provide a temperature signal;

a protrusion arranged above the interior surface, the protrusion comprising:

a convex surface;

a plurality of openings in the convex surface, extending through the protrusion, and aligned with the four photodiodes, each opening defined by an opaque surface configured to reduce light piping; and

a plurality of transmissive windows, each of the transmissive windows extending across a different one of the openings;

at least one opaque wall extending between the interior surface and the protrusion, wherein at least the interior surface, the opaque wall and the protrusion form cavities, wherein the photodiodes are arranged on the interior surface within the cavities;

one or more processors configured to receive one or more signals from at least one of the photodiodes and calculate an oxygen saturation measurement of the user, the one or more processors further configured to receive the temperature signal;

a network interface configured to wirelessly communicate the oxygen saturation measurement to at least one of a mobile phone or an electronic network;

a user interface comprising a touch-screen display, wherein the user interface is configured to display indicia responsive to the oxygen saturation measurement of the user;

a storage device configured to at least temporarily store at least the measurement; and

a strap configured to position the user-worn device on the user.

Id. at 47:13-23.

Masimo further asserts claim 12 of the ’648 patent, which depends from claim 8, and claims 24 and 30, which depend from claim 20. *See* CIB at 77-83. These claims of the ’648 patent are recited below:

8. A user-worn device configured to non-invasively determine measurements of a physiological parameter of a user, the user-worn device comprising:

a first set of light emitting diodes (LEDs), the first set comprising at least an LED configured to emit light at a first wavelength and at least an LED configured to emit light at a second wavelength;

a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength;

four photodiodes;

a protrusion comprising a convex surface, at least a portion of the protrusion comprising an opaque material;

a plurality of openings provided through the protrusion and the convex surface, the openings aligned with the photodiodes;

a separate optically transparent window extending across each of the openings;

one or more processors configured to receive one or more signals from at least one of the photodiodes and output measurements of a physiological parameter of a user;

a housing; and

a strap configured to position the housing proximate tissue of the user when the device is worn.

JX-0003 at 45:45-46:3.

12. The user-worn device of claim 8, wherein the physiological parameter comprises oxygen or oxygen saturation.

Id. at 46:15-16.

20. A user-worn device configured to non-invasively determine measurements of a user's tissue, the user-worn device comprising:

a plurality of light emitting diodes (LEDs);

at least four photodiodes configured to receive light emitted by the LEDs, the four photodiodes being arranged to capture light at different quadrants of tissue of a user;

a protrusion comprising a convex surface and a plurality of through holes, each through hole including a window and arranged over a different one of the at least four photodiodes; and

one or more processors configured to receive one or more signals from at least one of the photodiodes and determine measurements of oxygen saturation of the user.

Id. at 46:34-49.

24. The user-worn device of claim 20, wherein the protrusion comprises opaque material configured to substantially prevent light piping.

Id. at 46:59-61.

30. The user-worn device of claim 20, wherein the protrusion further comprises one or more chamfered edges.

Id. at 47:6-7.

C. Level of Ordinary Skill in the Art

The parties have stipulated to a level of ordinary skill in the art for the Poeze patents:

> [A] person with a working knowledge of physiological monitoring technologies. The person would have had a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two

> years of related work experience with capture and processing of data or information, including but not limited to physiological monitoring technologies. Alternatively, the person could have also had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline.

Joint Stipulation of Facts ¶ 12, EDIS Doc. ID 770692 (May 13, 2022).

D. Claim Construction

The parties dispute the construction of the terms "over"/"above" and the terms "openings"/"through holes" in the claims of the Poeze patents. *See* CIB at 42-53; RIB at 26-39; CRB at 13-19; RRB at 23-34.[3]

1. "over"/"above"

Several of the asserted claims of the Poeze patents contain limitations describing a protrusion that is "arranged over" or "arranged above" an interior surface. *See* '501 patent claim 1 ("a protrusion arranged over the interior surface"); '502 patent claim 28 ("a protrusion arranged above the interior surface"). Other limitations describe openings that are "positioned over" or "arranged over" photodiodes. *See* '501 patent claim 1 ("a plurality of openings extending through the protrusion and positioned over the three photodiodes"); '502 patent claim 19 ("each opening positioned over a different one associated with each of the four photodiodes"); '648 claim 20 ("each through hole including a window and arranged over a different one of the at least four photodiodes").

[3] The parties both argue that certain claim construction arguments were waived because they were not previously raised, *see* RIB at 37-38, CRB at 19 n.4, RRB at 31 n.17, 33 n.22, but these claim construction disputes were clearly addressed in the parties' pre-hearing briefs and pertain to the plain and ordinary meaning of the terms at issue. *See* CPBH at 39-43; RPHB at 8-15. Ground Rule 9.2 does not preclude parties from citing additional evidence that was admitted at the hearing to support arguments that are consistent with their pre-hearing briefs.

Apple interprets the "over" and "above" limitations to require that the claimed features be arranged vertically when the claimed device is in use. RIB at 26-34. Complainants argue that these terms refer to "the configuration of features of the device relative to each other, not to the position of the device relative to the Earth." CIB at 43. Both parties purport to rely on the ordinary meaning of these terms, without proposing any explicit construction. CIB at 42-49; RRB at 21.

Apple relies on the preambles of the asserted claims describing "a user-worn device configured to non-invasively measure a physiological parameter" to argue that the orientation of the claimed features must be considered when a device is in use. RIB at 27-28. Complainants dispute this interpretation, arguing that "configured to" refers to the design of the product, not the orientation of components. CIB at 45. Complainants argue that the devices described in the specification do not have a fixed orientation and that the embodiments of the invention show "that the protrusion is arranged over the photodiodes and their interior surface by extending across that surface." *Id*. at 43. Complainants note that the patent specification describes a variety of measurement sites without reference to any specific orientation. CRB at 14 (citing JX-0001 at 8:21-23, 10:15-27, 10:62-11:3, 11:45-55). Complainants cite an example in one embodiment of a material described as "over" the glass layer when it is depicted as below the layer in Figure 7A. *Id*. at 45-46 (citing JX-0001 at 27:59-62, Fig. 7A). Dr. Madisetti testified that Complainants' interpretation is consistent with the ordinary meaning of "over," citing the example of a bandage over a wound, explaining that "the Band-Aid is always over the scratch [ir]respective of the orientation of my hand." Tr. at 701:22-18.

Complainants also cite extrinsic evidence in Apple patents and prior art using the terms "over" and "above" to describe the arrangement of features similar to those claimed in the Poeze

patents. CIB at 46-49. *See, e.g.*, U.S. Patent No. 10,687,718 (CX-0118) at 32:17-23 ("For example, a back surface may comprise a first semi-circular protrusion that extends over the portions of the back surface."), 35:38-55 (FIG. 222A depicts . . . a protrusion 2202 disposed over an optical opening 2204."); U.S. Patent App. Pub. No. 2021/0093237 (CX-0103) at ¶ 0065 ("In some embodiments, windows 1220 over the emitters may be integral with the back cover 107 and windows 120 over the detectors may be inset within the back cover 107."); U.S. Patent App. Pub. No. 2017/03255744 (CX-1806) at ¶ 0044 ("For example, the back surface can include one or more cavities having a corresponding opening and a protrusion located over each of the openings."); U.S. Patent No. 4,224,948 (RX-0670) at 9:51-56 ("wherein said first and second light obstructing means comprise a pair of annular rings extending above the surface of the lower face of said case whereby said rings are in contact with the skin of the wearer").

Apple argues that Complainants' interpretation of the "over" and "above" limitations would render these terms meaningless. RRB at 23-24. Apple cites figures in the specification that consistently describe the claimed protrusion and openings located on top of the photodiodes. *Id*. at 24-26 (citing JX-0001 at 24:28-33, Figures 3C, 4C, 7B). Apple argues that the specification's use of the term "over" within the phrase "spread over" is irrelevant to the meaning of the claim phrases "positioned over" and "arranged over." RIB at 25-26. Apple further argues that in the Apple patents and patent applications using the term "over," the descriptions refer to devices that are depicted in a face-down position, not when they are configured to measure blood oxygen. *Id*. at 26-28. Apple argues that the "configured to" language in the claims requires that that the features have a specific orientation when the device is in use. *Id*. at 28-29.

In consideration of the parties' arguments and the evidence of record, the undersigned agrees with Complainants that the claim limitations using the terms "over" and "above" do not require a vertical arrangement of features in the context of the Poeze patents. The terms "over" and "above" are commonly understood words with ordinary meanings that can be understood by a lay judge. *See Phillips*, 415 F.3d at 1314. The undersigned agrees with Apple that the word "over" may be used to describe a vertical arrangement, but "over" can also be used to describe an arrangement where one feature covers another, as recognized by Dr. Madisetti's example of a bandage over a wound. Tr. (Madisetti) at 701:22-18. This is a common usage of the term "over" in the field of wearable medical equipment, *e.g.*, a mask over one's mouth, or in the field of optical sensors, *e.g.*, a filter over a lens. This is consistent with how the term "over" is used in the asserted claims of the Poeze patents, describing "a protrusion arranged over the interior surface" and openings "positioned over" or "arranged over" photodiodes. In the context of this claim language, the term "over" refers to an arrangement where one feature covers another—not the relative arrangement of these features in a vertical direction.[4] The ordinary meaning of the claim language does not restrict the orientation of these features, and whether the claimed photodiodes

[4] The term "above" is only used in asserted claim 28 of the '502 patent to refer to "a protrusion arranged above the interior surface." The undersigned agrees with Complainants that the patent specification does not require any specific orientation of the device and that the term "above" thus refers to a position relative to the device's features and not to its orientation relative to the Earth. *See* CIB at 43-49; CRB at 15-16. This is also consistent with the usage of the term in a prior art reference relied upon for invalidity purposes by Apple where the term "above" is used to refer to rings that extend beyond a surface, regardless of vertical orientation. *See* RX-0670 (Cramer) at claim 5 ("a pair of annular rings extending above the surface of the lower face of said case"). It is also consistent with the testimony of Apple's expert, Dr. Warren, that "[a] detector can't detect light without some sort of opening above it." Tr. (Warren) at 1193:5-6; *see also* RIB at 61 (same). Apple argues that "Cramer does not disclose restrictions on orientation" (RRB at 29) but this fact weighs against Apple's proposed construction: if the Cramer device can be in any orientation, the term "above" should have a meaning independent from orientation.

are facing upward or downward in relation to the Earth does not affect a device's satisfaction of this limitation.[5]

Accordingly, the undersigned finds that the terms "over" and "above" have their plain and ordinary meaning and do not require a vertical arrangement of features in a particular orientation.

2. "openings"/"through holes"

Several of the asserted claims (or claims from which the asserted claims depend) contain limitations describing "openings" that extend "through the protrusion." *See* '501 patent claim 1 ("a plurality of openings extending through the protrusion"); '502 patent claim 19 ("separate openings extending through the protrusion"), claim 28 ("a plurality of openings in the convex surface, extending through the protrusion"); '648 patent claim 8 ("a plurality of openings provided through the protrusion and the convex surface"). Claim 20 of the '648 patent describes "a plurality of through holes, each through hole including a window."

Apple argues that the claimed "openings" or "through holes" must not contain any material, such as glass or plastic. RIB at 34-39; RRB at 30-34; *id.* at 30 n.16 ("openings—like holes—require an absence of material"). Complainants submit that the claimed "openings" or "through holes" can contain a window of transparent material. CIB at 49-53; CRB at 17-18. Both parties purport to rely on the ordinary meaning of these terms, without proposing any explicit construction. CIB at 53; RRB at 30-31.

Complainants cite evidence in the claims and specification of the Poeze patents that the claimed "openings" and "through holes" can contain a window of transparent material. CIB at

[5] Apple's arguments regarding the "configured to" language of the claim preambles are thus irrelevant to the construction of this limitation.

49-51. Complainants submit that the purpose of these openings is to allow light to pass through, citing claim 1 of the '501 patent, which describes "the plurality of openings configured to allow light to reach the photodiodes." JX-0001 at claim 1. Complainants cite examples in the claims and specification of the Poeze patents describing transparent windows in the relevant openings and through holes. CIB at 49-51. Complainants further identify Apple patents that refer to "openings" and "windows." *Id*. at 52-53. In reply, Apple cites testimony of its engineers describing [redacted]. RRB at 33-34. Apple argues that an opening or a hole is "an absence of material, into which something can be placed." *Id*. at 32.

In consideration of the parties' arguments and the evidence of record, the undersigned agrees with Complainants that the ordinary meaning of "openings" and "through holes" in the context of the Poeze patents does not preclude transparent material placed in the claimed "openings" or "through holes." An "opening" or "hole" can refer to an absence of material, but this is not necessarily a requirement. For example, a skylight would still be an "opening" in a roof after a glass window is installed, and a swimming hole is still a "hole" when it is filled with water. The undersigned agrees with Complainants that the ordinary meaning of the terms "opening" and "hole" can include openings and holes that include material.

The claims and specification of the Poeze patents use the terms "openings" and "holes" in a way that is consistent with this ordinary meaning by referring to "openings" and "through holes" that may contain transparent material. *See, e.g.*, '502 patent claim 19 ("optically transparent material within each of the openings"), claim 28 ("a plurality of transmissive windows, each of the transmissive windows extending across a different one of the openings"); '648 patent claim 8 ("a separate optically transparent window extending across each of the

openings"), claim 20 ("each through hole including a window"). The specification explicitly provides that "[t]he openings can be made from glass to allow attenuated light from a measurement site, such as a finger, to pass through to one or more detectors." JX-0001 at 8:26-30; *see also* JX-0001 at 19:38-48 (describing "openings or windows," which "allow light to pass from the measurement site to the photodetectors"), 27:20-27 ("One or more components of conductive glass 730b can be provided in the openings 703."). Figure 7B depicts conductive glass provided in the identified opening:

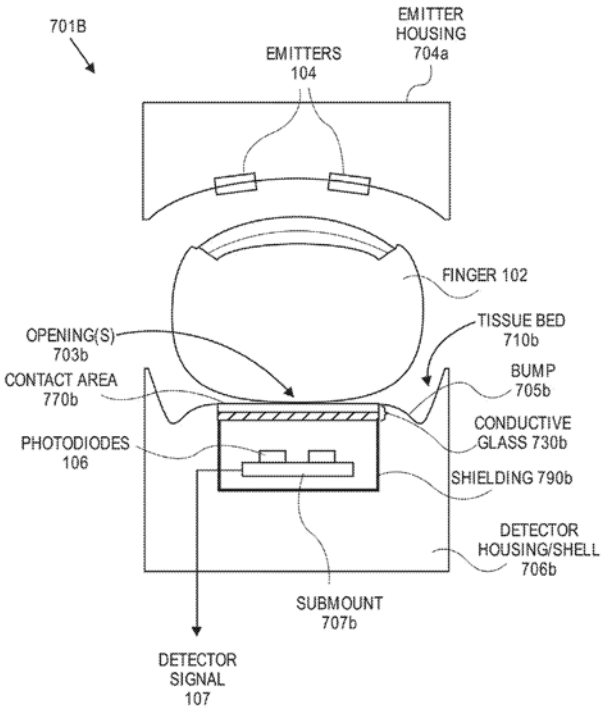

FIG. 7B

JX-0001 at Fig. 7B; *see id*. at 27:13-32. In view of these disclosures, the undersigned agrees with the testimony of Dr. Madisetti that the claimed "openings" and "through holes" in the Poeze patents can be made of glass or transparent material that allows light to pass through to the detectors. *See* Tr. (Madisetti) at 702:8-703:10.

Apple argues that a "window" is something different from an "opening" or "hole," RIB at 37-38, but none of the statements in the specification cited by Apple suggest that an "opening" can no longer be referred to as an "opening" when filled with glass or covered by a window. To the contrary, the specification describes conductive glass that "can be provided in the openings." JX-0001 at 27:20-22. The claims of the Poeze patents repeatedly describe "windows extending across . . . the openings." '502 patent claim 28; *see also* '648 patent claim 8 (same); '648 patent, claim 20 ("each through hole including a window"). Claim 19 of the '502 patent describes "optically transparent material within each of the openings." The intrinsic evidence supports Complainants' interpretation of these terms to include "openings" and "through holes" that contain transparent material allowing for the transmission of light to the photodiodes.

Accordingly, the undersigned finds that the claimed "openings" and "through holes" can contain transparent material.

E. Infringement

Complainants allege that the Accused Products infringe claim 12 of the '501 patent, claims 22 and 28 of the '502 patent, and claims 12, 24, and 30 of the '648 patent. CIB at 53-83. There is no dispute with respect to the structure and operation of the Accused Products, and Apple only disputes infringement with respect to the "over"/"above" and "openings"/"through holes" limitations addressed above in the context of claim construction. RIB at 26-39; RRB at 20-34. Based on the evidence of record, and because Apple's proposed claim constructions have been rejected, the undersigned finds that these limitations are met, and that the Accused Products thus infringe each of the asserted claims, as discussed below.[6]

[6] Apple's opening brief argues, in addition, that there is no indirect infringement of claim 28 of the '502 patent. *See* RIB at 39-40. Complainants do not provide any argument regarding indirect infringement.

1. '501 Patent Claim 12[7]

a. Element [1 preamble]: "A user-worn device configured to noninvasively measure a physiological parameter of a user, the user-worn device comprising:"[8]

There is no dispute that the Accused Products meet the limitations of the preamble of claim 1, which requires "[a] user-worn device configured to non-invasively measure a physiological parameter of a user." *See* CIB at 59-60. Dr. Madisetti determined that the Accused Products are watches configured to measure blood oxygen saturation, relying on Apple's marketing materials and technical documentation. Tr. (Madisetti) at 679:12-680:5; CX-0281C (Block Dep. Tr.) at 71:21-72:5, 87:10-14, 177:10-178:7, 251:4-7; CX-1451 (Apple Watch advertisement) at 1:49; CX-1406 (Apple Watch User Guide); CX-1726 (Apple Watch Series 7 Technical Specifications). The evidence of record shows that this limitation is met.

b. Element [1A]: "at least three light emitting diodes (LEDs)"

There is no dispute that each of the Accused Products contains a sensor module with at least three LEDs. *See* CIB at 60-61. Dr. Madisetti identified four clusters of LEDs in each Accused Product, with each cluster containing three LEDs of different wavelengths. Tr. (Madisetti) at 680:6-22; CX-1548C (Apple Watch teardown photographs); CX-0281C (Block Dep. Tr.) at 65:5-67:20; CX-0026C (Apple Engineering Requirement Specification) at 7-8, 30-

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Apple does not explain why an indirect infringement finding is needed to find a violation as to claim 28 of the '502 patent, or as to any other asserted claim (which are all apparatus claims).

[7] Because claim 12 of the '501 patent depends from claim 1, the infringement, technical prong and invalidity analyses address the limitations of both claims 1 and 12. *See* CIB at xxvi.

[8] The parties have stipulated that all preambles of all asserted claims are limiting. *See* Joint Stipulation of Facts ¶ 9, EDIS Doc. ID 770692 (May 13, 2022).

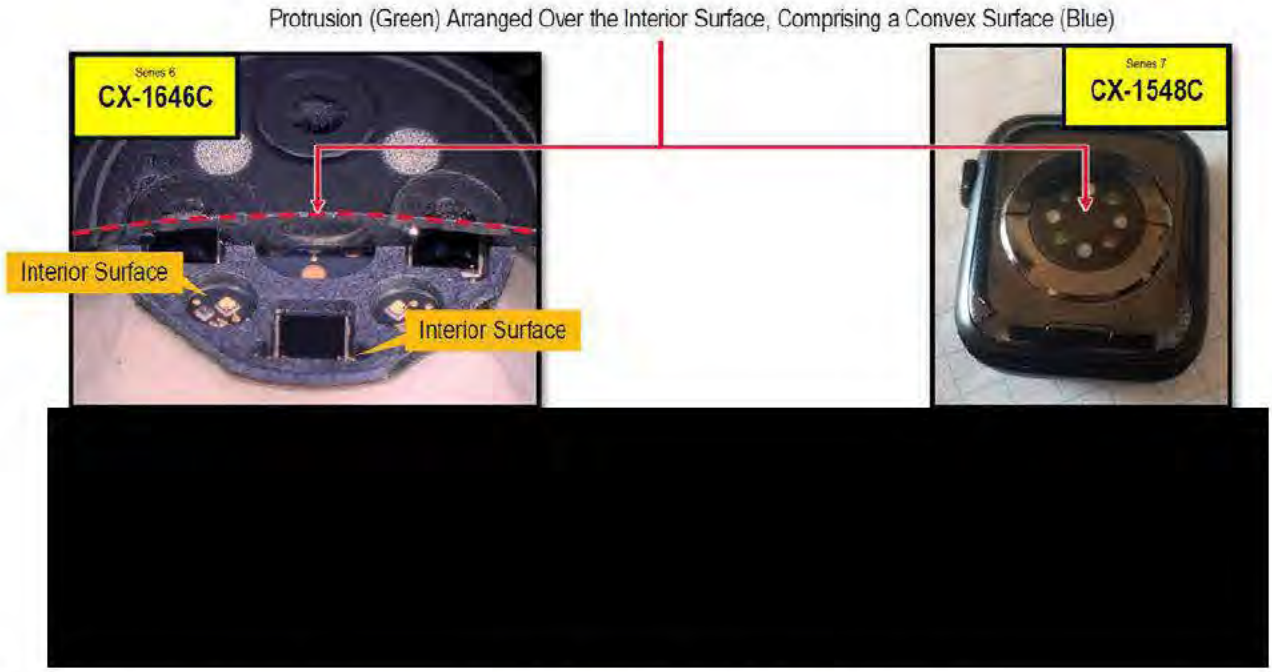
32; CX-0059C (Apple Watch Series 7 Engineering Drawings) at 1-3. The evidence of record shows that this limitation is met.

c. Element [1B]: "at least three photodiodes arranged on an interior surface of the user-worn device and configured to receive light attenuated by tissue of the user"

There is no dispute that each of the Accused Products contains at least three photodiodes on an interior surface that are configured receive light that has passed through the user's tissue. *See* CIB at 61-62. Dr. Madisetti identified four photodiodes arranged on Apple Watch sensor boards that are configured to receive light emitted from the LEDs after it has passed through the user's tissue. Tr. (Madisetti) at 680:23-681:11; CX-0281C (Block Dep. Tr.) at 70:13-16, 86:2-87:18; CX-0026C (Apple Engineering Requirement Specification) at 7-8, 30-32; CX-0059C (Apple Watch Series 7 Engineering Drawings) at 1-3. The evidence of record shows that this limitation is met.

d. Element [1C]: "a protrusion arranged over the interior surface, the protrusion comprising a convex surface"

Complainants identify a domed surface in the Accused Products as the claimed protrusion with a convex surface. CIB at 54-57. Dr. Madisetti identified this domed surface arranged over the interior surface of the Accused Products where the photodiodes are located. Tr. (Madisetti) at 681:12-682:11.



CDX-0011C.016 (citing CX-1646C at 4; CX-1548C at 3; CX-0063C at 1).

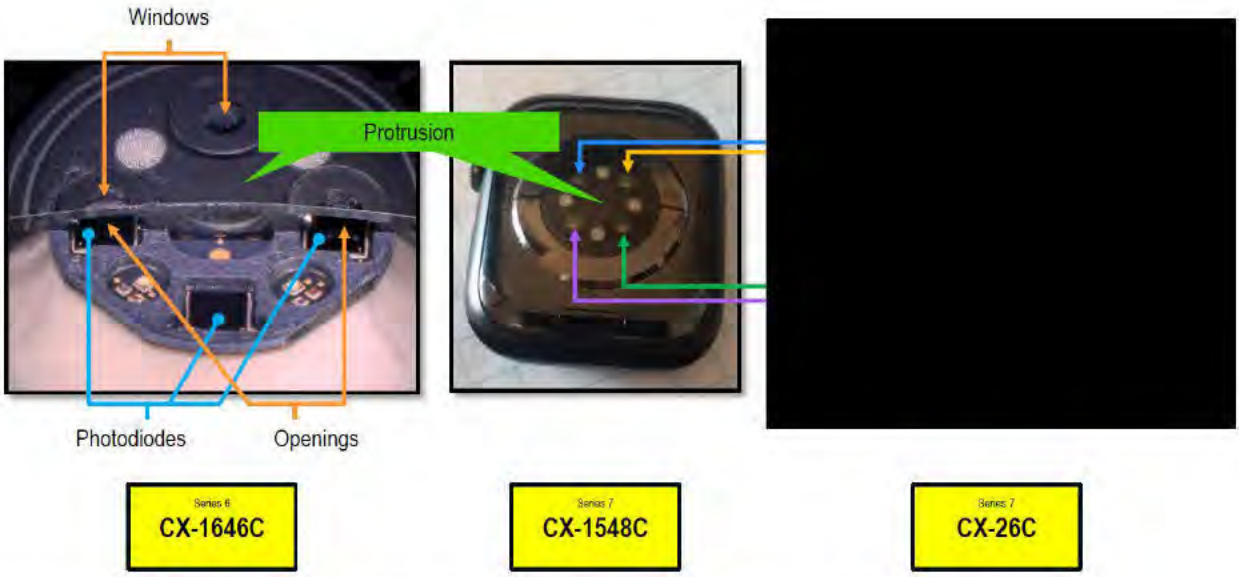
Apple argues that the identified protrusion is not "over" the interior surface when the Accused Products are being used for blood oxygen monitoring (with the photodiodes pointed down toward the user's wrist). RIB at 26-34; RRB at 21-29. There is no dispute regarding the orientation of the Accused Products, but as discussed above in the context of claim construction, the claim term "over" does not require a particular vertical arrangement—the protrusion is "over" the interior surface because it is covering the interior surface.

Accordingly, the undersigned finds that the Accused Products meet the limitation requiring "a protrusion arranged over the interior surface."

e. Element [1D]: "a plurality of openings extending through the protrusion and positioned over the three photodiodes"

Complainants identify openings in the Accused Products that are positioned over the four photodiodes. CIB at 57-59. Dr. Madisetti identified evidence

[redacted] that allow light to pass through to the photodiodes. Tr. (Madisetti) at 682:12-683:17.



CDX-0011C.017 (citing CX-1646C at 4; CX-1548C at 3; CX-0026C at 8, 31).

Apple argues that the alleged "openings" do not infringe this limitation because they are [redacted] RIB at 34-39; RRB at 29-34. Apple engineer Ueyn Block explained: [redacted] Tr. (Block) at 901:16-902:3. Apple also argues that the openings are not positioned "over" the photodiodes when the Accused Products are being used for blood oxygen monitoring (with the photodiodes pointed down toward the user's wrist). RIB at 26-39; RRB at 21-29.

As discussed above in the context of claim construction, the undersigned finds that the claimed "openings" can contain transparent material. The fact that the openings in the Accused

Products [redacted] does not mean that these are not "openings" in accordance with the claim language. There is no dispute that the [redacted] within the openings is transparent and allows for light to reach the photodiodes. *See* CX-0281C (Block) at 272:2-9. There is also no dispute that each opening has an opaque lateral surface separating the opening from the surrounding material. *See* CIB at 62-64; Part IV.E.1.f (Element 1E) *infra*.

The undersigned also finds that the openings are positioned "over" the four photodiodes. As discussed above in the context of claim construction, the claim term "over" does not require a particular vertical arrangement—the openings are positioned "over" the photodiodes because they are aligned with the photodiodes and covering them.

Accordingly, the Accused Products meet the plurality of openings" limitation of '501 patent claim 1.

f. Element [1E]: "the openings each comprising an opaque lateral surface, the plurality of openings configured to allow light to reach the photodiodes, the opaque lateral surface configured to avoid light piping through the protrusion"

There is no dispute that the Accused Products have opaque lateral surfaces in their alleged openings that are configured to avoid light piping. *See* CIB at 62-64. Apple engineers described a [redacted] *see also* CX-0070C at 1; CX-0189C at 2; CX-1548C at 3; CX-0072C at 26, 29-30. Dr. Madisetti considered this evidence to identify [redacted]

[redacted] as opaque lateral surfaces meeting this limitation. Tr. (Madisetti) at 683:18-685:3. The evidence of record shows that this limitation is met.

g. Element 1[F]: "one or more processors configured to receive one or more signals from the photodiodes and calculate a measurement of the physiological parameter of the user"

There is no dispute that the Accused Products have processors that receive signals from the photodiodes and calculate measurements of physiological parameters. *See* CIB at 64-65. Dr. Madisetti identifies an [redacted] application processor running Apple's [redacted] algorithm to calculate oxygen saturation and pulse rate. Tr. (Madisetti) at 685:4-25; *see* CX-0013C (Apple Engineering Requirements Specification) at 12; CX-0100C (Apple Engineering Requirements Specification) at 6-31; CX-0072C at 3 (Apple Watch Series 6 BOM); CX-1726 (Apple Watch Series 7 Technical Specifications) at 2; CX-0299C (Waydo Dep. Tr.) at 38:10-40:6, 50:11-52:4. The evidence of record shows that this limitation is met.

h. Element [12]: "wherein the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape"

Claim 12 of the '501 patent depends from claim 1, further requiring that "the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape." There is no dispute that the Accused Products meet this limitation. *See* CIB at 65-66. As discussed above, Dr. Madisetti identified a convex protrusion in the Accused Products, and Apple documents and testimony confirm that the protrusion is designed [redacted]. *See* Tr. (Madisetti) at 686:1-18; CX-0281 (Block Dep. Tr.) at 200:6-14; CX-0063C (Apple Watch Series 7 Engineering Drawings) at 1; CX-1548C (photographs of Apple Watch Series 7) at 3;

CX-0070C (Apple Watch Series 7 Engineering Drawings) at 1; CX-0010 (Apple website) at 3. The evidence of record shows that this limitation is met.

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Accordingly, because each limitation of claims 1 and 12 are satisfied, the Accused Products infringe claim 12 of the '501 patent.

2. '502 Patent Claim 22[9]

a. Element [19 preamble]: "A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user worn device comprising:"

There is no dispute that the Accused Products meet the limitations of the preamble of '502 patent claim 19, which requires "[a] user-worn device configured to non-invasively measure an oxygen saturation of a user." *See* CIB at 67. The relevant evidence was discussed above in the context of the preamble of '501 patent claim 1. The evidence of record shows that this limitation is met.

b. Element [19A]: "a plurality of emitters configured to emit light, each of the emitters comprising at least two light emitting diodes (LEDs)"

There is no dispute that each of the Accused Products contains clusters of LEDs, with each cluster containing three LEDs. *See* CIB at 68. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

[9] Because claim 22 of the '502 patent depends from claims 19, 20, and 21, the infringement, technical prong and invalidity analyses address the limitations of claims 19, 20, 21, and 22. *See* CIB at xxvii.

c. Element [19B]: "four photodiodes arranged within the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user"

There is no dispute that each of the Accused Products contains four photodiodes configured to receive light that has been attenuated by tissue of the user. *See* CIB at 68. The relevant evidence was discussed above in the context of the "photodiodes" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

d. Element [19C]: "a protrusion comprising a convex surface including separate openings extending through the protrusion and lined with opaque material, each opening positioned over a different one associated with each of the four photodiodes, the opaque material configured to reduce an amount of light reaching the photodiodes without being attenuated by the tissue"

There is no dispute that each of the Accused Products contains a protrusion comprising a convex surface, as discussed above in the context of the "protrusion" limitation of '501 patent claim 1. *See* CIB at 66. With respect to the '502 patent claim 19 limitation requiring "openings extending through the protrusion," Complainants identify the same "openings" that are discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 66-67. Complainants further identify the same [redacted] discussed above in the context of the "opaque lateral surfaces" limitation of '501 patent claim 1. *Id.*

Apple disputes infringement of this limitation based on its erroneous proposed constructions of the claim terms "over" and "openings." *See* RIB at 26-39; RRB at 21-34. These arguments have been rejected, however, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1 and in the claim construction analysis above. *See* Part IV.D, *supra*. Accordingly, the undersigned finds that the Accused Products meet the limitation in '502 patent claim 19 requiring a "protrusion" including "openings extending

through the protrusion" that are "lined with opaque material," and "each opening positioned over" the photodiodes.

e. Element [19D]: "optically transparent material within each of the openings"

There is no dispute that each of the Accused Products contains optically transparent material within each of the identified openings. *See* CIB at 68. The evidence for the presence of [redacted] in these openings was discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

f. Element [19E]: "one or more processors configured to receive one or more signals from at least one of the four photodiodes and output measurements responsive to the one or more signals, the measurements indicative of the oxygen saturation of the user"

There is no dispute that each of the Accused Products contain processors that receive signals from the photodiodes and output measurements of oxygen saturation. *See* CIB at 68. The relevant evidence was discussed above in the context of the "processors" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

g. Element [20]: "further comprising a thermistor"

Claim 20 of the '502 patent depends from claim 19, further requiring a thermistor. There is no dispute that the Accused Products include a thermistor. *See* CIB at 68-69. Dr. Madisetti identified a [redacted] of the Accused Products. Tr. (Madisetti) at 688:18-689:8; *see* CX-0026C (Apple Engineering Requirement Specification) at 31; CX-1548C (Apple Watch teardown photographs) at 37; CX-0059C (Apple Watch Series 7 Engineering Drawings) at 1-5. The evidence of record shows that this limitation is met.

h. Element [21]: "wherein the one or more processors are further configured to receive a temperature signal from the thermistor and adjust operation of the user-worn device responsive to the temperature signal"

Claim 21 of the '502 patent depends from claim 20, further requiring that "the one or more processors are further configured to receive a temperature signal from the thermistor and adjust operation of the user device responsive to the temperature signal." There is no dispute that the Accused Products [redacted]. *See* CIB at 69-70. Dr. Madisetti identified Apple documents and testimony showing that a processor in the Accused Products [redacted] Tr. (Madisetti) at 689:17-690:16 (citing CX-0100C (Apple Engineering Requirement Specification) at 8; *see also* CX-0281C (Block Dep. Tr.) at 62:3-64:17; CX-0283C (Charonneau-LeFort Dep. Tr.) at 78:4-79:18, 123:6-12; CX-0299C (Waydo Dep. Tr.) at 84:2-85:22; CX-0285C (Dua Dep. Tr.) at 139:1-15. The evidence of record shows that this limitation is met.

i. Element [22]: "wherein the plurality of emitters comprise at least four emitters, and wherein each of the plurality of emitters comprises a respective set of at least three LEDs"

Claim 22 of the '502 patent depends from claim 21, further requiring that "the plurality of emitters comprise at least four emitters, and wherein each of the plurality of emitters comprises a respective set of at least three LEDs." There is no dispute that the plurality of emitters in the Accused Products comprise four sets of three LEDs. *See* CIB at 70-71. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

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Accordingly, because each limitation of claims 19, 20, 21, and 22 are satisfied, the undersigned finds that the Accused Products infringe claim 22 of the '502 patent.

3. '502 Patent Claim 28

a. Element [28 preamble]: "A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user worn device comprising:"

There is no dispute that the Accused Products meet the limitations of the preamble of '502 patent claim 28, which requires "[a] user-worn device configured to non-invasively measure an oxygen saturation of a user." *See* CIB at 72. The relevant evidence was discussed above in the context of the preamble of '501 patent claim 1. The evidence of record shows that this limitation is met.

b. Element [28A]: "a first set of light emitting diodes (LEDs), the first set of LEDs comprising at least an LED configured to emit light at a first wavelength and an LED configured to emit light at a second wavelength"

There is no dispute that each of the Accused Products contains four sets of LEDs, with each set containing three LEDs emitting light at different wavelengths. *See* CIB at 72. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

c. Element [28B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising at least an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

There is no dispute that each of the Accused Products contains four sets of LEDs, with each set containing three LEDs emitting light at different wavelengths. *See* CIB at 72. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1, and Dr. Block confirmed that the wavelengths in each of the LED groups is the same--

containing one infrared LED, one red LED, and one green LED. *See* CX-0281C (Block Dep. Tr.) at 65:5-67:20. The evidence of record shows that this limitation is met.

d. Element [28C]: "four photodiodes arranged in a quadrant configuration on an interior surface of the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user"

There is no dispute that each of the Accused Products contains four photodiodes arranged in a quadrant configuration receiving light that has been attenuated by tissue of the user. *See* CIB at 72-73. The relevant evidence was discussed above in the context of the "photodiodes" limitation of '501 patent claim 1, and Dr. Madisetti identified photographs of the sensor board of the Accused Products showing the quadrant configuration of the photodiodes. Tr. (Madisetti) at 692:3-16; CX-1548C. The evidence of record shows that this limitation is met.

e. Element [28D]: "a thermistor configured to provide a temperature signal"

There is no dispute that each of the Accused Products contains a thermistor that provides a temperature signal. *See* CIB at 73. The relevant evidence was discussed above in the context of '502 patent claim 20. The evidence of record shows that this limitation is met.

f. Element [28E]: "a protrusion arranged above the interior surface, the protrusion comprising: a convex surface"

There is no dispute that each of the Accused Products contains a protrusion comprising a convex surface, as discussed above in the context of the "protrusion" limitation of '501 patent claim 1. *See* CIB at 71. Apple disputes infringement of this limitation based on its erroneous proposed construction of the term "above." *See* RIB at 26-34; RRB at 21-29. These arguments have been rejected, however, as discussed above in the context of the "protrusion" limitation of '501 patent claim 1 and in the claim construction analysis above. *See* Part IV.D.1, *supra*.

Accordingly, the undersigned finds that the Accused Products meet the limitation in '502 patent claim 28 requiring a "protrusion arranged over the interior surface."

g. Element [28F]: "a plurality of openings in the convex surface, extending through the protrusion, and aligned with the four photodiodes, each opening defined by an opaque surface configured to reduce light piping"

With respect to the "plurality of openings" limitation of '502 patent claim 28, Complainants identify the same "openings" that are discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 71. There is no dispute that these openings are aligned with the four photodiodes. *See id.* Apple disputes infringement of this limitation based on its erroneous proposed construction of the term "openings." *See* RIB at 34-39; RRB at 29-34. These arguments have been rejected, however, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. Accordingly, the undersigned finds that the Accused Products meet the limitation in '502 patent claim 28 requiring a "plurality of openings in the convex surface, extending through the protrusion, and aligned with the four photodiodes." Further, there is no dispute that the Accused Products have opaque surfaces surrounding the openings that are configured to reduce light piping, as discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1. *See* CIB at 71. Accordingly, the evidence shows that this limitation is met by the Accused Products.

h. Element [28G]: "a plurality of transmissive windows, each of the transmissive windows extending across a different one of the openings"

There is no dispute that each of the Accused Products contains transmissive windows extending across each of the identified openings. *See* CIB at 73. The evidence for the presence of transparent windows in these openings was discussed above in the context of the "plurality of

openings" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

i. Element [28H]: "at least one opaque wall extending between the interior surface and the protrusion, wherein at least the interior surface, the opaque wall and the protrusion form cavities, wherein the photodiodes are arranged on the interior surface within the cavities"

There is no dispute that each of the Accused Products contains an opaque wall between the interior surface and the protrusion that forms a cavity for the photodiodes. *See* CIB at 74. Dr. Madisetti identified the opaque wall in photographs of the Accused Products. Tr. (Madisetti) at 692:17-693:13; *see* CX-1646C (Complaint Exhibit 18) at 4; CX-0026C (Apple Engineering Requirement Specification) at 7-8, 30-32; CX-0059C (Apple Watch Series 7 Engineering Drawings) at 1-3; *see also* CX-0283C (Charbonneau-Lefort Dep. Tr.) at 87:5-8, 105:22-106:7. The evidence of record shows that this limitation is met.

j. Element [28I]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and calculate an oxygen saturation measurement of the user, the one or more processors further configured to receive the temperature signal"

There is no dispute that each of the Accused Products contains processors that receive signals from the photodiodes and output measurements of oxygen saturation, and there is no dispute that the processors receive a temperature signal. *See* CIB at 74. The relevant evidence was discussed above in the context of the "processors" limitations of '501 patent claim 1 and '502 patent claim 21. The evidence of record shows that this limitation is met.

k. Element [28J]: "a network interface configured to wirelessly communicate the oxygen saturation measurement to at least one of a mobile phone or an electronic network"

There is no dispute that the Accused Products have a network interface that can wirelessly communicate oxygen saturation measurements to a mobile phone or electronic network. *See* CIB at 74-75. Dr. Madisetti identifies Bluetooth and Wi-Fi interfaces that communicate SpO2 measurements to an Apple iPhone. Tr. (Madisetti) at 693:14-694:11; *see* CX-0010 (Apple website) at 5; CX-1726 (Apple Watch Series 7 Technical Specifications) at 21. This operation of the Accused Products was confirmed by the testimony of Apple engineers. *See* CX-0299C (Waydo Dep. Tr.) at 74:20-75:17 (SpO2 measurements "stored in the HealthKit database on the Watch will also eventually make its way to the phone" via "Wi-Fi or Bluetooth"); CX-0285C (Dua) at 144:9-14 ("the heart rate along with the SpO_2 that's measured at the same time are both communicated to the iPhone"). The evidence of record shows that this limitation is met.

l. Element [28K]: "a user interface comprising a touch-screen display, wherein the user interface is configured to display indicia responsive to the oxygen saturation measurement of the user"

There is no dispute that the Accused Products have a touch-screen display that shows oxygen saturation measurements. *See* CIB at 75-76. Dr. Madisetti identified Apple documents showing that Apple Watches have touch-screen displays that can show an SpO2 measurement. Tr. (Madisetti) at 694:12-22 (citing CX-1407 at 3); *see also* CX-0281C (Block Dep. Tr. at 237:11-238:8); CX-0010 (Apple webpage). The evidence of record shows that this limitation is met.

m. Element [28L]: "a storage device configured to at least temporarily store at least the measurement"

There is no dispute that the Accused Products store the blood oxygen measurement in memory. *See* CIB at 76. Apple engineers confirmed that the SpO2 values are stored in the memory of the Accused Products. *See* CX-0299C (Waydo Dep. Tr.) at 74:17-19; CX-0285C (Dua Dep. Tr.) at 131:8-15; *see also* CX-1726 at 1-2 (identifying memory in Apple Watch Series 7). The evidence of record shows that this limitation is met.

n. Element [28M]: "a strap configured to position the user-worn device on the user"

There is no dispute that the Accused Products have a strap. *See* CIB at 76. Dr. Madisetti identified a strap configured to hold the Accused Products in place on a user's wrist. Tr. (Madisetti) at 695:11-20; *see* CX-0010 (Apple website) at 4; CX-1726 (Apple Watch Series 7 Technical Specifications) at 3. The evidence of record shows that this limitation is met.

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Accordingly, because each limitation of the claim is satisfied, the undersigned finds that the Accused Products infringe claim 28 of the '502 patent.

4. '648 Patent Claim 12[10]

a. Element [8 preamble]: "A user-worn device configured to non-invasively determine measurements of a physiological parameter of a user, the user-worn device comprising:"

There is no dispute that the Accused Products meet the limitations of the preamble of '648 patent claim 8, which requires "[a] user-worn device configured to non-invasively determine measurements of a physiological parameter of a user." *See* CIB at 77. The relevant

[10] Because claim 12 of the '648 patent depends from claim 8, the infringement, technical prong and invalidity analyses address the limitations of claims 8 and 12. *See* CIB at xxix.

evidence was discussed above in the context of the preamble of '501 patent claim 1. The evidence of record shows that this limitation is met.

b. Element [8A]: "a first set of light emitting diodes (LEDs), the first set comprising at least an LED configured to emit light at a first wavelength and at least an LED configured to emit light at a second wavelength"

There is no dispute that each of the Accused Products contains four sets of LEDs, with each set containing three LEDs emitting light at different wavelengths. *See* CIB at 78. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

c. Element [8B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

There is no dispute that each of the Accused Products contains four sets of LEDs, with each set containing three LEDs emitting light at different wavelengths. *See* CIB at 78. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1 and the "second set of LEDs" limitation of '502 patent claim 28. The evidence of record shows that this limitation is met.

d. Element [8C]: "four photodiodes"

There is no dispute that each of the Accused Products contains four photodiodes. *See* CIB at 78. The relevant evidence was discussed above in the context of the "photodiodes" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

e. Element [8D]: "a protrusion comprising a convex surface, at least a portion of the protrusion comprising an opaque material"

There is no dispute that each of the Accused Products contains a protrusion comprising a convex surface, which includes a portion with opaque material. *See* CIB at 78. The relevant

evidence was discussed above in the context of the "protrusion" and "openings" limitations of '501 patent claim 1. The evidence of record shows that this limitation is met.

f. Element [8E]: "a plurality of openings provided through the protrusion and the convex surface, the openings aligned with the photodiodes"

With respect to the "plurality of openings" limitation of '648 patent claim 8, Complainants identify the same "openings" that are discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 77. There is no dispute that these openings are aligned with the four photodiodes. *See id.* Apple disputes infringement of this limitation based on its erroneous proposed construction of the term "openings." *See* RIB at 34-39; RRB at 29-34. These arguments have been rejected, however, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1 and in the claim construction analysis above. *See* Part IV.D.2, *supra*. Accordingly, the undersigned finds that the Accused Products meet the limitation in '648 patent claim 8 requiring a "a plurality of openings provided through the protrusion and the convex surface, the openings aligned with the photodiodes."

g. Element [8F]: "a separate optically transparent window extending across each of the openings"

There is no dispute that each of the Accused Products contains optically transparent windows extending across each of the identified openings. *See* CIB at 78. The evidence for the presence of transparent windows in these openings was discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

h. Element [8G]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and output measurements of a physiological parameter of a user"

There is no dispute that each of the Accused Products contains processors that receive signals from the photodiodes and output measurements of oxygen saturation. *See* CIB at 79. The relevant evidence was discussed above in the context of the "processors" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

i. Element [8H]: "a housing"

There is no dispute that the Accused Products have a housing. *See* CIB at 79. Dr. Madisetti identified a photograph of the housing for the Accused Products. Tr. (Madisetti) at 697:17-24 (citing CX-1548C at 3). The evidence of record shows that this limitation is met.

j. Element [8I]: "a strap configured to position the housing proximate tissue of the user when the device is worn"

There is no dispute that the Accused Products have a strap. *See* CIB at 80. The relevant evidence was discussed above in the context of the "strap" limitation of '502 patent claim 28. The evidence of record shows that this limitation is met.

k. Element [12]: "the physiological parameter comprises oxygen or oxygen saturation"

There is no dispute that the Accused Products meet the limitations of '648 patent claim 12, which depends from claim 8 and requires that "the physiological parameter comprises oxygen or oxygen saturation." *See* CIB at 80. The relevant evidence was discussed above in the context of the preamble and the "physiological parameter" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

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Accordingly, because each of the limitations of claims 8 and 12 are satisfied, the undersigned finds that the Accused Products infringe claim 12 of the '648 patent.

5. '648 Patent Claim 24[11]

a. Element [20 preamble]: "A user-worn device configured to non-invasively determine measurements of a user's tissue, the user-worn device comprising:"

There is no dispute that the Accused Products meet the limitations of the preamble of '648 patent claim 20, which requires "[a] user-worn device configured to non-invasively determine measurements of a user's tissue." *See* CIB at 81. The relevant evidence was discussed above in the context of the preamble of '501 patent claim 1. The evidence of record shows that this limitation is met.

b. Element [20A]: "a plurality of light emitting diodes (LEDs)"

There is no dispute that each of the Accused Products has LEDs. *See* CIB at 82. The relevant evidence was discussed above in the context of the "LEDs" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

c. Element [20B]: "at least four photodiodes configured to receive light emitted by the LEDs, the four photodiodes being arranged to capture light at different quadrants of tissue of a user"

There is no dispute that each of the Accused Products contains four photodiodes arranged in quadrants. *See* CIB at 82. The relevant evidence was discussed above in the context of the "photodiodes" limitation of '501 patent claim 1 and the "photodiodes" limitation of '502 patent claim 28. The evidence of record shows that this limitation is met.

d. Element [20C]: "a protrusion comprising a convex surface"

There is no dispute that each of the Accused Products contains a protrusion comprising a convex surface. *See* CIB at 80-81. The relevant evidence was discussed above in the context of

[11] Because claim 24 of the '648 patent depends from claim 20, the infringement, technical prong and invalidity analyses address the limitations of claims 20 and 24. *See* CIB at xxix.

the "protrusion" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

e. Element [20D]: "a plurality of through holes, each through hole including a window and arranged over a different one of the at least four photodiodes"

With respect to the '648 patent claim 20 limitation requiring "a plurality of through holes," Complainants identify the holes in the protrusion that are discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 81. Apple disputes infringement of this limitation based on its erroneous proposed constructions of the claim terms "over" and "through holes." *See* RIB at 26-39; RRB at 21-34. These arguments have been rejected, however, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1 and in the claim construction analysis above. *See* Part IV.D, *supra*. Accordingly, the undersigned finds that the Accused Products meet the limitation in '648 patent claim 20 requiring a "a plurality of through holes, each through hole including a window and arranged over a different one of the at least four photodiodes."

f. Element [20E]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and determine measurements of oxygen saturation of the user"

There is no dispute that each of the Accused Products contains processors that receive signals from the photodiodes and output measurements of oxygen saturation. *See* CIB at 82. The relevant evidence was discussed above in the context of the "processors" limitation of '501 patent claim 1. The evidence of record shows that this limitation is met.

g. Element [24]: "wherein the protrusion comprises opaque material configured to substantially prevent light piping"

Claim 24 of the '648 patent depends from claim 20, further requiring that "the protrusion comprises opaque material configured to substantially prevent light piping." There is no dispute

that the identified protrusion in the Accused Products has a coating and ink that is configured to prevent light piping, as discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1. *See* CIB at 82. The evidence of record shows that this limitation is met.

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Accordingly, because each of the limitations of claims 20 and 24 are satisfied, the undersigned finds that the Accused Products infringe claim 24 of the '648 patent.

6. '648 Patent Claim 30

Claim 30 of the '648 patent depends from claim 20, further requiring that "the protrusion further comprises one or more chamfered edges." There is no dispute that the identified protrusion in the Accused Products has chamfered edges. *See* CIB at 82-83. Dr. Madisetti identified chamfered edges on engineering drawings for the Accused Products. Tr. (Madisetti) at 699:4-19; CX-0063C (Apple Watch Series 7 Engineering Drawings) at 2; *see also* CX-1548C (Apple Watch Series 7 Photographs) at 3; CX-0070C (Apple Watch Series 7 Engineering Drawings) at 1. The evidence of record shows that this limitation is met.

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Accordingly, because each of the limitations of claims 20 and 30 are satisfied, the undersigned finds that the Accused Products infringe claim 30 of the '648 patent.

F. Domestic Industry—Technical prong

The domestic industry products that Complainants rely on for the Poeze patents are the RevA sensor (CPX-0052C), the RevD sensor (CPX-0058C), the RevE sensors (CPX-0019C, CPX-0020C, CPX-0065C), and the Masimo W1 (CPX-0146C). CIB at 26-35. Complainants allege that the RevA, RevD, RevE, and Masimo W1 devices practice claim 12 of the '501 patent and claims 12, 24, and 30 of the '648 patent; and that the RevD, RevE, and Masimo W1 devices

practice claim 28 of the '502 patent. CIB at 85-117. For the reasons discussed below, the evidence shows, by a preponderance, that Complainants have satisfied the technical prong with respect to certain claims of the Poeze patents.

1. Consideration of Post-Complaint Evidence

As an initial matter, the parties dispute whether evidence of post-complaint activities can be considered in the context of the domestic industry requirement. *See* RIB at 18-21; RRB at 17-18, 154; CRB at 11-13.

Apple argues that the only evidence that should be considered with respect to the alleged domestic industry is evidence of activities that pre-date the filing of the complaint, citing Commission precedent requiring that satisfaction of the domestic industry requirement be assessed at the time of the complaint. RIB at 18-21. Apple relies on *Certain Thermoplastic-Encapsulated Electric Motors, Components Thereof, and Products and Vehicles Containing the Same* ("*Thermoplastic-Encapsulated Electric Motors*"), where the Commission stated that "[o]rdinarily, the relevant date at which to determine if the domestic industry requirement of section 337 is satisfied is the filing date of the complaint." Inv. No. 337-TA-1073, Comm'n Op. at 6-7, EDIS Doc. ID 684974 (Aug. 12, 2019). Apple argues that the date of the complaint is the relevant timeframe for evaluating the domestic industry, and that the Commission has held that it "will consider post-complaint evidence regarding domestic industry only in very specific circumstances, *i.e.*, 'when a significant and unusual development has occurred after the complaint has been filed.'" *Certain Collapsible Sockets for Mobile Electronic Devices and Components Thereof*, Inv. No. 337-TA-1056, Comm'n Op. at 15 n.10, EDIS Doc. ID 649819 (July 9, 2018) (quoting *Certain Television Sets, Television Receivers, Television Tuners, and*

Components Thereof, Inv. No. 337-TA-910, Comm'n Op. at 72, EDIS Doc. ID 568157 (Oct. 30, 2015)).

With respect to the technical prong, Complainants contend that post-complaint evidence can be considered in this investigation because the Masimo W1 (a post-complaint product) has been shown to practice claims of the asserted patents, in contrast to the post-complaint products in *Thermoplastic-Encapsulated Electric Motors*. CRB at 12. With respect to the economic prong, Complainants also distinguish the facts in *Thermoplastic-Encapsulated Electric Motors* because [redacted]. *Id.* Complainants further argue that Masimo has made certain investments that represent significant and unusual developments, including investments in [redacted], [redacted] and the acquisition of Sound United. *See* Tr. (Scruggs) at 433:13-15; Tr. (McGavock) at 543:16-544:14, 545:3-17; Tr. (Al-Ali) at 323:18-324:25; Tr. (Muhsin) at 344:14-345:1; CX-1637 (Masimo 2021 Earnings Presentation) at 19-20; Tr. (Young) at 482:14-25.

Consistent with Commission precedent, evidence regarding Complainants' post-complaint activities will not be considered with respect to the domestic industry in this investigation.

The Commission has held that, "as a general matter, the only activities that are relevant to the determination of whether a domestic industry exists or is in the process of being established are those that occurred before the complaint was filed." *Certain Video Game Systems and Controllers*, Inv. No. 337-TA-743, Comm'n Op., 2012 WL 13171643, at *3 (Jan. 20, 2012). However, "in appropriate situations, based on the specific facts and circumstances of an investigation, the Commission may consider activities and investments beyond the filing of the

complaint." *Id.*[12] The Commission has held that such "facts and circumstances" may be shown by "a significant and unusual development" such as circumstances pertaining to "bankruptcy, a change in patent ownership, manufacturing, or licensing activity." *Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, Inv. No. 337-TA-910, Comm'n Op., 2015 WL 6755093 (Oct. 30, 2015). Where there has been no showing of significant and unusual developments, the Commission has held that it would be error to "consider[] evidence as of the close of discovery, rather than as of the complaint filing date." *Certain Televisions, Remote Controls, and Components Thereof*, Inv. No. 337-TA-1263, Comm'n Op., 2022 WL 17486245, at *13 (Nov. 30, 2022) ("*Certain Televisions*").

Complainants have not made a showing of significant and unusual developments in the present investigation.[13] Complainants rely on developments with respect to the manufacturing of "Masimo Watch" products, CIB at 289-90, but to the extent that the Commission has considered post-complaint evidence due to unusual developments regarding manufacturing, this has been in circumstances involving the cessation of domestic manufacturing. *See, e.g., Certain Video Graphics Display Controllers, and Products Containing Same,* Inv. No. 337-TA-412, Initial Determination at 12-13, EDIS Doc. ID 172529 (May 17, 1999) (unreviewed in relevant part); *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376,

[12] The Federal Circuit has similarly affirmed the Commission's use of the complaint's filing date for assessing domestic industry under the facts and circumstances of the cases at issue. *See Bally/Midway Mfg. v. U.S. Int'l Trade Comm'n*, 714 F.2d 1117, 1120 (Fed Cir. 1983) (holding that, "under the circumstances of this case," the proper date for assessing the domestic "industry" was the filing date of the complaint, where a different position would undercut the purposes of Section 337); *Motiva, LLC v. Int'l Trade Comm'n*, 716 F.3d 596, 601 n.6 (Fed. Cir. 2013) (affirming Commission's use of the complaint's filing date as the relevant date for the domestic industry determination).

[13] Apple argues that Complainants have waived any contention regarding "significant and unusual developments" because this argument was not raised in Complainants' pre-hearing brief. *See* RRB at 154. Complainants did not waive this argument. *See* CPHB at 229-231.

Comm'n Op. 4, 10-13, EDIS Doc. ID 44138 (Aug. 21, 1997). Masimo's post-complaint progress towards the manufacture of "Masimo Watch" products appears to be consistent with Masimo's pre-complaint plans and projections for these products—there is nothing significant or unusual about these developments. *See* RIB at 19. Accordingly, post-complaint evidence regarding the alleged domestic industry will not be considered. *Cf. Certain Televisions*, 2022 WL 17486245, Comm'n Op. at *13 (holding that, in the context of considering whether the technical prong of the domestic industry had been shown, the ID erred to the extent post-complaint evidence was considered).[14]

Masimo's asserted pre-complaint domestic industry products are the RevA (CPX-0052C), RevD (CPX-0058C), and RevE prototypes (CPX-0019C, CPX-0020C, CPX-0065C). There is no dispute that the RevA and RevD sensors were made before the filing of the complaint—Mr. Scruggs explained that Masimo built the RevA sensor in November 2020, and the RevD sensor in April 2021. Tr. (Scruggs) at 396:2-13, 397:7-24. Masimo contends that two of the RevE prototypes were created pre-complaint. *See* CRB at 31-32.[15]

The undersigned will not consider any evidence regarding the Masimo W1 product, because this product made in December 2021, several months after the complaint was filed. *See* Tr. (Kiani) at 124:5-24; Tr. (Scruggs) at 398:24-399:400:2.

[14] The underlying Initial Determination reviewed by the Commission, like the investigation here, included a claim for a domestic industry in the process of being established. *See Certain Televisions, Remote Controls, and Components Thereof*, Inv. No. 337-TA-1263, Initial Determination, at 89-92, 144-145 (June 28, 2022) (EDIS Doc. ID 775506).

[15] Apple contends that the software installed on the RevD sensor has a most recent date of July 30, 2021, and that the software installed on the RevE sensors was not loaded until September and October 2021, with an earliest "known date" of July 9, 2021—after the filing of the complaint. *See* RIB at 42-43. This issue is discussed *infra* in the context of whether a domestic industry existed at the time of the complaint.

A limitation-by-limitation analysis for the RevA, RevD, and RevE devices is set forth below.

2. '501 Patent Claim 12

a. Element [1 preamble]: "A user-worn device configured to noninvasively measure a physiological parameter of a user, the user-worn device comprising:"

The preamble of '501 patent claim 1 requires "[a] user-worn device configured to non-invasively measure a physiological parameter of a user." Complainants submit that the RevA, RevD, and RevE devices meet this limitation because they are configured to measure the oxygen saturation and pulse rate of a user. CIB at 86-87; *see also* CIB at 30-35. Complainants rely on testimony from Mr. Scruggs and Mr. Muhsin describing the functionality of each of the Masimo devices. Tr. (Scruggs) at 407:22-408:4, 410:1-4, 405:8-406:11; Tr. (Muhsin) at 346:6-15. Dr. Madisetti observed a demonstration of the RevA, RevD, and RevE by Mr. Scruggs and determined that these devices each calculate oxygen saturation. Tr. (Madisetti) at 715:20-716:21; CDX-0011C.054. Mr. Al-Ali described internal testing of the oxygen saturation measurements of Masimo's prototype sensors that was presented in October 2020. Tr. (Al-Ali) at 272:16-277:13; CX-0378C at 32. He described this presentation as relating to a sensor with a design consistent with the RevA device (CPX-0052C). *See* Tr. (Al-Ali) at 270:17-22 (referencing *id.* at 260:11-25:14 (discussing CX-0375C; CPX-0052C)). He also described testing of other prototype Masimo Watch devices in early 2021. Tr. (Al-Ali) at 265:15-268:21, 276:12-278:3; CX-0433C. Mr. Al-Ali further described testing of RevE devices in June 2021. Tr. (Al-Ali) at 316:2-317:20; CX-0494C. Masimo submits that the test results for the domestic industry products show a degree of accuracy that is consistent with FDA guidance. CIB at 85 (citing CX-0269).

Apple argues that Complainants have not met their burden to show that any of the domestic industry products measure oxygen saturation. RIB at 46-52. Apple submits that Complainants failed to identify the source code in the domestic industry products that calculates any physiological parameter. *Id.* at 47-48; *see* Tr. (Sarrafzadeh) at 1124:24-1125:11. Apple's experts testified that their observations of demonstrations of the domestic industry products were insufficient to determine whether oxygen saturation or pulse rate were being measured. Tr. (Warren) at 1254:8-1256:25; Tr. (Sarrafzadeh) at 1122:20-1126:20. They further testified that certain measurements of blood oxygen relied upon by Complainants were "inconsistent" with reference measurements from another Masimo device. Tr. (Sarrafzadeh) at 1126:7-20; Tr. (Warren) at 1256:2-25; RDX-0008.149C.

With respect to the RevA and RevD sensors, Apple disputes whether these are "user-worn" devices, because the devices were produced without a strap or any other means for being worn by a user. RIB at 45-46. Complainants submit that each of these sensors includes mechanisms for attaching a strap, and Mr. Scruggs testified that they each had straps "at one point in time." Tr. (Scruggs) at 405:8-406:3, 406:23-407:18; CIB at 89.

In consideration of this evidence, the undersigned finds that Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices measure blood oxygen saturation. The testimony of Masimo's witnesses is credible regarding the design and testing of these products with respect to measuring blood oxygen, and is supported by the results of the testing described in Masimo's documents. In particular, Mr. Al-Ali explicitly identified testing of blood oxygen functionality conducted in 2020 using prototype designs consistent with the RevA sensor, additional testing in the timeframe of the RevD devices in early 2021, and further testing of RevE devices in June 2021. Tr. (Al-Ali) at 260:11-25:14, 265:15-268:21, 270:17-22,

276:12-278:3, 315:16-316:18; CX-0375C; CX-0378C; CX-0433C; CX-0494C.[16] Dr. Madisetti observed a demonstration of the RevA, RevD, and RevE by Mr. Scruggs and determined that these devices each calculate oxygen saturation. Tr. (Madisetti) at 715:20-716:21; CDX-0011C.054.[17] Apple's experts also attended a demonstration of the RevA, RevD, and RevE by Mr. Scruggs, although their observations were inconclusive. Tr. (Warren) at 1254:4-1256:25; Tr. (Sarrafzadeh) at 1122:20-1126:20; RDX-0007C.154; RX-1470; *see* Tr. (Warren) at 1258:9-17 ("My opinion is that these DI articles do not implement the functionality in that's in the claims, because I was not able to establish that they were producing physiological parameters.").[18] The testimony of Mr. Ali-Ali regarding Masimo's internal testing, together with Dr. Madisetti's testimony, credibly indicate that Masimo's sensors are configured to make oxygen saturation measurements. *See* Tr. (Ali-Ali) at 272:16-275:12, 276:12-278:3, 318:15-22;

[16] This testing included a [redacted] that, Mr. Ali-Ali explained, provided measurements "well within acceptable numbers for a hospital product." *See* Tr. (Ali-Ali) at 274:11-275:3. Apple argues that this testing is not clearly linked to the specific domestic industry prototypes produced, CRB at 41-42, but the timing of these testing results matches with the development of the RevA, RevD, and RevE devices, and the fact that Masimo was able to test the blood oxygen functionality of multiple prototypes during this time is strong circumstantial evidence that the RevA, RevD, and RevE devices were capable of measuring blood oxygen, particularly given the evidence that these devices were not separate products, but part of an iterative design process. *See, e.g.*, Tr. (Scruggs) at 394:13-398:23. Moreover, as discussed *infra*, a domestic industry in the process of being established does not require the current existence of a physical article. Thus, this testing also strongly supports a finding that Masimo had, at the time of filing the complaint, taken necessary tangible steps to develop a product that will practice this limitation of the patent and a significant likelihood of success in doing so.

[17] Apple cites the fact that Dr. Madisetti was unable to identify the correct Masimo source code at hearing. *See* CRB at 33-34. This does not undercut the demonstrated evidence that Masimo tested its devices to measure blood oxygen saturation.

[18] Apple's experts identified differences in the oxygen saturation measurements of a commercially available pulse oximeter in comparison to the Masimo W1, but this post-complaint device is not being considered as part of the asserted domestic industry. *See* RDX-0008.149C. Moreover, the variation in the measurements appears to be consistent with FDA guidance regarding pulse oximetry—an FDA document identified by Complainants states: "For example, if an FDA-cleared pulse oximeter reads 90%, then the true oxygen saturation in the blood is generally between 86%-94%." CX-0269 (FDA Safety Communication) at 4.

CX-0378C at 32; CX-0494C; Tr. (Madisetti) at 715:20-716:20; CDX-0011C.054. The evidence of record is sufficient to show, by a preponderance, that the RevA, RevD, and RevE sensors measure blood oxygen.

With respect to the "user-worn" limitation, there is no dispute that the RevE sensors have straps that allow these devices to be worn. *See* Tr. (Scruggs) at 408:20-409:14; CPX-0019C; CPX-0020C; CPX-0065C. The RevA and RevD sensors produced in discovery do not have straps, but these devices have attachment mechanisms for a strap, and Mr. Scruggs testified that these devices had straps "at one point in time." Tr. (Scruggs) at 405:8-406:3, 406:23-407:18, 460:13-17. Moreover, as discussed above, Mr. Al-Ali described testing relating to the Masimo's RevA and RevD sensors in the fall of 2020 and early 2021. Tr. (Al-Ali) at 260:11-25:14, 265:15-268:21, 270:17-22, 276:12-278:3. His description of this testing suggests that the devices were "user-worn." *See Id.* at 278:5-13 (describing placement of devices on user's wrist).[19] The evidence is sufficient to show, by a preponderance, that the RevA, RevD, and RevE sensors meet the "user-worn" limitation.

Accordingly, a preponderance of the evidence of record shows that the RevA, RevD, and RevE sensors meet the limitations of the preamble of '501 patent claim 1.

b. Element [1A]: "at least three light emitting diodes (LEDs)"

There is no dispute that the RevA, RevD, and RevE devices each contain a sensor module with at least three LEDs. *See* CIB at 89-91; RIB at 45-54. Dr. Madisetti identified two clusters of LEDs in each of these devices, with each cluster containing four or five LEDs. Tr. (Madisetti) at 711:14-712:4, 712:20-713:15; CDX-0011C.09 (citing CX-1111C (RevA CAD); CX-1124C

[19] The testing data for the sensor consistent with the RevA device includes "Motion Analysis," including "Walking/Running." CX-0378C at 27.

(RevD CAD); CX-1125C (RevE CAD); *see* CPX-0052C (RevA); CPX-0058C (Rev D); CPX-0019C, CPX-0020C, CPX-0065C (RevE). The evidence of record shows that this limitation is met by the RevA, RevD, and RevE devices.

c. Element [1B]: "at least three photodiodes arranged on an interior surface of the user-worn device and configured to receive light attenuated by tissue of the user"

Dr. Madisetti identified at least three photodiodes on an interior surface in each of the RevA, RevD, and RevE devices. Tr. (Madisetti) at 712:5-19. He relied on photographs and schematics of the devices to identify the photodiodes. *Id.*; CDX-0011C.050 (for RevA citing CPX-0052C; CX-0661C (photo)); CX-0473C (schematic) at 1, 3; CX-1111C (CAD) at 3, 5, 6; for RevD citing CPX-0058C; CX-0389C (schematic) at 1, 3; CX-1124C (CAD) at 3-4, 8; for RevE citing CPX-0019C, CPX-0020C, CPX-0065C; CX-0653C, CX-0655C, CX-0676C (photos); CX-0390C (schematic) at 1, 3; CX-1125C (CAD) at 2, 6, 7); *see generally* CIB at 91-92.

Apple argues that the evidence produced by Complainants is insufficient to show that these devices each have at least three photodiodes, because these elements are not visible from the outside of the devices and the schematics and technical drawings are allegedly unreliable. RIB at 52-54. Mr. Scruggs admitted that there were certain discrepancies between Masimo's CAD files and the actual RevA, RevD, and RevE sensors, recognizing that the devices represented "what we were able to manufacture at the time." RX-1209C (Scruggs Dep. Tr.) at 91:18-92:24; *see also* Tr. (Scruggs) at 465:2-467:18 (confirming "there are some differences" between the CAD files and the prototype products). Dr. Warren was unable to confirm whether the devices had photodiodes through a visual inspection. Tr. (Warren) at 1259:12-23.

In consideration of the parties' arguments, the undersigned finds that Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices each have at least three photodiodes meeting this claim limitation. Although there are some discrepancies between the physical prototypes and Masimo's schematics and technical drawings, there is no evidence that the layout of the photodiodes is inaccurate. Mr. Scruggs testified that "the essential meat and potatoes stuff, like the sensor, it's very accurately reflected" by the CAD drawings, because "that's very important for the devices." Tr. (Scruggs) at 467:2-7, 477:9-478:8; *see also* Tr. (Al-Ali) at 313:144-314:7 (confirming the accuracy of the CAD drawings for the RevE sensors).

Accordingly, the evidence shows, by a preponderance, that each of the RevA, RevD, and RevE devices meet the "at least three photodiodes" limitation of '501 patent claim 1.

d. Element [1C]: "a protrusion arranged over the interior surface, the protrusion comprising a convex surface"

There is no dispute that the RevA, RevD, and RevE devices each contain a convex protrusion. *See* CIB at 92-93. Dr. Madisetti identified convex protrusions in each of these devices, relying on photographs and the physical devices. Tr. (Madisetti) at 713:16-714:7; CDX-0011C.051 (citing CX-0813C (RevA); CX-0815C (RevD); CX-0812C (RevE); *see* CPX-0052C (RevA); CPX-0058C (Rev D); CPX-0019C, CPX-0020C, CPX-0065C (RevE). The evidence of record shows that this limitation is met by the RevA, RevD, and RevE devices.

e. Element [1D]: "a plurality of openings extending through the protrusion and positioned over the three photodiodes"

In the convex protrusion of the RevA, RevD, and RevE devices, Dr. Madisetti identified openings with transparent windows, relying on technical drawings and the physical devices. Tr. (Madisetti) at 714:8-24; CDX-0011C.052 (citing CX-1111C (RevA); CX-1124C (RevD); CX-

1125C (RevE)); *see* CPX-0052C (RevA); CPX-0058C (Rev D); CPX-0019C, CPX-0020C, CPX-0065C (RevE); CIB at 93-95. Apple argues that these features are not "openings," referencing its non-infringement arguments for this limitation. RRB at 43. This argument is inconsistent with the claim construction for "openings" adopted above, and accordingly, the evidence shows that the RevA, RevD, and RevE devices meet the plurality of openings" limitation of '501 patent claim 1.

f. Element [1E]: "the openings each comprising an opaque lateral surface, the plurality of openings configured to allow light to reach the photodiodes, the opaque lateral surface configured to avoid light piping through the protrusion"

Mr. Scruggs described a "light barrier" present in the RevA, RevD, and RevE devices that is a "black feature that surrounds the emitters so it separates the LEDs from the photodiodes." Tr. (Scruggs) at 400:3-24; CDX-005C.002. He explained that the light barrier was configured "so that light would travel only into the skin and . . . to minimize light traveling within the sensor." *Id.* Dr. Madisetti identified these features in technical drawings for the RevA, RevD, and RevE devices and testified that these were opaque lateral surfaces configured to allow light to reach the photodiodes and to avoid light piping through the protrusion. Tr. (Madisetti) at 714:25-19; CDX-0011C.053 (citing CX-1111C (RevA); CX-1124C (RevD); CX-1125C (RevE)).

Apple argues that the evidence produced by Complainants is insufficient to show that these devices have the claimed opaque lateral surfaces, because these features are not visible from the outside of the devices, and the schematics and technical drawings are allegedly unreliable. RIB at 52-54; RRB at 43-44. For the same reasons discussed above in the context of the "at least three photodiodes" limitation, Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices each have opaque lateral surfaces meeting this

claim limitation. The undersigned finds Mr. Scruggs's testimony regarding these features to be credible and Masimo's CAD drawings to be reliable with respect to these features.

Accordingly, the evidence shows by a preponderance that each of the RevA, RevD, and RevE devices meet the "opaque lateral surface" limitation of '501 patent claim 1.

g. Element [1F]: "one or more processors configured to receive one or more signals from the photodiodes and calculate a measurement of the physiological parameter of the user"

Dr. Madisetti identifies processors in the RevA, RevD, and RevE devices that receive signals from photodiodes and calculate oxygen saturation. Tr. (Madisetti) at 715:20-716:21. Dr. Madisetti relies on documentation for each of these products. *Id.*; CDX-0011C.054 (for RevA: CX-0701C at 2, CPX-012C, and CX-0836C at 4; for RevD: CX-0710C at 2-3, CX-1062C at 48, and CX-1074C; for RevE: CX-0705C at 2-3, CX-1062C at 30, 35). Mr. Scruggs described the measurement of oxygen saturation and pulse rate in each iteration of the Masimo Watch. Tr. (Scruggs) at 393:17-394:3. He described the sensor board of the RevA device including two processors on the sensor board responsible for calculating the pulse oximetry measurement. *Id.* at 406:4-11. He also identified two processors on the sensor board of the RevD device. *Id.* at 408:11-19.

As discussed above in the context of the preamble, Apple argues that Complainants have not met their burden to show that any of the domestic industry products measure oxygen saturation. RIB at 46-52. For the reasons discussed above, however, the undersigned finds that Complainants have met their burden to show, by a preponderance, that the RevA, RevD, and RevE devices calculate oxygen saturation. The record evidence further shows, by a preponderance, that the RevA, RevD, and RevE each contain processors for receiving signals from the photodiodes and calculating oxygen saturation.

Accordingly, the evidence shows that each of the RevA, RevD, and RevE devices meet the "one or more processors" limitation of '501 patent claim 1.

h. Element [12]: "wherein the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape"

Claim 12 of the '501 patent depends from claim 1, further requiring that "the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape." There is no dispute that this limitation is practiced by the RevA, RevD, and RevE devices. *See* CIB at 102. As discussed above, Dr. Madisetti identified a convex protrusion in these products, and his analysis confirms that the protrusion is designed to contact a user's wrist and conform the skin into a concave shape. *See* Tr. (Madisetti) at 716:24-717:13; CDX-0011C.055 (citing CX-0813C (RevA); CX-0815C (RevD); CX-0812C (RevE)).

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Accordingly, because each limitation of claims 1 and 12 are satisfied by a preponderance of the evidence, the undersigned finds that the RevA, RevD, and RevE devices practice claim 12 of the '501 patent.

3. '502 Patent Claim 28

a. Element [28 preamble]: "A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user worn device comprising:"

The preamble of '502 patent claim 28 requires "[a] user-worn device configured to non-invasively measure an oxygen saturation of a user." The parties' disputes with respect to this preamble are the same as those addressed above in the context of the preamble of '501 patent claim 1. *See* CIB at 102; RIB at 54. As discussed above in the context of the preamble of '501

patent claim 1, Complainants have shown by a preponderance of the evidence that the RevD and RevE devices are user-worn devices that measure blood oxygen saturation, meeting the limitations of the preamble of '502 patent claim 28.[20]

b. Element [28A]: "a first set of light emitting diodes (LEDs), the first set of LEDs comprising at least an LED configured to emit light at a first wavelength and an LED configured to emit light at a second wavelength"

There is no dispute that the RevD and RevE devices contain LEDs, as discussed above in the context of the "LEDs" limitation of '501 patent claim 1. *See* CIB at 103. Dr. Madisetti identified two clusters of LEDs in each of these devices, with each cluster containing four or five LEDs. Tr. (Madisetti) at 711:14-712:4, 712:20-713:15; CDX-0011C.09 (citing CX-1111C (RevA CAD); CX-1124C (RevD CAD); CX-1125C (RevE CAD); CX-1128C (Masimo W1 CAD); *see* CPX-0052C (RevA); CPX-0058C (Rev D); CPX-0019C, CPX-0020C, CPX-0065C (RevE)). Complainants rely on the testimony of Mr. Scruggs with respect to the wavelengths of light in these LEDs, identifying clusters of four LEDs in the RevD and RevE devices with wavelengths of [redacted] Tr. (Scruggs) at 406:23-407:18, 408:20-409:14. Apple argues that Dr. Madisetti did not identify any evidence of these wavelengths and that the arrangement of the LEDs could not be confirmed by a visual inspection, RIB at 55, but Mr. Scruggs's testimony and Masimo's schematics are sufficient to show, by a preponderance, that the RevD and RevE devices meet this limitation of '502 patent claim 28.

[20] Complainants do not assert that the RevA device practices claim 28 of the '502 patent. *See* CIB at 102-112.

c. Element [28B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising at least an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

As discussed above in the context of the "LEDs" limitation of '501 patent claim 1 and the "first set of LEDs" limitation of '502 patent claim 28, the evidence shows that the RevD and RevE devices each have two separate clusters of LEDs, and Mr. Scruggs described these clusters as having the same sets of wavelengths. *See* Tr. (Scruggs) at 406:23-407:18, 408:20-409:14, 410:5-24. Accordingly, the evidence shows, by a preponderance, that the RevD and RevE devices meet the "second set of LEDs" limitation of '502 patent claim 28.

d. Element [28C]: "four photodiodes arranged in a quadrant configuration on an interior surface of the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user"

With respect to the "four photodiodes" limitation of '502 patent claim 28, Complainants rely on the same evidence discussed above in the context of the "at least three photodiodes" limitation of '501 patent claim 1. *See* CIB at 103-04. Complainants identify a "quadrant configuration" in schematics of these products that were reviewed by Dr. Madisetti. *Id.* (citing CDX-0011C.050; CX-1111C; CX-1124C; CX-1125C; CX-1128C). Apple argues that Complainants' evidence with respect to this limitation is unreliable, *see* RIB at 54-55, but for the same reasons discussed above in the context of the "at least three photodiodes" limitation of '501 patent claim 1, the undersigned finds that Complainants have shown by a preponderance of the evidence that the RevD and RevE devices each have four photodiodes arranged in a quadrant configuration that meet this claim limitation.

e. Element [28D]: "a thermistor configured to provide a temperature signal"

Dr. Madisetti identified thermistors in the RevD and RevE devices, relying on schematics and technical drawings. Tr. (Madisetti) at 720:21-721:5; CDX-0011C.059 (for RevD citing CX-1124C (CAD) at 3, 8; CX-0536C (schematic) at 1, 3; CX-0710C (schematic) at 3, 7; for RevE citing CX-1125C (CAD) at 2, 7; CX-0705C (schematic) at 3, 7; CX-0390C (schematic) at 3). Mr. Scruggs identified two thermistors in the RevD and RevE devices. Tr. (Scruggs) at 406:23-407:18 (RevD), 408:20-409:14 (RevE); *see generally* CIB at 104-106.

Apple argues that the evidence produced by Complainants is insufficient to show that these devices have the claimed thermistors, because these features are not visible from the outside of the devices, and the schematics and technical drawings are allegedly unreliable. RIB at 54-55. For the same reasons discussed above in the context of the photodiode limitations of '501 patent claim 1, the undersigned finds Mr. Scruggs's testimony regarding these features to be credible and Masimo's CAD drawings to be reliable with respect to these features.

Accordingly, the undersigned finds that each of the RevD and RevE devices meet the "thermistor" limitation of '502 patent claim 28.

f. Element [28E]: "a protrusion arranged above the interior surface, the protrusion comprising: a convex surface"

There is no dispute that each of the RevD and RevE devices contain a protrusion comprising a convex surface that is arranged above the interior surface, as discussed above in the context of the "protrusion" limitation of '501 patent claim 1. *See* CIB at 106. The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

g. Element [28F]: "a plurality of openings in the convex surface, extending through the protrusion, and aligned with the four photodiodes, each opening defined by an opaque surface configured to reduce light piping"

There is no dispute that each of the RevD and RevE devices have a "plurality of openings" extending through the protrusion and aligned with the photodiodes, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1, and these openings are defined by opaque surfaces, as discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1. *See* CIB at 106. The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

h. Element [28G]: "a plurality of transmissive windows, each of the transmissive windows extending across a different one of the openings"

There is no dispute that each of the RevD and RevE devices have a "plurality of transmissive windows," as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 106-07. The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

i. Element [28H]: "at least one opaque wall extending between the interior surface and the protrusion, wherein at least the interior surface, the opaque wall and the protrusion form cavities, wherein the photodiodes are arranged on the interior surface within the cavities"

There is no dispute that each of the RevD and RevE devices contain an opaque wall between the interior surface and the protrusion, as discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1. *See* CIB at 107-08. Dr. Madisetti further identifies cavities formed by the opaque wall and the protrusion, relying on schematics and technical drawings. Tr. (Madisetti) at 721:6-25; CDX-0011C.060 (for RevD citing CX-1124C (CAD); CX-0666C (schematic); for RevE citing CX-1125C (CAD); CX-1038C (schematic)).

The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

j. Element [28I]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and calculate an oxygen saturation measurement of the user, the one or more processors further configured to receive the temperature signal"

There is no dispute that each of the RevD and RevE devices contain processors that receive signals from the photodiodes, as discussed above in the context of the "processors" limitation of '501 patent claim 1. *See* CIB at 108. Apple disputes whether these processors calculate oxygen saturation, RIB at 54, but as discussed above in the context of the preamble of the '501 patent claim 1, a preponderance of the evidence shows that the RevD and RevE devices measure and calculate oxygen saturation. Moreover, there is no dispute that the processors receive a temperature signal, as discussed above in the context of the "thermistor" limitation. *See id.* at 104-108. The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

k. Element [28J]: "a network interface configured to wirelessly communicate the oxygen saturation measurement to at least one of a mobile phone or an electronic network"

There is no dispute that the RevD and RevE devices contain network interfaces that can communicate with a mobile device via Bluetooth. *See* CIB at 108-110. Dr. Madisetti identified evidence that these devices have a network interface. Tr. (Madisetti) at 722:1-24; CDX-0011C.061 (citing CX-0709C (RevD and RevE sensor board schematic); CX-0836C (RevE demonstration photographs) at 9, 12, 13). Mr. Scruggs described the wireless communication capability of the RevD and RevE devices. Tr. (Scruggs) at 406:23-407:18, 408:20-409:14. The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

l. Element [28K]: "a user interface comprising a touch-screen display, wherein the user interface is configured to display indicia responsive to the oxygen saturation measurement of the user"

There is no dispute that the RevD and RevE devices have a touch-screen display that shows oxygen saturation measurements. *See* CIB at 111. Dr. Madisetti identified evidence that these devices have touch-screen displays that can show an SpO2 measurement. Tr. (Madisetti) at 722:1-24; CDX-0011C.061 (citing CPX-058C (RevD device); CX-1062C (photographs); CPX-019C, CPX-020C, CPX-065C (RevE devices); CX-1068C, CX-1069C, CX-1072C (RevE device videos)). The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

m. Element [28L]: "a storage device configured to at least temporarily store at least the measurement"

There is no dispute that the RevD and RevE devices store the blood oxygen measurement in memory. *See* CIB at 111. Dr. Madisetti identified evidence that these devices have memory to store the SpO2 measurement. Tr. (Madisetti) at 722:1-24; CDX-001C.061 (citing CX-0709C (RevD and RevE sensor board schematic)). The evidence shows, by a preponderance, that this limitation is met by the RevD and RevE devices.

n. Element [28M]: "a strap configured to position the user-worn device on the user"

There is no dispute that the RevE have straps for a user's wrist. *See* CIB at 112; CPX-019C, CPX-020C, CPX-065C. With respect to the RevD device, Complainants identify a mechanism for attaching a strap and rely on Mr. Scruggs's testimony that it had a strap "at some point." *See* Tr. (Scruggs) at 406:23-407:18. As discussed above in the context of the preamble of '501 patent claim 1, the undersigned finds that a preponderance of the evidence shows that the RevD device also had a strap.

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Accordingly, because each limitation of the claim is satisfied, the undersigned finds that the RevD and RevE products practice claim 28 of the '502 patent.

4. '648 Patent Claim 12

a. Element [8 preamble]: "A user-worn device configured to non-invasively determine measurements of a physiological parameter of a user, the user-worn device comprising:"

The preamble of '648 patent claim 8 requires "[a] user-worn device configured to non-invasively determine measurements of a physiological parameter of a user." The parties' disputes with respect to this preamble are the same as those addressed above in the context of the preamble of '501 patent claim 1. *See* CIB at 112; RIB at 55-56. As discussed above in the context of the preamble of '501 patent claim 1, the undersigned finds that Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices are user-worn devices that measure blood oxygen saturation, meeting the limitations of the preamble of '502 patent claim 28.

b. Element [8A]: "a first set of light emitting diodes (LEDs), the first set comprising at least an LED configured to emit light at a first wavelength and at least an LED configured to emit light at a second wavelength"

There is no dispute that the RevA, RevD, and RevE devices each contain LEDs, as discussed above in the context of the "LEDs" limitation of '501 patent claim 1. *See* CIB at 112-13. Apple disputes whether the LEDs meet each of these limitations, *see* RIB at 56, but as discussed in the context of the "first set of LEDs" limitation of '502 patent claim 28, the evidence shows that the LEDs are arranged in clusters in the RevD and RevE devices and have a first and second wavelength. In addition, the evidence shows that the LEDs in the RevA device

have wavelengths that are the same as the RevD and RevE devices, as discussed by Mr. Scruggs. *See* Tr. (Scruggs) at 405:8-406:3.

c. Element [8B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

There is no dispute that the RevA, RevD, and RevE devices each contain clusters of LEDs, as discussed above in the context of the "LEDs" limitation of '501 patent claim 1. *See* CIB at 112-13. Moreover, the undersigned finds that there is a second set of LEDs in the RevD and RevE devices meeting his limitation, as discussed in the context of the "second set of LEDs" limitation of '502 patent claim 28. *See* CIB at 113. In addition, the evidence shows that there is a second set of LEDs in the RevA device with the same wavelengths as the first set, as discussed by Mr. Scruggs. *See* Tr. (Scruggs) at 405:8-406:3.

d. Element [8C]: "four photodiodes"

Complainants identify four photodiodes in each of the RevA, RevD, and RevE devices, citing the same evidence discussed above in the context of the "photodiodes" limitation of '501 patent claim 1. *See* CIB at 113. Apple disputes whether the evidence is sufficient to show the presence of these photodiodes, *see* RIB at 56, but the evidence shows, by a preponderance, that the RevA, RevD, and RevE devices each contain four photodiodes, for the reasons discussed above in the context of the "photodiodes" limitation of '501 patent claim 1.

e. Element [8D]: "a protrusion comprising a convex surface, at least a portion of the protrusion comprising an opaque material"

There is no dispute that the RevA, RevD, and RevE devices each contain a protrusion comprising a convex surface, which includes a portion with opaque material, as discussed above in the context of the "protrusion" and "openings" limitations of '501 patent claim 1. *See* CIB at

113. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

f. Element [8E]: "a plurality of openings provided through the protrusion and the convex surface, the openings aligned with the photodiodes"

Complainants identify a "plurality of openings" in the RevA, RevD, and RevE devices, citing the same evidence discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 113. Apple disputes this limitation based on its erroneous construction for the term "openings." *See* RRB at 46. As discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1, the evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

g. Element [8F]: "a separate optically transparent window extending across each of the openings"

There is no dispute that the RevA, RevD, and RevE devices each contain optically transparent windows extending across each of the identified openings, as discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 113-14. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

h. Element [8G]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and output measurements of a physiological parameter of a user"

There is no dispute that the RevA, RevD, and RevE devices each contain processors that receive signals from the photodiodes, as discussed above in the context of the "processors" limitation of '501 patent claim 1. *See* CIB at 114. Apple disputes whether these processors calculate oxygen saturation, RIB at 56, but as discussed above in the context of the preamble of the '501 patent claim 1, a preponderance of the evidence shows that the RevA, RevD, and RevE

devices measure and calculate oxygen saturation. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

i. Element [8H]: "a housing"

There is no dispute that the RevA, RevD, and RevE devices each have a housing. *See* CIB at 114-15. Dr. Madisetti identified photographs of the housing for the RevA, RevD, and RevE devices. Tr. (Madisetti) at 725:19-726:1; CDX-0011C.066 (citing CX-0661C; CX-1058C; CX-1415C; CX-0784C); *see also* CPX-052C; CPX-058C; CPX-019C; CPX-020C; CPX-065C. Mr. Scruggs also testified that the RevA, RevD, and RevE devices each have a housing. Tr. (Scruggs) at 405:8-06:3, 406:23-407:18, 408:20-409:14. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

j. Element [8I]: "a strap configured to position the housing proximate tissue of the user when the device is worn"

There is no dispute that the RevE devices have straps for a user's wrist. *See* CIB at 115; CPX-019C, CPX-020C, CPX-065C. In addition, as discussed above in the context of the preamble of '501 patent claim 1, the undersigned finds that the record evidence is sufficient to find that the RevA and RevD devices had straps.

k. Element [12]: "the physiological parameter comprises oxygen or oxygen saturation"

Claim 12 of the '648 patent depends from claim 8 and requires that "the physiological parameter comprises oxygen or oxygen saturation." There is no dispute with respect to this limitation, except to the extent that Apple disputes the satisfaction of the preamble limitation regarding the measurement of a physiological parameter. *See* CIB at 115; RIB at 56. The undersigned finds that the RevA, RevD, and RevE devices are configured to determine

measurements of blood oxygen for the same reasons discussed above in the context of the preamble and the "physiological parameter" limitation of '501 patent claim 1.

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Accordingly, because each limitation of the claim is satisfied, the undersigned finds that the RevA, RevD, and RevE devices practice claim 12 of the '648 patent.

5. '648 Patent Claim 24

a. Element [20 preamble]: "A user-worn device configured to non-invasively determine measurements of a user's tissue, the user-worn device comprising:"

The preamble of '648 patent claim 20 requires "[a] user-worn device configured to non-invasively determine measurements of a user's tissue." The parties' disputes with respect to this preamble are the same as those addressed above in the context of the preamble of '501 patent claim 1. *See* CIB at 115; RIB at 55-56. As discussed above in the context of the preamble of '501 patent claim 1, Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices are user-worn devices that measure blood oxygen saturation, meeting the limitations of the preamble of '648 patent claim 20.

b. Element [20A]: "a plurality of light emitting diodes (LEDs)"

There is no dispute that the RevA, RevD, and RevE devices each contain LEDs, as discussed above in the context of the "LEDs" limitation of '501 patent claim 1. *See* CIB at 115.

c. Element [20B]: "at least four photodiodes configured to receive light emitted by the LEDs, the four photodiodes being arranged to capture light at different quadrants of tissue of a user"

With respect to the "four photodiodes" limitation of '648 patent claim 20, Complainants rely on the same evidence discussed above in the context of the "four photodiodes" limitation of '502 patent claim 28 for the RevD and RevE devices. *See* CIB at 115-16. Complainants further

submit that the RevA has four photodiodes arranged in a quadrant configuration, citing a photograph and technical drawings. *See* CX-0661C (photo); CX-0473C (schematic) at 1, 3; CX-1111C (CAD). Apple argues that Complainants' evidence with respect to this limitation is unreliable, *see* CIB at 56, but for the same reasons discussed above in the context of the "at least three photodiodes" limitation of '501 patent claim 1, Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices each have four photodiodes arranged in a quadrant configuration that meet this claim limitation.

d. Element [20C]: "a protrusion comprising a convex surface"

There is no dispute that the RevA, RevD, and RevE devices each contain a protrusion comprising a convex surface, which includes a portion with opaque material, as discussed above in the context of the "protrusion" limitation of '501 patent claim 1. *See* CIB at 116. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

e. Element [20D]: "a plurality of through holes, each through hole including a window and arranged over a different one of the at least four photodiodes"

Complainants identify "through holes" in the RevA, RevD, and RevE devices, citing the same evidence discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1. *See* CIB at 116. Apple disputes this limitation based on its erroneous construction for the term "openings." *See* RRB at 46. As discussed above in the context of the "plurality of openings" limitation of '501 patent claim 1, the evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

f. Element [20E]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and determine measurements of oxygen saturation of the user"

There is no dispute that the RevA, RevD, and RevE devices each contain processors that receive signals from the photodiodes, as discussed above in the context of the "processors" limitation of '501 patent claim 1. *See* CIB at 116-17. Apple disputes whether these processors calculate oxygen saturation, RIB at 56, but as discussed above in the context of the preamble of the '501 patent claim 1, a preponderance of the evidence shows that the RevA, RevD, and RevE devices measure and calculate oxygen saturation. The evidence shows, by a preponderance, that this limitation is met by the RevA, RevD, and RevE devices.

g. Element [24]: "wherein the protrusion comprises opaque material configured to substantially prevent light piping"

Claim 24 of the '648 patent depends from claim 20, further requiring that "the protrusion comprises opaque material configured to substantially prevent light piping." There is no dispute that the identified protrusion in the RevA, RevD, and RevE devices meets this limitation, as discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1. *See* CIB at 117.

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Accordingly, because each of the limitations of claims 20 and 24 are satisfied, the undersigned finds that the RevA, RevD, and RevE devices practice claim 24 of the '648 patent.

6. '648 Patent Claim 30

Claim 30 of the '648 patent depends from claim 20, further requiring that "the protrusion further comprises one or more chamfered edges." There is no dispute that the identified protrusions in the RevA, RevD, and RevE devices have chamfered edges. *See* CIB at 117. Dr. Madisetti identified chamfered edges on engineering drawings for the RevA, RevD, and

RevE. Tr. (Madisetti) at 726:2-14; CDX-0011C.067 (citing CX-1111C (RevA); CX-1124C (RevD); CX-1125C (RevE)).

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Accordingly, because each of the limitations of claims 20 and 30 are satisfied, the undersigned finds that the RevA, RevD, and RevE devices practice claim 30 of the '648 patent.

7. Domestic Industry Existing at the Time of the Complaint

Apple argues that no patent-practicing domestic industry article existed at the time of the complaint. RIB at 42-45; RRB at 12-14. Complainants dispute Apple's contentions. CRB at 30-32. As discussed above, Complainants have shown by a preponderance of the evidence that the RevA, RevD, and RevE devices practice claim 12 of the '501 patent and claims 12, 24, and 30 of the '648 patent, and that the RevD and RevE devices also practice claim 28 of the '502 patent.

With respect to a domestic industry that is alleged to exist at the time of the complaint, the Commission has held that a domestic industry article must exist at that time. *See Thermoplastic-Encapsulated Electric Motors*, Comm'n Op. at 9, EDIS Doc. ID 684974 ("Both Federal Circuit law and Commission precedent require the existence of actual 'articles protected by the patent' in order to find that a domestic industry exists.") (citing *Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d 1354 (Fed. Cir. 2013) ("[a] company seeking section 337 protection must . . . provide evidence that . . . relates to an actual article that practices the patent")); *id.* at 10 (finding that no domestic industry "exists" relating to the articles protected by the patent where evidence failed to show "the presence of an article protected by the patent at the time of the complaint").

In consideration of the parties' arguments, the undersigned finds that the RevA, RevD, and RevE devices have been shown to be articles protected by claims of the Poeze patents existing at the time of the complaint. As discussed *supra*, although the RevA and RevD devices were produced in discovery without a strap, a preponderance of the evidence shows that these devices were user-worn devices before the filing of the complaint. *See* Tr. (Scruggs) at 405:8-406:3, 406:23-407:18, 460:13-17; Tr. (Al-Ali) at 260:11-25:14, 265:15-268:21, 270:17-22, 276:12-278:3; CX-0378C at 27.

Apple further argues that the laptop Mr. Scruggs used to display the oxygen saturation measurement from the RevA sensor during discovery was not used with this sensor before the filing of the complaint, RIB at 43-44, but this laptop is not part of the domestic industry article protected by the identified claims of the Poeze patents (Complainants do not assert that the RevA practices claim 22 of the '502 patent, which requires a display). *See* CRB at 30-31. Mr. Scruggs's laptop was part of the demonstration showing that the RevA sensor was configured as required by the claims, *see* Tr. (Madisetti) at 757:16-23; CX-0836C (demonstration photos) at 4, but the laptop is not part of the domestic industry article—the RevA had the required configuration even in the absence of the laptop.[21]

With respect to the RevD sensor, Apple argues that software was loaded on this device on July 30, 2021, after the complaint was filed. RIB at 42-43; *see* Tr. (Scruggs) at 459:4-460:7; Tr. (Sarrafzadeh) at 1121:9-24; RX-1183C.0035-39. As discussed above, however, Mr. Al-Ali described testing of RevD sensors in early 2021—before the filing of the complaint. Tr. (Al-Ali)

[21] As described by Mr. Al-Ali, an October 2020 presentation describes internal testing of the oxygen saturation measurements of prototype sensors consistent with the RevA design. Tr. (Al-Ali) at 272:16-277:13; CX-0378C at 32.

at 276:17-278:13. A preponderance of the evidence thus shows that the RevD existed prior to the complaint.[22]

With respect to the RevE devices, Apple argues that the software installed on these devices has a "known date" of July 9, 2021, and this software was loaded on these devices in September and October 2021. *See* RIB at 42-43; Tr. (Scruggs) at 457:12-25, 458:1-459:2, 460:23-461:16; Tr. (Sarrafzadeh) at 1121:9-24; RX-1183C.0035-39. At the hearing, Mr. Scruggs could not specifically identify a date when the RevE devices were made, stating that they were "built between May and September 2021," a range of dates that includes the date the complaint was filed. Tr. (Scruggs) at 398:20-23; *see id.* at 458:1-459:3 (admitting that CPX-0020C was created in September 2021). The evidence shows that at least one of the RevE devices produced (CPX-0019C) existed at the time of the complaint—the evidence shows that software was loaded on this device on July 9, 2021,[23] which pre-dates the filing date of the amended complaint, July 12, 2021, as recognized in the Commission's Notice of Institution. 86 Fed. Reg. 46275.[24] Moreover, Mr. Al-Ali described testing of RevE devices (though not the

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[22] Apple's arguments focus on the physical devices produced in discovery, *e.g.*, CPX-0058C, which were loaded with specific software, but the circumstantial evidence regarding testing shows, by a preponderance of the evidence, that prototype devices with designs that are consistent with the asserted domestic industry products were operational before the filing of the complaint and subject to testing. *See* Tr. (Ali-Ali) at 272:16-275:12, 276:12-278:3, 318:15-22; CX-0378C at 32; CX-0494C; n.16 *supra*.

[23] Complainants acknowledge that these devices were altered after the filing of the complaint with "different firmware versions prior to and subsequent to that version for development," but have represented that the July 9 version of the software was restored in October 2021. *See* RX-1183C.0037-.0039; Tr. (Scruggs) at 457:9-21 (software was installed on physical 19 on July 9, 2021).

[24] The original complaint was filed on June 30, 2021, with a redacted public version of an amended complaint filed July 7, 2021, a full confidential version of the amended complaint filed on July 12, 2021, and a supplement to the complaint filed on July 19, 2021. *See* EDIS Doc. ID 745713, 746186, 746514, 747244. *See In re Samsung Electronics Co., Ltd.*, 2 F.4th 1371, 1376 (Fed. Cir. 2021) (amended complaints supersede the original complaint); *Nolen v. Lufkin Indus., Inc.*, 466 Fed. Appx. 895, 898 (Fed. Cir. 2012) ("Generally, an amended pleading supersedes the original for all purposes").

specific devices produced) in June 2021. Tr. (Al-Ali) at 316:2-317:20 (citing CX-0494C and explaining "that data was collected on June 29th). This record is sufficient to show, by a preponderance of the evidence, that RevE devices existed and practiced asserted claims of Poeze patents at the time the complaint was filed.

* * *

Accordingly, Complainants have shown that the technical prong of the domestic industry requirement is satisfied with respect to a domestic industry existing at the time of the complaint for the Poeze patents.

8. Domestic Industry in the Process of Being Established

Complainants have separately alleged that there is a domestic industry in the process of being established. CIB at 305-09; *see* Amended Complaint ¶ 86. In *Certain Stringed Musical Instruments & Components Thereof* ("*Stringed Instruments*"), the Commission held that a domestic industry is in the process of being established when (1) a complainant takes "the necessary tangible steps to establish such an industry in the United States," and (2) there is a "significant likelihood that the industry requirement will be satisfied in the future." Inv. No. 337-TA-586, Comm'n Op. at 14-17, EDIS Doc. ID 300615 (May 16, 2008). The Commission recently declined to adopt an ID's finding that a currently existing article must exist at the time of the complaint to show a domestic industry in the process of being established. *Certain Televisions, Remote Controls, and Components Thereof*, Comm'n Op., Inv. No. 337-TA-1263, 2022 WL 17486245, at *15 (Nov. 30, 2022) ("The Commission, however, does not adopt the ID's finding that a currently existing physical article must exist at the time of the complaint filing to show a domestic industry in the process of being established."). The Commission further found that a domestic industry in the process of being established had not been shown because

the record lacked sufficient evidence of a future physical article that would practice the patent. *See id.* (Roku failed to produce "sufficient evidence of how . . . [the] domestic industry device . . . ***will operate*** so as to allow the parties to probe in discovery, and the Commission to make a determination, as to whether Gazelle ***will practice*** the '875 patent") (emphasis added).[25] The Commission's discussion indicates that a physical article practicing the patent need not yet exist to prove a "process of being established claim."[26]

Following this guidance, the evidence of record shows, by a preponderance, that the technical prong of the domestic industry requirement is satisfied based on an industry in the process of being established. As discussed *supra*, the evidence shows that the RevA device practices claim 12 of the '501 patent and claims 12, 24, and 30 of the '648 patent. Similarly, the RevD and RevE devices meet all of the limitations of claim 12 of the '501 patent, claim 28 of the '502 patent, and claims 12, 24, and 30 of the '648 patent.

Even if certain of the Masimo Watch prototypes were missing limitations of the Poeze patents, *e.g.*, the "user-worn" limitation in the claim preambles, the evidence shows that at the

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[25] *See also id.* ("'Respondents have had no opportunity to evaluate . . . whether Roku's future promised product actually would practice the claims of the '875 patent'") (quoting ID with approval); *id.* (finding that Roku failed to meet its burden of showing "that there was a significant likelihood that the Gazelle Remote (or any other physical article) would practice one or more claims of the '875 patent in the future"); *id.* ("Evidence of a complainant's progress towards an article that will practice one or more claims of the asserted patent as of the complaint filing date is relevant to whether the complainant has taken the necessary tangible steps to establish an industry, and whether there is a significant likelihood that the domestic industry requirement will be satisfied in the future").

[26] At the time the parties filed their post-hearing briefs, the Commission had not yet addressed in this manner "the circumstances, if any, in which a complainant can demonstrate a domestic industry in the process of being established absent the existence of a protected article." *Thermoplastic-Encapsulated Motors*, Comm'n Op. at 11-12, 2019 WL 9596564, at *7 (EDIS Doc. ID 684974); *cf. Certain Mobile Devices with Multifunction Emulators*; Inv. No. 337-TA-1170, Initial Determination at 148-52, EDIS Doc. ID 738549 (Mar. 16, 2021) (finding satisfaction of the technical prong in the absence of a physical article based on complainants' "tangible and necessary steps to practice the claim" and a "significant likelihood that the practice will occur."), *reviewed and taking no position on this issue*, Comm'n Notice, EDIS 747056 (July 16, 2021).

time of the complaint, Masimo had taken necessary "tangible steps" in engineering and research and development towards a product that practiced claims of the Poeze patents. As described above, Masimo's design documents and testing results show that the Masimo Watch prototypes in development meet the limitations of the Poeze patents.[27] Mr. Scruggs described the development process for Masimo Watch prototypes as an iterative process. *See id.* at 393:12-20 ("we've designed, built, and tested many iterations of the Masimo Watch"), 402:2-12 (describing "the progression of the different sensor designs"); *see also* Tr. (Muhsin) at 342:25-343:7 (describing "many iterations of wrist sensors"), 345:2-7 (describing "[m]any iterations on the watch through the design phases"); Tr. (Al-Ali) at 275:13-276:11 (describing ongoing testing of sensor designs, and with each subsequent design, "[i]t gets a little bit better"). Thus, even if the evidence were insufficient to show that the RevA, RevD, and RevE devices existing at the time of the complaint practiced each of the limitations of the asserted claims, the evidence would be sufficient to show a domestic industry in the process of being established.

Accordingly, the undersigned finds that Complainants have satisfied the technical prong with respect to claim 12 of the '501 patent, claim 28 of the '502 patent, and claims 12, 24, and 30 of the '648 patent, for a domestic industry in the process of being established based on the RevA, RevD, and RevE devices.

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[27] Apple argues that its experts were not allowed certain access to the prototypes (*see* RIB at 48-49), but Complainants produced schematics, source code, and the data from Masimo's testing regarding these prototypes in discovery, and provided witnesses for deposition. *See* CRB at 29-30, 33-34. Many of Apple's complaints regarding domestic industry discovery were addressed in the context of Apple's motion for sanctions and Apple's motion to strike domestic industry contentions. *See* Order No. 31 (Apr. 8, 2022); Order No. 32 (May 5, 2022). The record shows that Apple was provided a reasonable opportunity to evaluate whether Masimo's development activities would result in a product practicing the asserted claims. *See Certain Televisions, Remote Controls, and Components Thereof*, Inv. No. 337-TA-1263, Comm'n Op., 2022 WL 17486245, at *15 (Nov. 30, 2022) (noting that respondents should be given an "opportunity to evaluate in fact or expert discovery whether [complainant]'s future promised product actually would practice the claims").

G. Invalidity – Anticipation/Obviousness

Apple alleges that the asserted claims of the Poeze patents are invalid as anticipated in view of U.S. Patent No. 7,620,212 (RX-0411), entitled "Electro-Optical Sensor," which issued from an application filed on August 12, 2003, identifying assignee Lumidigm, Inc. (RX-0411 is referenced herein as "Lumidigm"). RIB at 67-103. There is no dispute that Lumidigm is prior art to the Poeze patents.

Apple further alleges that the asserted claims of the Poeze patents are invalid as obvious in view of Lumidigm alone or in combination with U.S. Patent No. 5,766,131 (RX-0666, "Seiko '131"), which issued from an application filed on July 30, 1996; U.S. Patent No. 4,224,948 (RX-0670, "Cramer"), which issued from an application filed on November 24, 1987, the textbook *Design of Pulse Oximeters* by J.G. Webster (RX-0035, "Webster"), published in 1997; and/or U.S. Patent No. 9,001,047 (RX-0673, "Apple '047"), which issued from an application filed on January 4, 2008. RIB at 67-103. There is no dispute that these references are prior art to the Poeze patents.

The undersigned finds that Lumidigm does not anticipate any asserted claim of the Poeze patents at least because, as discussed below, it does not include the required "protrusion" with a "convex" surface as set forth in all asserted claims. Accordingly, the relevant analysis for all asserted claims is an obviousness assessment. For the reasons discussed below, the evidence shows, clearly and convincingly, that '501 patent claim 12 is invalid as obvious. Apple has not shown, clearly and convincingly, that any of the asserted claims of the '502 patent or the '648 patent is invalid as obvious.

1. '501 Patent Claim 12

a. Element [1 preamble]: "A user-worn device configured to noninvasively measure a physiological parameter of a user, the user-worn device comprising:"

Apple submits that Lumidigm discloses a "user-worn device configured to noninvasively measure a physiological parameter of a user" in Figure 8B, a "biometric reader" that "is built into the case of a wristwatch." RX-0411 at 11:60-12:2; *see* Tr. (Warren) at 1207:23-1208:13; RDX-8C.23.

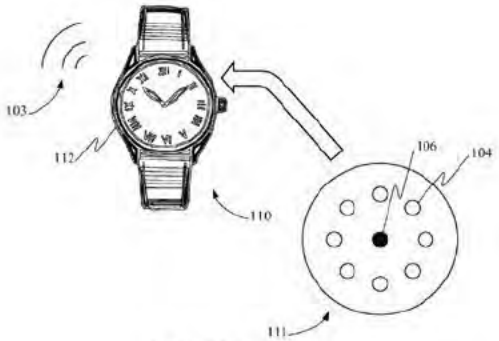


FIG. 8B

This device "operates based upon signals detected from the skin in the area of the wrist." RX-0411 at 11:60-63. Apple submits that Lumidigm discloses embodiments in which the sensor is incorporated into a user-worn wristwatch, and that in certain embodiments, Lumidigm's sensor uses those signals to "measure physiological parameters, based on the 'concentration of a substance in the individual's tissue,' including 'oxygenation and/or hemoglobin levels in the blood.'" RIB at 70 (citing RX-0411 at 19: 16-28, 11:61-64, Tr. (Warren) at 1208:1-13, 1214:12-1215:4); *see also* RIB at 68.

Complainants argue that Lumidigm fails to disclose non-invasively measuring a physiological parameter in the wristwatch embodiment of Figure 8B. CIB at 124-26. Complainants submit that the "biometric reader" of Lumidigm is used to identify a user based on "tissue spectral data" and not to measure a physiological parameter. *Id.* (citing RX-0411 at

10:42-59, 5:30-44, 11:15-28, 11:60-61); *see* Tr. (Madisetti) at 1340:17-25, 1341:8-12. Complainants argue that the "extended functionality" of Lumidigm is not disclosed in connection with the wristwatch embodiment. *See* Tr. (Madisetti) at 1330:6-8, 1330:20-1331:11, 1340:17-1341:14. Complainants describe these functionalities as part of a "brainstorming session," relying on the testimony of Robert Rowe, one of the named inventors of Lumidigm. *See* Tr. (Rowe) at 1146:18-1147:3.

In consideration of the parties' arguments, the undersigned finds that Lumidigm meets the limitations of the preamble of '501 patent claim 1 by disclosing a user-worn wristwatch embodiment with a biometric sensor configured to measure a physiological parameter. *See* RX-0411 at 3:35-47, 11:60-12:2, 19:18-28; Tr. (Warren) at 1208:1-12; RDX-8.20 (identifying, *inter alia*, incorporation of a "alcohol-monitor function" and a "bilirubin-monitor function"). Lumidigm describes the measurement of such parameters as a non-invasive "spectroscopic function." *Id.* at 3:45-47, 19:18-28. The undersigned agrees with Complainants that the primary focus of Lumidigm is a biometric sensor for identification, but Lumidigm clearly discloses additional "extended functionality" using "the spectral-analysis capabilities of the biometric sensor," including where "the spectral analysis is used to identify a physiological state of an individual." *Id.* at 18:26-28. Lumidigm provides that "identification of such a physiological state may be made by measuring the spectral variation of a measured spectrum for light scattered by the tissue of the individual, and comparing it with a reference spectral variation." *Id.* at 18:29-32. Lumidigm describes, *inter alia*, examples of a bilirubin monitor and a blood-alcohol monitor. *Id.* at 19:29-50.

These disclosures of physiological monitoring are in the "extended functionality" section of the Lumidigm specification, which are clearly applicable to the user-worn wristwatch

embodiment, with the specification stating that the extended functionalities are "especially suitable when the biometric sensor is comprised by a portable device, such as a portable electronic device." *Id.* at 17:67-18:2. The specification explicitly identifies "a watch" as an example of a "portable electronic device having extended functionality." *Id.* at 3:21-37. These extended functionalities, in combination with biometric functions, are also reflected in the claims of the Lumidigm patent, which claim a device "further configured to operate the biometric sensor to perform a nonbiometric function," and providing a limited set of nonbiometric functions including "an alcohol-monitor function, a bilirubin-monitor function," and "a hemoglobin-monitor function." *Id.* at 25:35-45 (claims 11 and 12).

Complainants cite evidence that the Lumidigm inventors never developed a device with the described extended functionalities, *see* CIB at 126-27, but "the invention in a prior art publication need not have actually been made or performed to satisfy enablement." *In re Antor Media Corp.*, 689 F.3d 1282, 1290 (Fed. Cir. 2012). Moreover, there is a "presumption . . . that both the claimed and unclaimed disclosures in a prior art patent are enabled." *Amgen Inc. v. Hoechst Marison Roussel, Inc.*, 314 F.3d 1313, 1355 (Fed. Cir. 2003).[28]

[28] While this statement in *Amgen* arose in the context of an anticipation analysis, it is relevant to obviousness as well. While a non-enabled prior art reference can be used in an obviousness analysis for what it teaches, "the evidence of record must still establish that a skilled artisan could have made the claimed invention." *Raytheon Techs. Corp. v. GE Co.*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) ("even though a non-enabling reference can play a role in an obviousness analysis, the evidence of record must still establish that a skilled artisan could have made the claimed invention"). The Federal Circuit has held that "[i]n the absence of . . . other supporting evidence to enable a skilled artisan to make the claimed invention, a standalone § 103 reference must enable the portions of its disclosure being relied upon . . . the same standard applied to anticipatory references." *Id.* at 1381. This holding indicates that the same presumption applied to asserted anticipation references can be applied to an embodiment disclosed in a prior art obviousness reference. *See also In re Kumar*, 418 F.3d 1361, 1368 (Fed. Cir. 2005) ("when a *prima facie* case of obviousness is deemed made . . . rebuttal may take the form of evidence that the prior art does not enable the claimed subject matter . . . [t]he applicant has the burden of coming forward with evidence in rebuttal").

Complainants identify evidence that measuring blood oxygen at the wrist would have been unlikely to be successful at the time of the Poeze patents, *see* CIB at 127-29, but claim 1 of the '501 patent is not limited to blood oxygen—the preamble limitations can be met by a device that measures any "physiological parameter." Lumidigm describes functionality for measuring several different physiological parameters, *e.g.*, hemoglobin levels, bilirubin, and blood alcohol, and Complainants have not offered any evidence to rebut the presumption that these functionalities are enabled by Lumidigm's disclosure.[29] Accordingly, the undersigned finds that Lumidigm clearly and convincingly discloses the preamble limitation of claim 1.

b. Element [1A]: "at least three light emitting diodes (LEDs)"

There is no dispute that Lumidigm discloses at least three LEDs. *See* CIB at 71-72. Lumidigm describes a "sensor assembly" that "comprises a plurality of light sources." RX-0411 at 6:22-24. Lumidigm explicitly states that these light sources "may comprise light emitting diodes ('LEDs')." *Id.* at 6:38-43. There are more than three light sources depicted in the wristwatch embodiment in Figure 8B, and Lumidigm provides that "FIG. 8B again shows the equidistant-sensor geometry of FIG. 4 for illustrative purposes only; more generally, any of the sensor geometries previously disclosed or other equivalent configurations can be used for this application." *Id.* at 11:65-12:2. One such alternative to the sensor geometry of Figure 4 is depicted in Figure 6, which shows 3 light sources:

[29] Complainants' arguments regarding blood oxygen are discussed *infra* in relation to the '502 and '648 patents. As set forth therein, the undersigned agrees with Complainants that there is no prior art enablement of a wristwatch that measures blood oxygen.

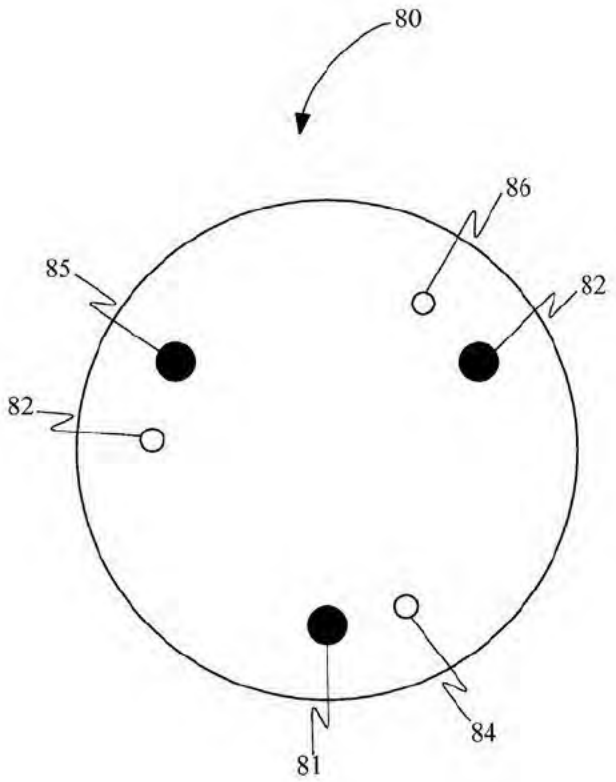


FIG. 6

Id. at Fig. 6, 9:12-25 (identifying "light sources 82, 84, 86"). Moreover, Lumidigm explicitly discloses that "any of the sensor geometries previously disclosed or other equivalent configurations can be used for" the wristwatch embodiment. *Id.* at 11:65-12:2. Given this explicit statement, the evidence indicates that Lumidigm discloses the wristwatch embodiment using the sensor geometry of Figure 6.

c. Element [1B]: "at least three photodiodes arranged on an interior surface of the user-worn device and configured to receive light attenuated by tissue of the user"

Apple contends that Lumidigm discloses "at least three photodiodes." RIB at 72-74; *see* Tr. (Warren) at 1208:25-1209:17. Apple cites to Figure 6 of Lumidigm, depicted above, which shows "three detectors 81, 83, 85." RX-0411 at 9:15-18. Lumidigm also discloses that "[t]he detector type and material is chosen to be appropriate to the source wavelengths and the

measurement signal and timing requirements," providing examples of "PbS, PbSe, InSb, InGaAs, . . . ," and for a "spectral range from about 350 nm to about 1100 nm, a suitable detector material is silicon." *Id.* at 6:56-63. Dr. Warren testified at the hearing that a detector made of indium gallium arsenide (InGaAs) or silicon would be a photodiode. Tr. (Warren) at 1209:14-17. This testimony is corroborated by references to silicon photodiodes in other prior art references. *See* RX-0035.0053 ("The photodetector is a silicon photodiode"); RX-1221 ("silicon NPN planar epitaxial phototransistors").

Apple further contends that the photodiodes disclosed in Lumidigm are "arranged on an interior surface," citing Figure 2, which depicts "the detector 36 recessed from the sensor surface 39 in optically opaque material 37 that makes up the body of the sensor head 32." RX-0411 at 8:1-4.

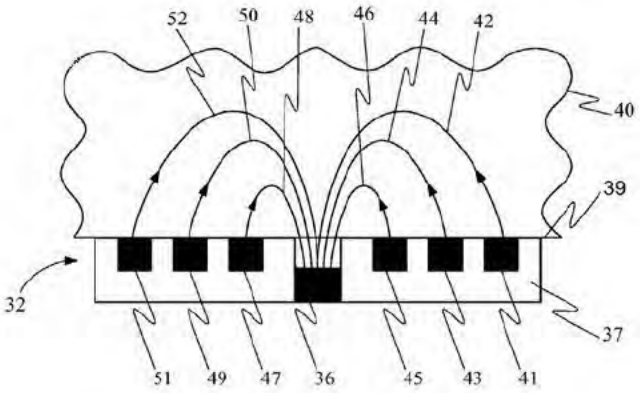


FIG. 2

Id. at Fig. 2; RIB at 73-74. Lumidigm describes this "optical geometry" as a "diffuse reflectance sampling geometry where the light sources and detector lie on the same side of the tissue." RX-0411 at 7:12-14. While one detector is depicted in Figure 2, Apple cites Lumidigm's disclosure that "[t]he detector 36 may comprise a single element, a plurality of discrete elements, or a one- or two-dimensional array of elements." *Id.* at 4:54-56.

Complainants argue that there is no explicit disclosure of photodiodes in Lumidigm and there is no disclosure of three photodiodes arranged on an interior surface in connection with the wristwatch embodiment. CIB at 130; CRB at 46.

In consideration of the parties' arguments, the undersigned finds that Lumidigm meets the "at least three photodiodes" limitation of '501 patent claim 1. Lumidigm clearly discloses silicon detectors, and Complainants fail to offer any rebuttal to Mr. Warren's testimony, corroborated by other prior art disclosures, that the silicon detectors are photodiodes. *See* Tr. (Warren) at 1209:14-17. Three photodiodes are explicitly disclosed in Figure 6 of Lumidigm. *See* RX-0411 at 9:15-25. As discussed above, Lumidigm contains an express disclosure that "any of the sensor geometries previously disclosed or other equivalent configurations can be used for" the wristwatch embodiment. *Id.* at 11:65-12:2.

Although there is no explicit depiction of three detectors arranged on an interior surface like the single detector in the cross-section of Figure 2, the Federal Circuit has held that "a reference can anticipate a claim even if it 'd[oes] not expressly spell out' all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would 'at once envisage' the claimed arrangement or combination." *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015). Relying on this precedent, the Federal Circuit upheld a finding of anticipation based on prior art that "explicitly contemplates the combination of the disclosed functionalities." *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1343 (Fed. Cir. 2016). Lumidigm's Figure 2 is a cross-sectional view of the arrangement of light sources and detector depicted in Figure 3, *id.* at 8:33-42, and the arrangement of three light sources and three detectors in Figure 6 is one specifically disclosed alternative to Figure 3. *See id.* at 9:12-25; Tr. (Warren) at 1211:15-20 (cross-section for Fig. 6 would be similar to Fig.

2).[30] As recognized by Dr. Warren, Lumidigm expressly discloses the use of these source-detector arrangements in the wristwatch embodiment. *See* Tr. (Warren) at 1214:12-1215:4; RX-0411 at 11:65-12:2.[31] Accordingly, the undersigned finds that Lumidigm's disclosures meet this limitation in the context of Lumidign's wristwatch embodiment.

d. Element [1C]: "a protrusion arranged over the interior surface, the protrusion comprising a convex surface"

Apple contends that Lumidigm discloses a protrusion meeting the limitations of '501 patent claim 1. RIB at 74-75. Apple points to sensor head 32 depicted in Figure 2 of Lumidigm, citing a statement in the specification that "[t]he sensor head 32 may also have a compound curvature on the optical surface to match the profile of a device in which it is mounted, to incorporate ergonomic features that allow for good optical and mechanical coupling with the tissue being measured, or for other technical or stylistic reasons." RX-0411 at 7:57-63. Apple relies on Dr. Warren's testimony that a person of ordinary skill in the art would read the disclosure of a "compound curvature" and "realize that a practical implementation of this would be a convex surface." Tr. (Warren) at 1211:2-8.

Complainants argue that Lumidigm's sensor head 32 is flat, and there is no explicit disclosure of a protrusion comprising a convex surface. RIB at 130-32. Dr. Madisetti testified that Lumidigm's description of curvature to match the profile of a wristwatch would likely result in a concave shape, citing the deposition testimony of Robert Rowe, one of the Lumidigm

[30] Figures 3, 4, and 6 all depict source-detector arrangements in a circular shape that appears the same as the back of the wristwatch depicted in Figure 8B. *See* RX-0411 at Fig. 3, Fig. 4, Fig. 6, Fig. 8B.

[31] In addition, the evidence shows that Figure 2 depicts sensor surface 39 above an "interior surface" where detector 36 is located. *See* RX-0411 at 8:1-4 ("FIG. 2 illustrates a sensor-head geometry wherein the detector 36 is recessed from the sensor surface 39 in optically opaque material 37 that makes up the body of the sensor head 32."); Tr. (Warren) at 1209:19-1210:11; RIB at 73-74.

inventors. Tr. (Madisetti) at 1331:12-1332:24 (citing CX-0279C (Rowe Dep. Tr.) at 69:8-21). Complainants further argue that the statement regarding Lumidigm's wristwatch embodiment describing different configurations of "sensor geometries" only refers to the arrangement of light sources and detectors—not to the shape of the surface of the sensor head. CIB at 132.

In consideration of the parties' arguments, the undersigned finds that the evidence fails to show, clearly and convincingly, that Lumidigm alone discloses the claimed "protrusion comprising a convex surface" limitation of '501 patent claim 1. As depicted in Figure 2 of Lumidigm, sensor surface 39 of sensor head 32 is flat. While the description of "compound curvature" in Lumidigm's specification allows for the possibility of a convex shape, this is insufficient to show that this limitation is inherent in Lumidigm. *See Guangdong Alison Hi-Tech Co. v. Int'l Trade Comm'n*, 936 F.3d 1353, 1364 (Fed. Cir. 2019) ("An element may be inherently disclosed only if it is necessarily present, not merely probably or possibly present, in the prior art." (internal quotations removed)). Apple has not shown, clearly and convincingly, that a convex protrusion is either explicitly or inherently disclosed in Lumidigm.

Apple further contends that modifying Lumidigm to include the claimed protrusion would be obvious because a protrusion with a convex surface was a "well-known idea" in the prior art. RIB at 104-107. Dr. Warren testified that "it was already well-known that a convex curvature itself could be a useful element in increasing signal quality." Tr. (Warren) at 1211:2-8. He further identified convex protrusions in prior art references Seiko 131 and Cramer. *Id.* at 1230:18-1233:14; RDX-8C.67. Seiko 131 provides that "[w]hen the outside surface of the light transmittance plate is a convex surface, pressure is applied to the light transmittance plate by simply holding the outside surface of the light transmittance plate lightly against the body

surface, and positive contact between the body surface and outside surface of the light transmittance plate can therefore be improved." RX-0666 at 3:22-28.

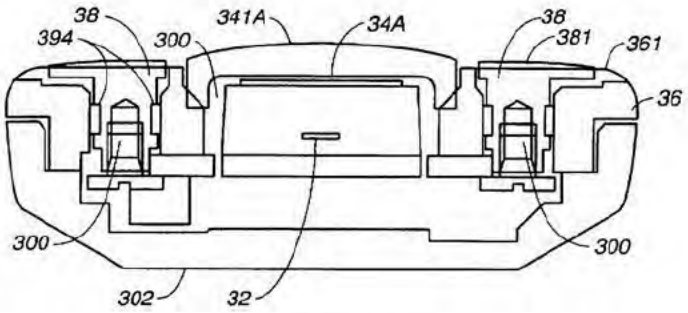
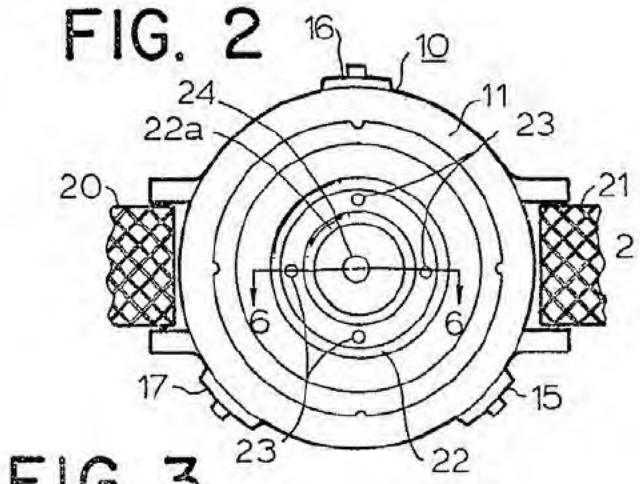
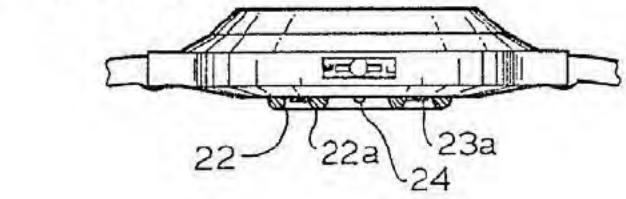


FIG._28

Id. at Fig. 28, 19:5-8 ("outside surface 341A of light transmittance plate 34A may also be convex as shown in FIG. 28."). Dr. Warren testified that "the purpose of this convex surface, as stated in Seiko, is to move residual blood out of the way and increase the quality of the measurement." Tr. (Warren) at 1231:4-8; RDX-8.67.

Cramer discloses raised portions identified as "boss 22" and "boss 22A," wherein "boss 22 serves to isolate the infra-red detector from ambient light" and "boss 22A prevents direct transmission of light between source 24 and detectors 23." RX-0670 at 5:45-51.





Id. at Fig. 2, Fig. 3. Cramer further states that "[t]he coaxial arrangement of these three elements provides a relatively large contact surface area resulting in not only effective sensing of a pulse rate but minimum discomfort to the wearer." *Id.* at 5:48-51. Cramer also states that "[t]he circular array of the detector 23 allows the detection of pulses in a substantial arteriolar-capillary bed within the hemispherical region denoted in Fig. 6 for increased signal to noise ratio and energy utilization." *Id.* at 5:51-56. Another prior art reference, U.S. Patent No. 4,880,304 (RX-0665, "Nippon"), describes an embodiment where "the portion of the sensor face containing the LEDs and the optical detector protrudes into the tissue slightly, thereby increasing the signal strength of the detected signal." RX-0665 at 5:12-17, Fig. 3b; Tr. (Warren) at 1245:8-16 (Nippon . . . conveys the idea that, if the detector protrudes slightly into tissue, not only can you get more repeatable coupling, but you can increase the sensitivity of the sensor").

Complainants argue that the claimed protrusion is not obvious in view of Lumidigm. CIB at 130-36. Dr. Madisetti testified that Lumidigm's description of curvature to match the

profile of a wristwatch would likely result in a concave shape, citing the deposition testimony of Robert Rowe, one of the Lumidigm inventors. Tr. (Madisetti) at 1331:12-1332:24 (citing CX-0279C (Rowe Dep. Tr.) at 69:8-21). Complainants argue that the reference to curvature on Lumidigm's "optical surface" is not the same as Lumidigm's "sensor surface 39." CIB at 131. Complainants further argue that the statement regarding Lumidigm's wristwatch embodiment describing different configurations of "sensor geometries" only refers to the arrangement of light sources and detectors—not to the shape of the surface of the sensor head. *Id.* at 132; *see* Tr. (Rowe) at 1152:7-21 (referring to the "sensor geometries previously disclosed as Figs. 3 through 7," without referencing Figure 2). Complainants argue that there is no motivation to modify Lumidigm to have a convex surface, because such a shape would not match the profile of a user's wrist and would add to the form factor of a wristwatch. RIB at 133-34; Tr. (Madisetti) at 1331:20-25. In addition, Dr. Madisetti identified a prior art reference expressing skepticism of pulse oximetry when there are "[v]ariations in contact pressure between the sensor and the skin," which would be caused by a convex protrusion. Tr. (Madisetti) at 1338:6-13; CDX-0012C.013 (citing CX-1733 at 2:47-57). Joe Kiani testified that Cercacor engineers had preferred concave surfaces for noninvasive sensors before conducting experiments showing that a convex protrusion produced a better signal. Tr. (Kiani) at 98:9-99:16.

With respect to Cramer, Complainants submit that the convex protrusions are annular rings that are not compatible with the other limitations of the Poeze patents (including Element 1[D] of the '501 patent), such as "openings" or "holes" through the protrusion. CIB at 144-46; CRB at 59. With respect to Seiko 131, Complainants submit that the identified convex protrusion is merely a single transparent window without "openings" or "holes" or "opaque lateral surfaces" (as required by Element [1E] of the '501 patent). CIB at 148-49 (identifying

"transparent window" in Seiko 131). Complainants further note that Seiko 131 describes a sensor worn on a user's finger, not on the wrist. CRB at 59. Complainants argue that Apple has failed to identify any reason or motivation to modify Lumidigm's wristwatch to incorporate a convex protrusion as disclosed in Cramer or Seiko 131. CIB at 133-34, 151-52; CRB at 60. Complainants further argue that Apple has failed to show that any such combination would have a reasonable expectation of success. CIB at 135, 152-53.

In reply, Apple argues that the "optical surface" described by Lumidigm is the same as the "sensor surface 39" depicted in Figure 2. RRB at 53. Apple further identifies Lumidigm's disclosure of an optical relay "between the sensor surface 39 and the skin 40," wherein "[t]he surface of the light relay can be contoured to fit specific product applications and ergonomic requirements." RX-0411 at 8:19-28. Apple disputes Complainants' interpretation of Mr. Rowe's testimony. RRB at 53-54. Apple further argues that Lumidigm expressly discloses the use of other "geometries" with its wristwatch embodiment. *Id.* Apple submits that there is no evidence that the prior art "taught away" from convex protrusions and cites prior art references recognizing the benefits of convex surfaces applying pressure to a user's skin. *Id.* at 55. Apple argues that both Cramer and Seiko 131 disclose convex protrusions and a person of ordinary skill would have been motivated to combine these structures with Lumidigm with a reasonable expectation of success. *Id.* at 60-62.

In consideration of the parties' arguments, the undersigned finds that Lumidigm's disclosure that the optical surface of its sensor head "may also have a compound curvature," together with prior art knowledge, would have provided one of ordinary skill in the art reason to implement the optical surface in a convex shape for the reasons that are explicitly disclosed in Lumidigm: "to match the profile of a device in which it is mounted, to incorporate ergonomic

features that allow for good optical and mechanical coupling with the tissue being measured, or for other technical or stylistic reasons." RX-0411 at 7:57-63. In particular, Dr. Warren offers credible testimony that one of ordinary skill in the art would have recognized the benefits of a convex surface at the time of the Poeze patents in terms of signal quality, which is consistent with the disclosures in several prior art references. *See* Tr. (Warren) at 1244:11-1246:3. Seiko 131 identifies a convex surface that improves "positive contact between the body surface and outside surface of the light transmittance plate." RX-0666 at 3:22-28, Fig. 28.[32] Prior art reference Nippon similarly describes increased signal strength from a protrusion into the tissue. *See* RX-0665 at 5:12-17, Fig. 3b; RIB 117, 146; Tr. (Warren) at 1245:8-16. These prior art disclosures show, clearly and convincingly, that one of ordinary skill in the art would have had "technical or stylistic reasons" for implementing a convex curvature for Lumidigm's sensor surface. *See* Tr. (Warren) at 1233:1-14; RX-0411 at 7:57-63.[33]

The evidence of "teaching away" offered by Complainants is not supported by the record evidence. Dr. Madisetti cites a prior art reference that raises concerns about "[v]ariations in contact pressure between the sensor and the skin," but this reference does not discuss convex surfaces. *See* CX-1733 at 2:47-57. Mr. Kiani's testimony that concave surfaces were preferred before the invention of the Poeze patents is not corroborated by any evidence from the relevant

[32] Lumidigm also discloses a "force sensing functionality . . . to ensure firm contact between the sensor and the skin," RX-0411 at 8:11-14, which addresses a stated goal of Seiko 131 to achieve "sufficient pressure against light transmittance plate 34A." RX-0666 at 19:8-13.

[33] The undersigned agrees with Apple that the "optical surface" and "sensor surface 39" refer to the same surface in the context of Lumidigm's Figure 2. *See* RRB at 53-54. In addition, Figure 2 depicts sensor surface 39 above an "interior surface" where detector 36 is located. *See* RX-0411 at 8:1-4 ("FIG. 2 illustrates a sensor-head geometry wherein the detector 36 is recessed from the sensor surface 39 in optically opaque material 37 that makes up the body of the sensor head 32.").

timeframe.[34] Even if a concave shape would be more likely to conform to the shape of a user's wrist, as argued by Complainants, this does not establish that one of ordinary skill in the art would have avoided a convex shape. As discussed above, several prior art references describe technical benefits associated with a convex protrusion for sensors on the skin.[35]

The undersigned also finds that one of ordinary skill in the art would have been able to implement a convex optical surface in Lumidigm's wristwatch with a reasonable expectation of success. *See* Tr. (Warren) at 1238:1-6. Lumidigm explicitly discloses that its sensor head could have a "compound curvature on the optical surface." *See* RX-0411 at 7:57-63.[36]

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[34] Complainants cite evidence from Apple's [redacted] several years after the priority date for the Poeze patents. This evidence is addressed *infra* in the context of objective indicia of non-obviousness.

[35] There is no evidence that the "form factor" of a convex protrusion would have been relevant to persons of ordinary skill in the art at the time of the Poeze patents—the only evidence that Complainants cite is Dr. Madisetti's conclusory testimony and a statement from Apple's prehearing brief related to the development of the Apple Watch, [redacted]. *See* CIB at 134; RRB at 55. In any case, this issue would not preclude a reason to modify Lumidigm in the manner described above. *See Allied Erecting and Dismantling Co., Inc., v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) ("a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine") (internal quotation omitted).

[36] It is unclear whether Apple argues for a specific physical combination of Lumidigm and Cramer, *e.g.*, by applying Cramer's structure of annular rings and photodiodes to the Lumidigm wristwatch. *See* RIB at 103-113. However, to the extent this combination is proposed, Apple does not explain how this combination would fit with the multiple LED/multiple photodiode arrangement relied upon for claim elements [1A] and [1B], particularly because Cramer's raised annular rings are designed to separate Cramer's single LED from Cramer's set of equidistant four photodiodes. *See* RX-0679 at 5:46-48 ("The boss 22A prevents direct transmission of light between source 24 and detectors 23."). In contrast, claim 1 requires at least three LEDs. Similar issues exist for the "protrusion" elements of the '502 and '648 patents, which also require multiple LEDs and photodiodes. *See* CIB at 143 (claim must be considered as a whole). Moreover, the evidence does not clearly and convincingly show that Cramer discloses a protrusion with openings or through holes within it over photodiodes (as required for Elements [1D], [19C], [28F], [8E], [20C-D]). *See* CIB at 144-146. Dr. Warren states that Cramer "describes what it calls a raised boss area, which is essentially a convex protrusion" that "consists of two concentric raised annular areas of opaque material." Tr. (Warren) at 1231:18-22. Dr. Madisetti similarly testified that the alleged protrusion is "just two rings." Tr. (Madisetti) at 1334:23-1335:2. The evidence does not clearly and convincingly show that the two raised rings of Cramer would be considered a single "protrusion."

Based on the above, the evidence shows clearly and convincingly that Lumidigm's disclosure of an optical surface that can have "compound curvature" would have provided a reason for one of ordinary skill in the art to modify the optical surface of Lumidigm's wristwatch embodiment to form a "protrusion comprising a convex surface," and this modification would have had a reasonable expectation of success.

e. Element [1D]: "a plurality of openings extending through the protrusion and positioned over the three photodiodes"

With respect to the "plurality of openings" limitation, Apple cites to Lumidigm Figure 2, which depicts "the detector 36 recessed from the sensor surface 39 in optically opaque material 37 that makes up the body of the sensor head 32." RX-0411 at 8:1-4. While one detector is depicted in Figure 2, Apple cites Lumidigm's disclosure that "[t]he detector 36 may comprise a single element, a plurality of discrete elements, or a one- or two-dimensional array of elements." *Id.* at 4:54-56. Apple submits that Lumidigm thus discloses openings positioned over one photodiode or multiple photodiodes. RIB at 75-76.

Apple further contends that the use of openings and holes for photodiodes was well known in the art and disclosed in Cramer and Seiko 131. RIB at 107-110. Dr. Warren testified that openings over photodiodes were well-known at the time of the Poeze patents, recognizing that "[a] detector can't detect light without some sort of opening above it." Tr. (Warren) at 1192:25-1193:6. He identified U.S. Patent No. 3,769,974 (RX-0473, "Smart") as a prior art reference with an example of an opening for a photodiode. *Id.* at 1193:7-18; RDX-8C.10; *see* RX-0473 at Fig. 1, 3:17-19 ("An annular inner wall 59 is formed of opaque epoxy and blocks the direct transmission of light from the diodes 16 to the phototransistor sensor 28."). In Seiko 131, Apple identifies an opening between the detector and the user's tissue. RIB at 108 (citing RX-0666 at Fig. 28). With respect to Cramer, Apple cites a datasheet for a detector identified in

Cramer—the CLT 2160 detector, which was described by Dr. Warren as a "can detector" that includes an opening between the photodiode and the surface of the detector. Tr. (Warren) at 1231:23-1232:9, 1234:3-8; *see* RX-0670 at 5:33-35 ("A suitable detector is the type CLT 2160 photo diode produced by Clairex Electronics, Inc."); RX-1221 (CLT 2160 datasheet).

Complainants dispute Lumidigm's disclosure of this limitation, arguing that there is no protrusion meeting the limitations of the claim and because three photodiodes are not explicitly disclosed in the configuration of Figure 2 or in connection with the wristwatch embodiment. CIB at 138.

With respect to Seiko 131, Complainants argue that there is only one photodiode and one opening, which does not extend through the light transmittance plate identified as the claimed convex surface. CIB at 148-49; CRB at 60-61. With respect to Cramer, Complainants argue that the openings over the photodiodes are between the "boss 22" and "boss 22A" that are identified as convex protrusions and thus do not extend through these protrusions. CIB at 145-46. Complainants further argue that the CLT 2160 datasheet is undated and was not authenticated by any witness. CRB at 63-64.

In consideration of the parties' arguments, the evidence clearly and convincingly shows that Lumidigm meets the "plurality of openings . . . positioned over the three photodiodes" limitation of '501 patent claim 1. As discussed above, the undersigned agrees with Complainants that there is no convex protrusion in Lumidigm, but Lumidigm discloses an opening extending through a protrusion that is positioned over a detector in Figure 2, and as discussed above in the context of the "at least three photodiodes" limitation, Lumidigm clearly shows that the placement of the detector in Figure 2 corresponds to the source-detector arrangement of Figure 3, and that the arrangement of three sources and three detectors in Figure

6 is a disclosed alternative to Figure 3 for use in the wristwatch embodiment. *See* RX-0411 at 7:5-9:25, 11:65-12:2, Fig. 2, Fig. 3, Fig. 4, Fig. 6, Fig. 8B. Under this arrangement, there is an opening positioned over each photodiode. *See* Tr. (Warren) at 1211:15-20 (cross-section in Fig. 6 would be similar to Fig. 2, with each photodiode recessed an opening over each photodiode). Dr. Warren's testimony and the disclosures in prior art references such as Smart also confirm that such openings over photodiodes were known in the art at the time of the Poeze patents. *See* Tr. (Warren) at 1192:25-1193:18; RX-0473 at 3:17-19, Fig. 1.

Further, as discussed in Part IV.E.1.d *supra*, a person of skill in the art would have reason to implement to modify the optical surface 39 of Lumidigm to form a "protrusion comprising a convex surface." This modified optical surface of the sensor head, like the optical surface of Lumidigm shown in Fig. 2, would extend over the photodiodes and the openings over them. *See* Tr. (Warren) at 1210:13-1211:14; *id.* at 1212:4-10 (sensor head would have same number of openings as photodiodes); RIB at 75. Accordingly, the evidence clearly and convincingly shows that this limitation of '501 patent claim 1 is met by Lumidigm's disclosures.

f. Element [1E]: "the openings each comprising an opaque lateral surface, the plurality of openings configured to allow light to reach the photodiodes, the opaque lateral surface configured to avoid light piping through the protrusion"

With respect to the "opaque lateral surface" limitation, Apple again cites to Lumidigm Figure 2, which depicts "the detector 36 recessed from the sensor surface 39 in optically opaque material 37 that makes up the body of the sensor head 32." RX-0411 at 8:1-4. Lumidigm further provides that "[t]he recessed placement of detector 36 minimizes the amount of light that can be detected after reflecting off the first (epidermal) surface of the tissue." *Id.* at 8:4-7. Lumidigm notes that "reflections from the top surface of tissue (known as 'specular' or 'shunted' light) are

detrimental to most optical measurements." *Id.* at 7:66-8:1. The effect of the recessed placement of the detector is described as an "optical blocking effect." *Id.* at 8:7-10.

Complainants argue that Lumidigm's disclosure of "optical blocking" is directed to light that is reflected off the surface of the tissue, which is distinct from "light piping." CIB at 139-40; *see* Tr. (Madisetti) at 1340:8-10. Complainants cite the specification of the Poeze patents, which describes "light piping (e.g., light that bypasses measurement site 102)." JX-001 at 22:48-50. At the hearing, Mr. Kiani described light piping as "light that goes from the LED directly to the photodetector, without going through the tissue." Tr. (Kiani) at 100:14-24.

The evidence clearly and convincingly shows that Lumidigm meets the "opaque lateral surface" limitation of '501 patent claim 1. There is no dispute that Lumidigm discloses an opaque lateral surface in the opening for a detector in Figure 2. Complainants argue that Lumidigm fails to explicitly recognize that this surface is "configured to avoid light piping," but Dr. Warren testified at the hearing that the "shunted" light described in Lumidigm "is what is called light piping in this matter." Tr. (Warren) at 1212:22-1213:3. The undersigned finds Dr. Warren's testimony on this issue to be credible and convincing, and Lumidigm's descriptions of reflections that are "specular" or "shunted" light are consistent with the meaning of "light piping" as that term is used in the context of the Poeze patents, because Lumidigm recognizes that this light bypasses the measurement site inside the user's tissue. *See* JX-0001 at 22:48-50; RX-0411 at 7:66-8:7. This is also consistent with Mr. Kiani's testimony regarding "light piping," because the "shunted" light described in Lumidigm goes from the emitters to the detector without passing through the tissue. Tr. (Kiani) at 100:14-24 (goal is to avoid light that has not gone "through the tissue"). Moreover, Lumidigm expressly discloses that the placement

of the detector creates an "optical blocking effect" that avoids "specular" or "shunted" light, *id.* at 7:66-8:10, and the evidence shows that this configuration would avoid light piping.

Apple also points to lateral surfaces in other prior art references, arguing that this limitation is obvious in combination with Seiko 131 or Cramer. Apple cites lateral surfaces around the photodiode disclosed in Seiko 131. RIB at 108 (citing RX-0666 at 10:30-36, Fig. 28). With respect to Cramer, Apple relies on the datasheet for the CLT 2160 detector, which was described by Dr. Warren as a "can detector" that "would be made from aluminum or stainless steel or some material that was impervious to light as a means to prevent light piping." Tr. (Warren) at 1231:23-1232:9, 1234:3-8; *see* RX-0670 at 5:33-35 ("A suitable detector is the type CLT 2160 photo diode produced by Clairex Electronics, Inc."); RX-1221 (CLT 2160 datasheet). Apple also cites Cramer's disclosure of "light blocking rings" that "isolate the photo detector from direct view from the light source and from view of the ambient light when the lower face is in contact with the wearer's body e.g. the wrist." RX-0670 at 2:46-51. One of these rings identified as "boss 22A prevents direct transmission of light between source 24 and detectors 23." *Id.* at 5:46-48. Apple further cites disclosures in Webster recognizing the problem of an "optical shunt," which is "when some of the light from the LEDs reaches the photodiode without passing through an arteriolar bed." RX-0035.0202. Webster recommends that "[o]ximeter probes should be manufactured of black opaque material that does not transmit light, or enclosed in an opaque plastic housing." *Id.*

Complainants argue that the alleged opaque lateral surfaces in Seiko 131 were not previously identified in Apple's prehearing brief or in any hearing testimony and are not supported by any teachings in Seiko 131. CRB at 63. With respect to Cramer, Complainants

argue that there is no explicit disclosure of opaque material and further argue that the CLT 2160 datasheet is unreliable. *Id.* at 63-64.

Because the claimed opaque lateral surfaces are set forth in Lumidigm, it is unnecessary to address whether they are disclosed by Lumidigm in combination with Seiko 131 or Cramer. However, the undersigned agrees with Complainants that Apple has failed to identify any opaque lateral surfaces in Seiko 131.[37] With respect to Cramer, the undersigned agrees with Apple that one of ordinary skill in the art would have recognized that the CLT 2160 detectors have opaque lateral surfaces. *See* Tr. (Warren) at 1234:3-8; RX-1221.[38] Webster's reference to an "optical shunt" is consistent with the description of light piping discussed above.

Accordingly, the undersigned finds that the "opaque lateral surface" limitation of '501 patent claim 1 is disclosed in Lumidigm in the context of Lumidigm's wristwatch embodiment.

g. Element [1F]: "one or more processors configured to receive one or more signals from the photodiodes and calculate a measurement of the physiological parameter of the user"

With respect to the "one or more processors" limitation, Apple cites to Lumidigm's disclosure that its "portable electronic device comprises an electronic arrangement for performing a standard function of the portable electronic device, a biometric sensor, and a processor," and "[t]he processor is configured to operate the electronic arrangement to perform the standard function and to operate the biometric sensor." RX-0411 at 3:21-31; RIB at 77-79. Lumidigm further discloses that after light signals are detected, "the signals can be digitized and

[37] Regardless of whether Apple's contentions are timely, Apple's shading of unlabeled structures in Figure 28 of Seiko 131 that are allegedly opaque lateral surfaces does not appear to be supported by the evidence of record. *See* RIB at 108.

[38] The undersigned finds the CLT 2160 datasheet to be reliable evidence. Complainants have not identified any timely-raised objection to the admission of RX-1221, and this exhibit appears to be reliable on its face.

recorded by standard techniques," and "[t]he recorded data can then be processed directly or converted." *Id.* at 9:58-62. A schematic for managing the functionality of the biometric sensor is illustrated in Figure 9, which depicts a "computer system" with "hardware elements that are electrically coupled via bus 342, which is also coupled with the biometric sensor 356." *Id.* at 12:56-66, Fig. 9. "The hardware elements include processor 332" and a "processing acceleration unit 346 such as a DSP or special-purpose processor." *Id.* at 12:66-13:14; *see* Tr. (Warren) at 1213:4-1214:1.

Complainants argue that Lumidigm fails to explicitly disclose that its processor calculates a measurement of a physiological parameter and does not explicitly describe a processor in the "wristwatch" embodiment. CRB at 49; *see* CIB at 124-29.

In consideration of the parties' arguments, the undersigned finds that Lumidigm meets the "one or more processors" limitation of '501 patent claim 1. Complainants' arguments were addressed above in the context of the preamble, and as discussed above, Lumidigm teaches that the "wristwatch" embodiment is one of the "portable devices" suitable for functionalities including the measurement of a physiological parameter. *See* RX-0411 at 3:35-47, 11:60-12:2, 19:18-28. With respect to the processing hardware depicted in Figure 9, Lumidigm explicitly notes that some of the components could be used in portable devices. *Id.* at 12:58-61. Moreover, a "processor" is explicitly claimed in Lumidigm as part of a "portable electronic device," where the processor "is further configured to operate the biometric sensor to perform a nonbiometric function," including a "spectrometer function," with examples provided of "an alcohol-monitor function, a bilirubin-monitor function," and "a hemoglobin-monitor function."

Id. at 25:32-45 (claims 10, 11, 12).[39] Dr. Warren testified that this limitation is met by Lumidigm with respect to calculating a measurement of a physiological parameter. *See* Tr. (Warren) at 1213:4-1214:1. Accordingly, Lumidigm clearly discloses a "processor" that receives signals from a sensor and calculates a measurement of a physiological parameter.

The undersigned further finds that, to the extent Lumidigm does not disclose such a processor, one of ordinary skill in the art would have had a reason to implement such calculations and a reasonable expectation of success in Lumidigm's "wristwatch" embodiment, because Lumidigm explicitly notes that its extended functionality is "especially suitable" for mobile devices. *See id.* at 17:67-18:2.

Accordingly, the undersigned finds that the "one or more processors" limitation of '501 patent claim 1 is met by Lumidigm.

h. Element [12]: "wherein the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape"

Claim 12 of the '501 patent depends from claim 1, further requiring that "the convex surface of the protrusion is an outermost surface configured to contact the tissue of the user and conform the tissue into a concave shape." As discussed above in the context of the "protrusion" limitation of '501 patent claim 1, the undersigned finds that a convex protrusion is neither explicitly nor inherently disclosed in Lumidigm but that one of ordinary skill in the art would have reason to modify Lumidigm's optical surface to form a convex protrusion.

Apple contends that this limitation is obvious in view of Lumidigm alone or in combination with Seiko 131 or Cramer, because a person of ordinary skill in the art would have

[39] As discussed above in the context of the preamble, there is a presumption that these functions are enabled, and Complainants have not provided evidence rebutting Lumidigm's enablement of measurements for physiological parameters other than blood oxygen.

understood that a convex protrusion would conform the user's tissue into a concave shape. RIB at 79, 106. Dr. Warren described the limitation in claim 12 as "an obvious statement," recognizing that "if you have a convex surface and you position it next to tissue, any pressure at all will conform the tissue into a concave shape." Tr. (Warren) at 1214:2-11. Complainants do not raise any arguments with respect to claim 12 that are significantly different from those addressed above in the context of claim 1. *See* CRB at 46-47, 71-73. Accordingly, in view of the unrebutted testimony of Dr. Warren, the undersigned finds that one of ordinary skill in the art would have known that a convex surface in contact with the tissue of the user would conform the tissue into a concave shape.

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As discussed above, Lumidigm explicitly discloses a user-worn wristwatch device configured to non-invasively measure physiological parameters of a user that meets the limitations of claim 1 requiring at least three LEDs, at least three photodiodes, a plurality of openings for each photodiode with opaque lateral surfaces, and a processor configured to calculate measurements of physiological parameters, and the evidence shows that one of ordinary skill in the art would have reason to modify the optical surface of the sensor head in Lumidigm's wristwatch to form the claimed protrusion comprising a convex surface based on Lumidigm's explicit suggestion of a sensor head with a "compound curvature" for "technical or stylistic reasons." RX-0411 at 7:57-63. For these and the other reasons discussed above, the evidence thus shows that a combination of elements disclosed in Lumidigm and known in the prior art would have yielded a wristwatch meeting each limitation of claims 1 and 12, and one of ordinary skill in the art would have had a reasonable expectation of success in making such a combination. Further, as discussed *infra*, secondary considerations of non-obviousness do not

weigh significantly against a finding that claim 12 of the '501 patent is obvious. Accordingly, the undersigned finds that claim 12 of the '501 patent is invalid as obvious.

2. '502 Patent Claim 22

As discussed below, the evidence fails to clearly and convincingly show that claim 22 of the '502 patent is rendered obvious by Lumidigm alone or in combination with other prior art.

a. Element [19 preamble]: "A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user worn device comprising:"

The preamble of '502 patent claim 19 requires "[a] user-worn device configured to non-invasively measure an oxygen saturation of a user." As discussed above in the context of the preamble of '501 patent claim 1, Lumidigm discloses a user-worn wristwatch embodiment with a biometric sensor configured to measure a physiological parameter. *See* RX-0411 at 3:35-47, 11:60-12:2, 19:18-28, claim 12. With respect to measuring oxygen saturation, Apple cites Lumidigm's teaching that "changes in blood flow cause spectroscopic changes that may be detected" with its biometric sensor, noting that "these spectroscopic changes are correlated with oxygenation and/or hemoglobin levels in the blood." RX-0411 at 19:22-26. Apple relies on Dr. Warren's opinion that one of ordinary skill in the art would have been able to implement pulse oximetry functionality in Lumidigm's wristwatch. Tr. (Warren) at 1216:10-25. Dr. Warren points to efforts by his students to measure blood oxygen at the wrist as early as 2002, *id.* at 1195:24-1196:10, and Apple cites prior art reflectance pulse oximeters that existed decades before the Poeze patents. *See* RX-0484.

Complainants argue that Lumidigm's disclosure is insufficient to teach a blood oxygen measurement in a wristwatch. CIB at 126-29; CRB at 44-46. Dr. Madisetti characterizes Lumidigm's description of an oxygen saturation measurement as "vague" and "aspirational." Tr.

(Madisetti) at 1330:20-1331:11. Complainants further argue that a person of ordinary skill would not have known how to implement the measurement of oxygen saturation or any other physiological parameter in Lumidigm's wristwatch embodiment and that Lumidigm provides no motivation for doing so. CIB at 128-29; Tr. (Madisetti) at 1340:20-1341:14. Complainants argue that implementing such functionalities in a wristwatch would not have a reasonable expectation of success, citing testimony from Apple engineers expressing skepticism that blood oxygen could be measured at the wrist. CIB at 129. Complainants cite evidence that Apple took [redacted]. *See* CRB at 86-87.

In reply, Apple argues that using Lumidigm's wristwatch to measure a physiological parameter such as blood oxygen would have been obvious to one of skill in the art. RRB at 51-52. Apple cites evidence that Dr. Warren experimented with measuring pulse oximetry on the wrist with his students at Kansas State University in 2002. Tr. (Warren) at 1195:24-1196:10, 1216:10-25; RX-0632 (2002 photograph); RX-0504 (2005 poster); RX-0508 (2005 article). Apple submits that the development timeline for implementing pulse oximetry in the Apple Watch is not relevant to the obviousness of the Poeze patents, because the [redacted]. RIB at 144-46; RRB at 68-69.

In consideration of the parties' arguments, the undersigned finds that the evidence of record fails to show that one of ordinary skill would have been enabled to measure oxygen saturation in the Lumidigm wristwatch. As discussed above in the context of the '501 patent, Lumidigm describes "extended functionality" including measurements of "oxygenation and/or hemoglobin levels in the blood," and states that such functionalities are "especially suitable when the biometric sensor is comprised by a portable device, such as a portable electronic device."

RX-0411 at 17:64-18:2, 19:18-28. The specification explicitly identifies "a watch" as an example of a "portable electronic device having extended functionality." *Id.* at 3:21-37. Lumidigm thus contemplates blood oxygen measurement in a wristwatch as one implementation of its "extended functionality," but the Federal Circuit has held that "when the prior art includes a method that appears, on its face, to be capable of producing the claimed composition," the patentee may rebut this evidence by presenting "sufficient reason or authority or evidence, on the facts of the case, to show that the prior art method would not produce or would not be expected to produce the claimed subject matter." *In re Kumar*, 418 F.3d 1361, 1368 (Fed. Cir. 2005); Part IV.G.1.a *supra* (discussing additional relevant authority).

In rebuttal to Lumidigm's blood oxygen disclosure, Complainants have presented persuasive evidence that persons of ordinary skill in the art would not have expected to successfully measure blood oxygen in a wristwatch at the time of the Poeze patents. *See* CIB at 126-29; CRB at 44-46. Mr. Rowe, the "primary inventor" of Lumidigm, *see* Tr. (Rowe) at 1146:18-1147:3, acknowledged that he never made a device that calculated blood oxygen at Lumidigm, Inc. CX-0297C (Rowe Dep. Tr.) at 118:4-119:8.[40] Complainants have also cited testimony from numerous Apple engineers describing the significant difficulty of performing pulse oximetry at the wrist. *See* Tr. (Mannheimer) at 1012:12-1013:6 (admitting that in 2014, he believed that pulse oximetry at the wrist would be a challenge, that he "did not know if it could be done," that "the wrist is just enormously different from the physiological perspective," and

[40] There is little to no technical description of the blood oxygen functionality in Lumidigm, let alone in the wristwatch embodiment specifically. *See* CIB at 126; RX-0411 at 19:24-28.

that the signal at the wrist is "enormously weak")[41]; *see also id.* at 998:21-999:6 (products he previously worked on "operated on a much more vascularized tissue bed, usually fingers or forehead . . . [t]he wrist is "just an incredibly different beast"); CX-0299C (Waydo Dep. Tr.) at 166:4-167:5 ("The wrist is one of the most difficult places on the body to do almost every physiological measurement"); CX-0295C (Shui Dep. Tr.) at 108:13-21 ("[redacted]. The watch is worn on the wrist, and the wrist is well known for its lack of signal."). The blood oxygen measurement described in Lumidigm is characterized as relying on "spectrographic changes that may be detected" by its biometric sensor, which are "correlated with oxygenation and/or hemoglobin levels." RX-0411 at 19:22-26. The testimony of Apple engineers shows the difficulty in calculating blood oxygen from such spectra if obtained at the wrist, [redacted]; Tr. (Land) at 983:2-12 [redacted]; *see* CIB at 169-171.

Apple counters this evidence with Dr. Warren's testimony describing pulse oximetry experiments at Kansas State University in 2002-05, RRB at 52-53, but there is little evidence that wrist-based blood oxygen levels were successfully measured in a watch-type environment. With

[41] Dr. Mannheimer had worked on pulse oximetry technology at Nellcor from 1987 to 2008, before joining Apple. *See* Tr. (Mannheimer) at 994:9-25, 1009:2-8. He was hired by Apple because of his "extensive experience" in pulse oximetry and biosensing in general. Tr. (Land) at 963:10-15.

respect to the work done with Professor Warren's undergraduate students cited by Respondents (*see* RRB at 52), Dr. Warren testified that his students "worked with [these sensors] on their wrists" (Tr. at 1216:23-25) and took measurements from various locations on the body, including wrists (Tr. at 1186:8-16, 1196:8-10, RDX-8.88). He provided no testimony regarding the results of those measurements. Apple also does not identify measurements of oxygen saturation at the wrist in the corroborating documents provided by Dr. Warren. *See* RIB at 64-67; RRB at 52-53; CRB at 45-46; RX-0504 (referencing wrist as a "viable" measuring site but only presenting data from finger and head); RX-0508.0007, .0012 (referencing "different body locations (*e.g.*, wrist, forehead or ear lobe) that have noticeably different vascular profiles" and presenting data from the thumb). Apple also argues that methods for pulse oximetry were well-known at the time of the Poeze patents, RRB at 51, but Apple's evidence for prior art blood oxygen measurements relies on measurements at other locations on the body—not at the wrist. *See, e.g.,* RX-0484 (describing measurement of blood oxygen at the finger).[42,43]

On the evidence of record, the presumption of enablement is overcome with respect to configuring Lumidigm's wristwatch to measure blood oxygen at the time of the Poeze patents.

[42] Apple argues that its engineers' testimony related solely to "adding that known functionality into the limited space of a small consumer device" (RRB at 47), but the testimony at issue indicates broader signal issues.

[43] Mr. Kiani testified at the hearing that he could have done a "conventional pulse oximeter" on the wrist "30 years ago" (Tr. (Kiani) at 114:20-22), but this testimony is less persuasive on this issue than the testimony of the Apple engineers, particularly given Mr. Kiani's testimony that many conventional pulse oximetry devices do not work. *See* Tr. (Kiani) at 102:20-21, 121:18-24. As discussed above, Apple documents [redacted]. CX-0177C at 13.

Accordingly, Apple has not shown that the preamble limitations of '502 patent claim 19 are met by Lumidigm.[44]

b. Element [19A]: "a plurality of emitters configured to emit light, each of the emitters comprising at least two light emitting diodes (LEDs)"

There is no dispute that Lumidigm discloses a plurality of emitters. *See* RIB at 80-82; CIB at 123. As discussed above in the context of the LEDs limitation of '501 patent claim 1, Lumidigm discloses "a plurality of light sources" that "may comprise light emitting diodes ('LEDs')," including "sets of LEDs." RX-0411 at 6:22-53. Lumidigm discloses several configurations with light sources arranged in sets of at least two:

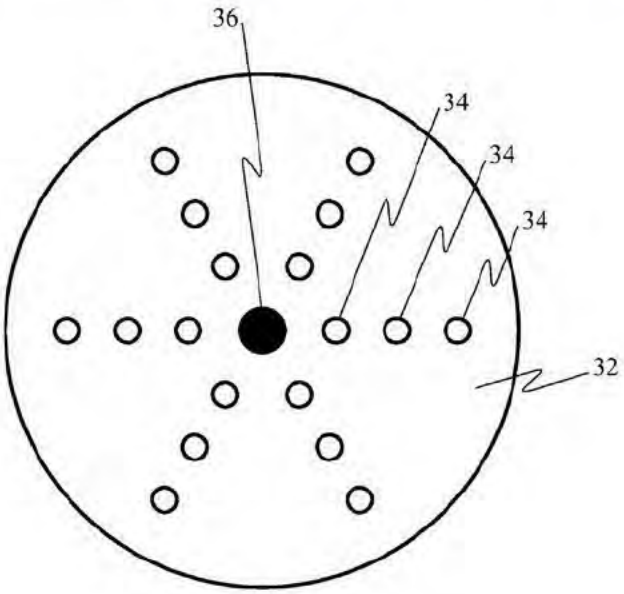


FIG. 3

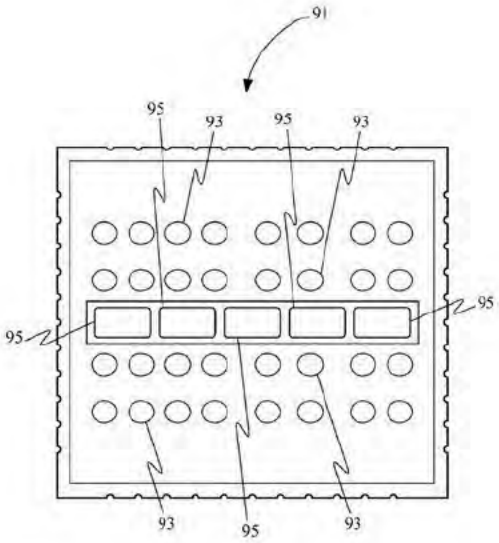


FIG. 7A

Id. at 8:33-42 (Fig. 3), 9:26-34 (Fig. 7A); *see also* RIB at 81 (identifying Figs. 3, 5, 7A, and 7B). Lumidigm explicitly discusses the benefits of pairs of light sources, noting that two light sources

[44] The evidence regarding the difficulty in achieving blood oxygen measurements at the wrist, as discussed above, also shows the lack of clear and convincing evidence of a reasonable expectation of success for the asserted obviousness arguments.

having the same wavelength "can be combined to increase the resulting signal-to-noise ratio of the measurement," while two light sources with different wavelengths can "provide unique and useful information about the tissue optical properties." *Id.* at 7:34-53.

c. Element [19B]: "four photodiodes arranged within the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user"

As discussed above in the context of the "photodiodes" limitation of '501 patent claim 1, the evidence shows that Lumidigm discloses silicon detectors that are photodiodes, and the sensor geometries disclosed in Lumidigm's specification can be used in the "wristwatch" embodiment in a configuration for receiving light that has been attenuated by tissue of the user. *See* RX-0411 at 6:56-63, 11:65-12:2. Lumidigm discloses two specific configurations with arrays of at least four detectors:

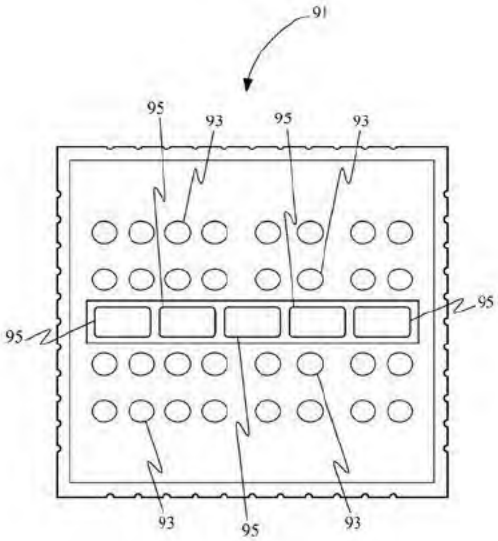


FIG. 7A

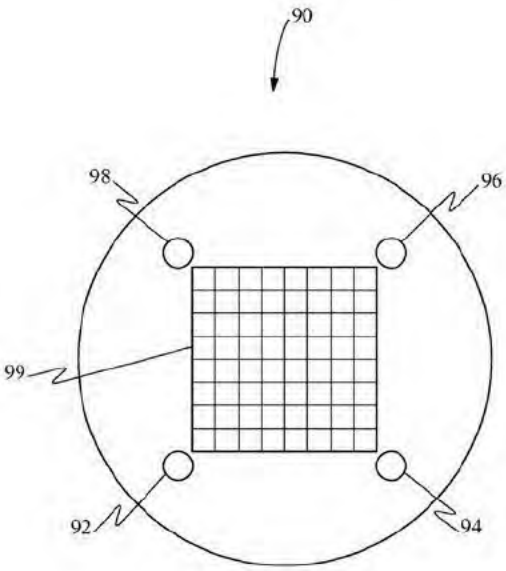


FIG. 7B

Id. at 9:26-45, Fig. 7A, Fig. 7B; Tr. (Warren) at 1221:10-15; RDX-8.37; RIB at 82. Lumidigm describes the benefits of such detector arrays, wherein "[t]he signal detected at each of the array

elements then represents a different source-detector separation with respect to the light from a given light source." *Id.* at 9:39-41.

d. Element [19C]: "a protrusion comprising a convex surface including separate openings extending through the protrusion and lined with opaque material, each opening positioned over a different one associated with each of the four photodiodes, the opaque material configured to reduce an amount of light reaching the photodiodes without being attenuated by the tissue"

As discussed above in the context of the "protrusion" limitation of '501 patent claim 1, Lumidigm's disclosures provide a reason to modify the optical surface of Lumidigm to form a protrusion comprising a convex surface. *See* Part IV.E.1.d. However, the evidence does not clearly and convincingly show how or why the "array"-type detectors in Lumidigm relied upon by Apple for Element [19B] would be formed with separate openings through the protrusion for individual photodiodes in the array. *See* RIB at 82; CIB at 143 (noting requirement to treat each claim as an integrated whole); CRB at 55 (same). For this limitation, Apple simply refers to the reasoning provided for the three-photodiode configuration relied upon for Element [1B] (which relies on the single diode example in Figure 2 of Lumidigm), but that configuration does not appear similar to the "array" configurations cited by Respondents for Element [19B], and no clear and convincing testimony linking Figs. 7A and 7B to separate "openings" through the protrusion for individual (or subsets of) diodes in an array has been provided.[45] *See* RIB at 72-

[45] Lumidigm explains that "detector 36" may be "a single element, a plurality of discrete elements, or a one- or two-dimensional array of elements." RX-0411 at 6:54-56. Fig. 2 shows a single opening over detector 36 which, if anything, would appear to suggest a single opening over an array, rather than separate openings over individual diodes in the array. While Apple argues that the Figs. 7A and 7B are merely "illustrative," and that Lumidigm's sensor "can include any number and arrangement of photodiodes" (RIB at 82), Apple did not clearly present any other specific LED/photodiode arrangement in its analysis of Element [19B] for assessment in view of the claim as a whole. *See* Tr. (Warren) at 1221:10-15 and RDX-8.37; RIB at 82.

74, 83-84; RX-0411 at 9:26-45 (discussing the "detector array" structure); CIB at 143 (arguing that Apple does not show obviousness based on claim as an integrated whole).

With regard to Figure 7B, Dr. Warren testified with regard to a different limitation that "one of ordinary skill could essentially choose any four of the photodiodes within this arrangement . . . and then include an opening over each one" (Tr. (Warren) at 1225:23-1226:1) but this testimony of what one of ordinary skill in the art could theoretically do is insufficient to clearly and convincingly show that Lumidigm discloses this arrangement, or provide a reason for one of ordinary skill in the art to modify Lumidigm to do so. *See Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 ("The obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether 'they would have been motivated to do so.'").

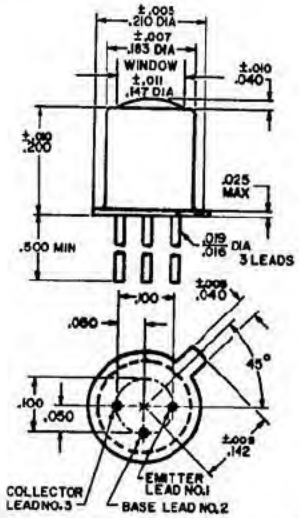
Apple also argues that Element [19C] is rendered obvious based on a combination with Cramer, which Apple contends includes four diodes in a circular array, with separate openings with opaque lateral surfaces positioned over each of the photodiodes. *See* RIB at 108-110. As discussed above in Part IV.E.1.d, the evidence does not clearly and convincingly show that one of skill in the art would have a reason to combine the specific structures of Cramer with Lumidigm, and Cramer only includes one LED (which would not meet the "plurality of emitters" requirement of Element [19A])). *See* n.36 *supra*.

e. Element [19D]: "optically transparent material within each of the openings"

With respect to the "optically transparent material" limitation of '502 patent claim 19, Apple identifies Lumidigm's disclosure of "an optical relay (not shown) between the sensor surface 39 and the skin 40" that "transfers the light . . . from the skin back to the detector(s)." RX-0411 at 8:19-23; RIB at 84-85. Lumidigm provides examples of these optical relays, including "fiber-optic face plates and tapers, individual optical fibers and fiber bundles, light

pipes and capillaries, and other mechanisms known to one of skill in the art." *Id.* at 8:23-26. Dr. Warren testified at the hearing that one of ordinary skill in the art would understand an "optical relay" to be an optically transparent material. Tr. (Warren) at 1221:16-1222:25; RIB at 84-85.

Apple further argues that this limitation would be obvious because the use of transparent materials within openings was well-known at the time of the Poeze patents. RIB at 111-113; Tr. (Warren) at 1193:23-1194:14, 1221:16-1222:9; RDX-8C.11 (citing RX-0670; RX-0665; RX-0666; RX-0667; RX-0648). Apple also points to the "light transmittance plate" disclosed in Seiko 131, wherein "[a] transparent window is formed on the top of sensor frame 36 . . . by means of light transmittance plate 34, which is a glass plate." RX-0666 at 10:30-32. With respect to Cramer, Apple identifies the datasheet for the CLT 2160, which depicts a "window on top of can." RX-1221; *see* RX-0670 at 5:33-35.



PHYSICAL DIMENSIONS — in accordance with JEDEC (T018) outline except for window on top of can.
All dimensions in inches. Collector electrically connected to case. Leads gold plated Kovar.

RX-1221. Apple further argues that Cramer discloses a further layer of clear transparent windows between the detectors and the skin. Tr. (Warren) at 1234:22-1235:12; RDX-8C.73 (citing RX-0670 at Fig. 6).

Complainants argue that Lumidigm's disclosure of an "optical relay" does not meet the "optically transparent material" limitation and is not disclosed in connection with Lumidigm's "wristwatch" embodiment. CIB at 138-39. Dr. Madisetti does not agree with Dr. Warren's opinions with respect to this limitation. *See* Tr. (Madisetti) at 1330:2-5.[46] Complainants argue that Seiko 131 fails to disclose multiple openings or optically transparent material within multiple openings. CIB at 148-49. Complainants argue that with respect to Cramer, the alleged windows are between the annular rings and are not "within" the openings. CIB at 146-47.

In consideration of the parties' arguments, the undersigned finds that Lumidigm clearly discloses "optically transparent material" over openings associated with photodiodes, but the evidence does not clearly and convincingly show a reason to incorporate such material "within" each opening. Lumidigm describes an optical relay that is comprised of optically transparent material. *See* RX-0411 at 8:19-26; *see* Tr. (Warren) at 1221:16-1222:25. The optical relay in Lumidigm is not "within" the opening depicted in Figure 2, however—it is located "between the sensor surface 39 and the skin 40." RX-0411 at 8:19-26, Fig. 2.[47] Apple appears to have

[46] Complainants argue that Apple should be precluded from arguing that Lumidigm discloses a "lens" because this contention was not disclosed in Apple's pre-hearing brief, RIB at 138-39, but there was no objection to Dr. Warren's testimony regarding a "lens" at the hearing, and Apple explains that the testimony merely represents Dr. Warren's opinion that one of ordinary skill in the art would understand Lumidigm's "optical relay" to be a "lens." RRB at 57-58.

[47] Seiko 131 similarly discloses a "light transmittance plate" that is positioned above its sensor but is not "within" any opening. *See* RX-0666 at 10:30-32. Cramer also discloses annular windows that do not appear to be associated within "each" opening. *See* Tr. (Warren) at 1234:22-1235:12; RDX-8C.73 (citing RX-0670 at Fig. 6).

identified transparent windows within an opening in Cramer's preferred photodiode, the CLT 2160, but did not provide a clear and convincing reason to modify Lumidigm to include such material within the openings or to incorporate the CLT 2160 photodiode in Lumidigm. *See* RX-0670 at 5:33-35, Fig. 6; RX-1221; RIB at 112-113.[48,49]

f. Element [19E]: "one or more processors configured to receive one or more signals from at least one of the four photodiodes and output measurements responsive to the one or more signals, the measurements indicative of the oxygen saturation of the user"

As discussed above in the context of the preamble limitations, the evidence indicates that one of skill in the art would not have been enabled to use the Lumidigm wristwatch embodiment to measure oxygen saturation. In particular, Lumidigm only discloses that spectroscopic changes correlated with oxygenation "may be detected according to the methods described above." RX-0411 at 19:22-26. Complainants have presented credible evidence that one of ordinary skill in the art would not have been able to successfully implement this detection in a wristwatch at the time of the Poeze patents. *See* CIB at 126-29; CRB at 44-46. Accordingly, for the same reasons discussed above in the context of the preamble, Apple has not shown by clear and convincing evidence that the "one or more processors" limitation of '502 patent claim 19 is met by Lumidigm.

[48] As discussed above in the context of the "opaque lateral surfaces" limitation of '501 patent claim 1, the undersigned finds the CLT 2160 datasheet to be reliable evidence for the structure of the photodiode disclosed in Cramer. *See* Part IV.G.1.f *supra*.

[49] Apple identifies a similar "can package" photodiode with a window described in Webster. RX-0035.0094-95 ("In the can package . . ., the photodiode chip is mounted on a metallic stem and is sealed with a cap that has a window to allow incident light to reach the semiconductor surface.").

g. Element [20]: "further comprising a thermistor"

Claim 20 of the '502 patent depends from claim 19, further requiring a thermistor. With respect to this limitation, Apple identifies Lumidigm's disclosure of "preprocessing steps" including "performing explicit corrections to account for sensor-to-sensor variations or environmental influences of temperature, humidity, and pressure." RX-0411 at 14:21-28. Lumidigm notes that "[t]hese and other techniques are well known in the art," *id.* at 14:29, and Dr. Warren testified that "a person of ordinary skill would realize that such a temperature measurement could easily be done with a thermistor." Tr. (Warren) at 1223:1-20. Apple identifies examples of suitable thermistors in Webster, which explicitly discloses a thermistor to compensate for LED temperature changes: "One way to compensate for LED temperature changes is to have a temperature sensor built into the probe along with the LEDs and photodiode." RX-0035.0085 (citation omitted). A thermistor is also identified as part of an oxygen sensor in a different chapter of Webster. *Id.* at 42. Apple submits that one of ordinary skill in the art would have been motivated to use one of the thermistors disclosed in Webster in Lumidigm's wristwatch embodiment with a reasonable expectation of success. RIB at 123-24; Tr. (Warren) at 1239:22-1240:3.

Complainants argue that Lumidigm fails to disclose or suggest a thermistor. *See* CIB at 140. With respect to Webster, Complainants submit that the two thermistors identified by Apple are in separate chapters describing different devices. *Id.* at 153-54; *see* Tr. (Madisetti) at 1336:5-18.

In consideration of the parties' arguments, the undersigned finds that Lumidigm includes an explicit suggestion to account for environmental influences including temperature in the operation of its biometric sensor, *see* RX-0411 at 14:21-28, and Apple has shown that one of

ordinary skill in the art would have had reason to use a thermistor to achieve this goal. *See* Tr. (Warren) at 1223:1-20. Moreover, the undersigned finds that one of ordinary skill in the art would have had a reasonable expectation of success adding a thermistor to Lumidigm's wristwatch embodiment, because it involves "the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 500 U.S. at 417. In the context of accounting for environmental influences, Lumidigm recognizes that "[t]hese and other techniques are well known in the art," *id.* at 14:29, and this is corroborated by Webster, which describes the use of a thermistor to "compensate for LED temperature changes." RX-0035.0085. In a separate chapter, Webster also discloses a thermistor that is used with an oxygen sensor. *Id.* at 42. The undersigned agrees with Complainants that Apple has failed to show that any of the thermistors disclosed in Webster could be directly implemented in Lumidigm's device, but "it is not necessary that [two pieces of prior art] be physically combinable to render obvious" the asserted patent. *Allied Erecting and Dismantling Co., Inc. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983)). The disclosures in Webster provide clear evidence that thermistors would have been known to persons of ordinary skill in the art to measure the temperature described in Lumidigm.

h. Element [21]: "wherein the one or more processors are further configured to receive a temperature signal from the thermistor and adjust operation of the user-worn device responsive to the temperature signal"

Claim 21 of the '502 patent depends from claim 20, further requiring that "the one or more processors are further configured to receive a temperature signal from the thermistor and adjust operation of the user device responsive to the temperature signal." The evidence shows that this limitation to be met for the same reasons discussed above in the context of '502 patent claim 20. In particular, Lumidigm explicitly discloses "preprocessing steps" including

"performing explicit corrections to account for sensor-to-sensor variations or environmental influences of temperature, humidity, and pressure." RX-0411 at 14:21-28. One of ordinary skill in the art would have recognized that these preprocessing steps would have been performed by the processor disclosed in Lumidigm, as discussed above in the context of the "one or more processors" limitation, using a temperature signal from a thermistor, as discussed above in the context of '502 patent claim 20.

i. Element [22]: "wherein the plurality of emitters comprise at least four emitters, and wherein each of the plurality of emitters comprises a respective set of at least three LEDs"

Claim 22 of the '502 patent depends from claim 21, further requiring that "the plurality of emitters comprise at least four emitters, and wherein each of the plurality of emitters comprises a respective set of at least three LEDs." As discussed above in the context of the "plurality of emitters" limitation, Lumidigm discloses "a plurality of light sources" that "may comprise light emitting diodes ('LEDs')," including "sets of LEDs." RX-0411 at 6:22-53. Figure 7A of Lumidigm discloses an embodiment with four sets of eight LEDs. *Id.* at 9:26-34 (Fig. 7A). *See* Tr. (Warren) at 1220:13-1221:6; RDX-8.36. As discussed above, the Figure 7A embodiment also meets the "four photodiodes" requirement of element [19B]. *See* RDX-8.37 (identifying Figure 7A and 7B as meeting the four photodiodes limitation).

* * *

For the reasons discussed above, the evidence fails to clearly and convincingly disclose a combination of elements meeting the limitations of claim 22 of the '502 patent, and Apple has not shown a reasonable expectation of success in achieving a combination of these elements in Lumidigm's wristwatch embodiment.

3. '502 Patent Claim 28

As discussed below, the evidence fails to clearly and convincingly show that claim 28 of the '502 patent is rendered obvious by Lumidigm alone or in combination with other prior art.

a. Element [28 preamble]: "A user-worn device configured to non-invasively measure an oxygen saturation of a user, the user worn device comprising:"

For the same reasons discussed above in the context of the preamble limitations of '502 patent claim 19 (Element 19 [Preamble]), the preamble limitations of '502 patent claim 28 are not met by Lumidigm because one of ordinary skill in the art would not have been enabled to measure oxygen saturation using the Lumidim watch embodiment.

b. Element [28A]: "a first set of light emitting diodes (LEDs), the first set of LEDs comprising at least an LED configured to emit light at a first wavelength and an LED configured to emit light at a second wavelength"

With respect to the first LEDs limitation of '502 patent claim 28, Apple identifies Lumidigm's disclosure that its light sources "can each have the same wavelength characteristics or can be comprised of sources with different center wavelengths in a spectral range from about 300 nm to about 10,000 nm." RX-0411 at 6:43-46; RIB at 88-90. Lumidigm provides that "the collection of light sources 34 can include some sources that have the same wavelengths as others and some sources that are different." *Id.* at 6:46-48. Lumidigm explicitly discusses the benefits of pairs of light sources, noting that two light sources having the same wavelength "can be combined to increase the resulting signal-to-noise ratio of the measurement," while two light sources with different wavelengths can "provide unique and useful information about the tissue optical properties." *Id.* at 7:34-53. There is no dispute that Lumidigm thus discloses LEDs emitting at different wavelengths, and Apple identifies the sensor geometries in Figs. 3, 5-6, and 7A-B of Lumidigm as meeting this limitation. RIB at 89-90. Lumidigm provides that "any of

the sensor geometries previously disclosed or other equivalent configurations can be used" in the wristwatch embodiment. *Id.* at 11:65-12:2.

c. Element [28B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising at least an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

With respect to the second LEDs limitation of '502 patent claim 28, Apple identifies Lumidigm's disclosure of "sets of LEDs . . . with differing wavelength characteristics that lie within the spectral range from about 350 nm to about 1100 nm." RX-0411 at 6:48-55. Lumidigm explicitly discusses the benefits of pairs of light sources, noting that two light sources having the same wavelength "can be combined to increase the resulting signal-to-noise ratio of the measurement," while two light sources with different wavelengths can "provide unique and useful information about the tissue optical properties." *Id.* at 7:34-53. Apple further cites U.S. Patent Application No. 10/262,403, which is incorporated by reference in Lumidigm, *see* RX-0411 at 1:40-44, and explicitly discloses multiple sets of LEDs with the same wavelengths emitted by LEDs in each set. *See* RX-0460 at ¶ 54, Fig. 6. There is no dispute that Lumidigm thus discloses a second set of LEDs emitting at the same wavelengths as the first set of LEDs, and Apple identifies the sensor geometries in Figs. 3, 5-6, and 7A-B of Lumidigm as meeting this limitation. Lumidigm states that in "any of the sensor geometries previously disclosed or other equivalent configurations can be used" in the wristwatch embodiment. *Id.* at 11:65-12:2.

d. Element [28C]: "four photodiodes arranged in a quadrant configuration on an interior surface of the user-worn device and configured to receive light after at least a portion of the light has been attenuated by tissue of the user"

As discussed above in the context of the "photodiodes" limitations of '501 patent claim 1 and '502 patent claim 19, the undersigned finds that Lumidigm discloses silicon detectors that

are photodiodes. *See* RX-0411 at 6:56-63, 9:26-45. With respect to the claimed "quadrant configuration," Apple points to Lumidigm's Figure 7B, where detectors are arranged in a two-dimensional array. *See* Tr. (Warren) at 1225:13-1226:1; RDX-8C.44; RX-0411 at 9:34-45, Fig. 7B; RIB at 91.

e. Element [28D]: "a thermistor configured to provide a temperature signal"

As discussed above in the context of '502 patent claims 20 and 21, the undersigned finds that Lumidigm, in combination with Webster, provides a reason to modify Lumidigm to include a thermistor and shows a reasonable expectation of success. *See* RX-0411 at 14:21-28; RX-0035.0085.

f. Element [28E]: "a protrusion arranged above the interior surface, the protrusion comprising: a convex surface"

As discussed above in the context of the "protrusion" limitation of '501 patent claim 1, the undersigned finds that one of skill in the art would have reason to modify Lumidigm to achieve this limitation, and a reasonable expectation of success. *See* RX-0411 at 4:54-56, 8:1-10, Fig. 2; RX-0666 at 19:5-8, Fig. 28; RX-0670 at 5:45-51, Fig. 3, Fig. 6.

g. Element [28F]: "a plurality of openings in the convex surface, extending through the protrusion, and aligned with the four photodiodes, each opening defined by an opaque surface configured to reduce light piping"

As discussed above in the context of the "plurality of openings" limitation of claim 22 (Element [19C]), the evidence fails to clearly and convincingly show a plurality of openings aligned with the four photodiodes in the context of the "four photodiode" embodiments relied upon by Apple for Element [28C].

h. Element [28G]: "a plurality of transmissive windows, each of the transmissive windows extending across a different one of the openings"

As discussed above in the context of the "optically transparent material" limitation of '502 patent claim 19 (Element [19D]), Lumidigm clearly discloses an "optical relay" that is transmissive and is positioned above an opening for a detector. *See* RX-0411 at 8:19-26; *see* Tr. (Warren) at 1221:16-1222:25. Lumidigm discloses a single window, but Dr. Warren suggests that "a person of skill would know that you could do an individual faceplate for each of the individual openings as a means to provide light but still optimize the process." Tr. (Warren) at 1221:1-1222:25. Dr. Warren identifies several prior art references with such windows extending across openings over photodiodes. *Id.* at 1193:23-1194:14; RDX-8C.11 (citing RX-0670; RX-0666; RX-0667).

i. Element [28H]: "at least one opaque wall extending between the interior surface and the protrusion, wherein at least the interior surface, the opaque wall and the protrusion form cavities, wherein the photodiodes are arranged on the interior surface within the cavities"

For the reasons discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1 and the "opaque material" limitation of '502 patent claim 19 (Elements [1E] and [19C]), the undersigned finds Lumidigm, in combination with the other prior art, discloses the requirements of this limitation. *See* RX-0411 at 7:66-8:11, Fig. 2; RX-0670 at 2:46-51, 5:33-35, 5:46-48, Fig. 3, Fig. 6; RX-1221.

j. Element [28I]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and calculate an oxygen saturation measurement of the user, the one or more processors further configured to receive the temperature signal"

As discussed above in the context of the "one or more processors" limitation of '502 patent claim 19 (Element [19E]), Lumidigm does not disclose a processor configured to calculate an oxygen saturation measurement.[50,51]

k. Element [28J]: "a network interface configured to wirelessly communicate the oxygen saturation measurement to at least one of a mobile phone or an electronic network"

With respect to the "network interface" limitation, Apple identifies a "communications system 344" disclosed in Lumidigm and depicted on Figure 9, which "may comprise a wired, wireless, modem, and/or other type of interfacing connection and permits data to be exchanged with external devices." RX-0411 at 13:9-12, Fig. 9. In the context of a key fob embodiment, Lumidigm discloses "short-range wireless techniques based upon RF signals 103 . . . to communicate between the fob and a corresponding reader." *Id.* at 11:38-42. In this embodiment, the transmission can be "a simple confirmed or denied signal" or "the most recent measured spectrum is transmitted to the reader and the comparison and decision is accomplished at the reader or at a host to which the reader is connected." *Id.* at 11:49-55. Apple further

[50] As discussed above in the context of the "one or more processors" limitation of '501 patent claim 1 (Element [1F]), Lumidigm does disclose a "processor" that receives signals from a sensor and outputs measurements indicative of physiological parameters. *See* RX-0411 at 12:56-13:14.

[51] As discussed above in the context of the "thermistor" limitations of '502 patent claims 20 and 21 (Elements [20] and [21]), the evidence shows that one of ordinary skill in the art would have reason to incorporate a thermistor in the Lumidigm wristwatch embodiment. *See* RX-0411 at 14:21-28; RX-0035.0085.

submits that "RF signals 103" are depicted in Figure 8B in the context of the wristwatch embodiment.

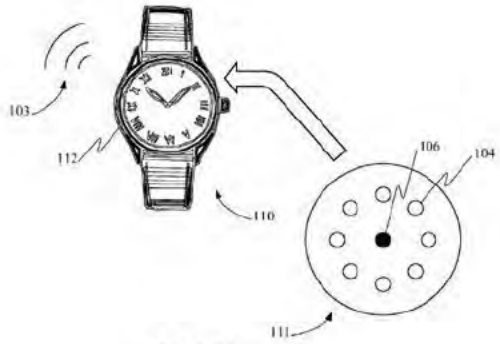


FIG. 8B

Id. at Fig. 8B; RIB at 94-95. Complainants dispute whether Lumidigm discloses this limitation in combination with the wristwatch embodiment and/or the extended functionality for measuring physiological parameters. CIB at 141-42; CRB at 51.

In consideration of the parties' arguments, the undersigned finds that Lumidigm clearly discloses a network interface for wireless communication with an electronic network in its wristwatch embodiment. *See* RX-0411 at 11:38-55, Fig. 8B. This does not include the communication of an oxygen saturation measurement, however, because no such measurement is disclosed in Lumidigm, for the reasons discussed above in the context of the preamble of '502 patent claim 19 (Element [19 preamble]).

l. Element [28K]: "a user interface comprising a touch-screen display, wherein the user interface is configured to display indicia responsive to the oxygen saturation measurement of the user"

With respect to the "user interface comprising a touch-screen display" limitation, Apple points to Lumidigm's disclosure of embodiments of "a personal electronic device that may be configured with biometric capability in the form of a PDA" and "a combined cellular telephone/PDA." RX-0411 at 12:21-48, Fig. 8D, Fig. 8E. Apple argues that such devices were

known to have touchscreen displays. RIB at 95-96; *see* Tr. (Warren) at 1226:23-1227:3. Apple further cites an embodiment disclosed in Lumidigm wherein the portable electronic device can access the internet "to display the retrieved information on the portable electronic device." RX-0411 at 21:29-33. Apple further asserts the widespread availability of touch-screen user interfaces, and Dr. Warren testified that a person of ordinary skill would have been able to incorporate a touch-screen into any portable device. RIB at 129-33; *see* Tr. (Warren) at 1226:23-1227:5. Apple identifies a touch-screen disclosed in U.S. Patent No. 9,001,047 (RX-0673, "Apple '047), and Dr. Warren testified that it would have been obvious to incorporate such a touch-screen with the display of a blood oxygen measurement disclosed in Lumidigm. Tr. (Warren) at 1240:4-1242:9. Apple also identifies certain references to "touch buttons" in Webster. RIB at 133 (citing RX-0035 at 114, 137, 218-223).

Complainants argue that Lumidigm provides no clear disclosure of a touch-screen in combination with its wristwatch embodiment and/or the extended functionality for measuring physiological parameters. CIB at 141-42; CRB at 51. With respect to Apple '047, Complainants argue that there is no disclosure of a user-worn device or any display of a physiological parameter such as an oxygen saturation measurement. CIB at 156-57; *see* Tr. (Madisetti) at 1337:3-11. Complainants argue that Apple has failed to show any motivation to combine or likelihood of success in adding a touch-screen to the wristwatch embodiment in Lumidigm. CIB at 157; CRB at 84-85.

In consideration of the parties' arguments, the undersigned agrees with Complainants that Lumidigm fails to disclose a touch-screen user interface for display of an oxygen saturation measurement in conjunction with the wristwatch embodiment, and Apple has not clearly and convincingly shown that this addition would be obvious. Dr. Warren's testimony on this issue is

conclusory. *See* Tr. (Warren) at 1226:22-1227:7, 1240:4-17, 1241:1-17; RDX-8.83-84. Apple relies on Lumidigm's identification of certain portable electronic devices with screens, but with no reference to touch-screen input. *See* RIB at 131 (citing RX-0411 Figs. 8B-8E, 3:35-37, 21:29-36). Moreover, the cellular phone and PDA embodiments are identified as separate from the wristwatch embodiment, with no suggestion that parts of these different portable electronic devices should be combined. *See id.* at 10:42-13:26. Lumidigm's wristwatch embodiment is depicted as an analog clock face with no screen for displaying any measurement. *See id.* at 11:60-12:2, Fig. 8B.[52]

The undersigned further finds that Apple has not clearly and convincingly identified a reason one of ordinary skill would have combined Lumidigm's wristwatch with the touch-screen interface disclosed in Apple '047 and shown that such a combination would have had a reasonable expectation of success. Dr. Warren's testimony on these issues is conclusory and fails to offer any reason for adding a touch-screen to Lumidigm's wristwatch—he merely offers his opinion that a touch-screen "is a well-known mechanism" and that "a person of ordinary skill would realize that, to add the features of . . . [a] touchscreen to Lumidigm, they could look to a number of references, but . . . Apple would be an obvious choice." Tr. (Warren) at 1240:4-1242:9. With respect to this limitation, Dr. Warren appears to have relied on the "touch-screen display" in the claim language as his only reason for incorporating this feature, and the Federal Circuit has held that such an approach is inadequate to prove obviousness. *See InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (reversing jury's finding of

[52] As discussed above regarding Element [28J], Lumidigm discloses a network interface for wirelessly communicating the measurement of a physiological parameter from the wristwatch to an external device (where it can be read). *See* Element [28J] *supra*; RX-0411 at 11:38-55; RIB at 94-95.

obviousness where expert used the asserted patent as a "roadmap" and her "testimony primarily consisted of conclusory references to her belief that one of ordinary skill in the art could combine these references, not that they would have been motivated to do so.").

Apple '047 also fails to disclose any use of a touch-screen in a wristwatch—it is primarily directed to "a rectangular touch screen display with a portrait view and a landscape view." *See* RX-0673 at 2:53-3:57 (describing embodiments of rectangular touch screen displays), Fig. 2; *see* Tr. (Warren) at 1240:18-25 (describing Apple '047). Apple's prior art touch-screen does not appear to be compatible with the wristwatch disclosed in Lumidigm, which has an analog clock face with a circular shape, and Dr. Warren did not provide testimony addressing this issue. *See* RX-0411 at Fig. 8B. Moreover, to the extent that Apple relies on Webster, Apple has not shown that any of the displays or user interfaces identified in Webster are touch-screens. *See* RX-0035 at 114, 137, 218-223.[53]

m. Element [28L]: "a storage device configured to at least temporarily store at least the measurement"

With respect to the "storage device" limitation, Apple identifies Lumidigm's disclosure of computer hardware elements in Figure 9, including storage device 338, memory 348, and computer-readable storage medium 340b. RX-0411 at 12:63-13:9. Lumidigm provides that "[t]he storage devices typically hold information defining the stored spectra as well as any personalized-setting information that may be used." *Id.* at 13:12-14. Complainants dispute this limitation, arguing that there is no clear disclosure of the storage devices in Figure 9 in

[53] Complainants argue that Apple failed to cite Webster with respect to this limitation in its pre-hearing brief. *See* CRB at 84. The undersigned agrees with Complainants that this contention is untimely, but even if these disclosures in Webster were considered, it would not change the determination regarding obviousness.

combination with the wristwatch embodiment and/or the extended functionality for measuring physiological parameters. CIB at 141-42; CRB at 51.

In consideration of the parties' arguments, the undersigned finds that Lumidigm discloses a storage device configured to store measurements from its biometric sensor. As discussed above in the context of the "one or more processors" limitation of '501 patent claim 1, Lumidigm explicitly notes that some of the components in Figure 9 could be used in portable devices, which includes the "wristwatch" embodiment. RX-0411 at 13:21-37 (identifying a "second set of embodiments" involving "a portable electronic device having extended functionality," and including "a cellular telephone, a personal digital assistant, an electronic fob, and a watch" as examples of the "electronic arrangement"), 2:58-61, 17:67-18:2. Lumidigm explicitly provides that "[t]he storage devices typically hold information defining the stored spectra," and the blood oxygen measurement described in Lumidigm is defined by "spectroscopic changes" that are "correlated with oxygenation." *Id.* at 13:12-14, 19:24-26. Accordingly, the "storage device" limitation of '502 patent claim 28 is disclosed in Lumidigm, except to the extent that this limitation requires storage of an oxygen saturation measurement.

n. Element [28M]: "a strap configured to position the user-worn device on the user"

With respect to the "strap" limitation, Apple identifies the strap depicted in Lumidigm's "wristwatch" embodiment. *See* RX-0411 at 11:60-64, Fig. 8B. There is no dispute that Lumidigm meets the "strap" limitation of '502 patent claim 28.

* * *

For the reasons discussed above, the evidence fails to clearly and convincingly disclose a combination of elements meeting the limitations of claim 28 of the '502 patent, and Apple has

not shown a reasonable expectation of success in achieving a combination of these elements in Lumidigm's wristwatch embodiment.

4. '648 Patent Claim 12

As discussed below, the evidence fails to clearly and convincingly show that claim 12 is obvious in view of Lumidigm alone or in combination with other asserted prior art.

a. Element [8 preamble]: "A user-worn device configured to non-invasively determine measurements of a physiological parameter of a user, the user-worn device comprising:"

For the same reasons discussed above in the context of the preamble limitations of '501 patent claim 1 (Element 1[A]), Lumidigm meets the preamble limitations of '648 patent claim 8 requiring a "user-worn device configured to non-invasively determine measurements of a physiological parameter of a user."

b. Element [8A]: "a first set of light emitting diodes (LEDs), the first set comprising at least an LED configured to emit light at a first wavelength and at least an LED configured to emit light at a second wavelength"

For the same reasons discussed above in the context of Element [28A] of the'502 patent, the evidence shows that this limitation is met by Lumidigm.

c. Element [8B]: "a second set of LEDs spaced apart from the first set of LEDs, the second set of LEDs comprising an LED configured to emit light at the first wavelength and an LED configured to emit light at the second wavelength"

For the same reasons discussed above in the context of Element [28B] of the'502 patent, the evidence shows that this limitation is met by Lumidigm.

d. Element [8C]: "four photodiodes"

For the same reasons discussed above in the context of the "four photodiodes" limitations of'502 patent claim 19 (Element [19B]), the undersigned finds that the "four photodiodes" limitation of '648 patent claim 8 is met by Lumidigm.

e. Element [8D]: "a protrusion comprising a convex surface, at least a portion of the protrusion comprising an opaque material"

For the same reasons discussed above in the context of the "protrusion" and "opaque lateral surface" limitations of '501 patent claim 1 (Elements [1C], [1D], and [1E]), the evidence shows that Lumidigm, in view of the prior art, provides a reason to modify the optical surface to form a "protrusion comprising a convex surface" with a portion of the protrusion (the openings) comprising an opaque material.

f. Element [8E] and Element [8F]: "a plurality of openings provided through the protrusion and the convex surface, the openings aligned with the photodiodes" and "a separate optically transparent window extending across each of the openings"

For the same reasons discussed above in the context of the "plurality of openings" limitations of '502 patent claim 19 (Element [19C]), the evidence fails to show, clearly and convincingly, a "plurality of openings" with a "separate optically transparent window extending across each of the openings" in combination with the "four photodiodes" embodiments of Lumidigm relied upon by Apple. *See* RIB at 82, 91, 98.

g. Element [8G]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and output measurements of a physiological parameter of a user"

For the same reasons discussed above in the context of the "one or more processors" limitation of '501 patent claim 1 (Element [1F]), the undersigned finds that the "one or more processors" limitation of '648 patent claim 8 is met by Lumidigm.

h. Element [8H]: "a housing"

With respect to the "housing" limitation, Apple identifies Lumidigm's disclosure that "the biometric reader 111 is built in the case of a wristwatch 112." RX-0411 at 11:60-64, Fig.

8B. There is no dispute that Lumidigm thus discloses a housing in its "wristwatch" embodiment. The evidence shows that this limitation is met by Lumidigm.

i. Element [8I]: "a strap configured to position the housing proximate tissue of the user when the device is worn"

For the same reasons discussed above in the context of the "strap" limitation of '502 patent claim 28 (Element [28M]), the evidence shows that the "strap" limitation of '648 patent claim 8 is met by Lumidigm.

j. Element [12]: "wherein the physiological parameter comprises oxygen or oxygen saturation"

'648 patent claim 12 depends from claim 8 and further requires that "the physiological parameter comprises oxygen or oxygen saturation." For the same reasons discussed above in the context of the preamble limitations of '502 patent claim 19, this limitation is not met by Lumidigm, because the evidence shows that one of ordinary skill would not have been able to successfully configure Lumidigm's wristwatch to measure blood oxygen.

5. '648 Patent Claim 24

As discussed below, the evidence fails to clearly and convincingly show that claim 24 of the '648 patent is rendered obvious by Lumidigm alone or in combination with other prior art.

a. Element [20 preamble]: "A user-worn device configured to non-invasively determine measurements of a user's tissue, the user-worn device comprising:"

Complainants dispute this limitation on the grounds that Lumidigm does not disclose measurement of a "physiological parameter" (*see* CIB at 124-125). For the same reasons discussed above in the context of the preamble limitations of '501 patent claim 1, Lumidigm discloses the preamble limitations of '648 patent claim 20 requiring a "user-worn device configured to non-invasively determine measurements of a user's tissue." Moreover, the preamble language of Element [20 preamble] does not necessarily require measurement of a

"physiological parameter," only "measurements of a user's tissue." Lumidigm clearly shows that the biometric functionality of the wristwatch embodiment requires "measurements of a user's tissue," and Complainants do not dispute that the wristwatch embodiment of Lumidigm performs biometric functionality. *See* RX-0411 at 5:30-44 (describing biometric identification of an individual based on comparing "tissue spectral data taken at the time of use and compared to stored tissue spectral data from prior ***measurement***") (emphasis added); CIB at 125 (describing Lumidigm's wristwatch as "identifying a user or authorizing them to do something using 'tissue spectral data'").

b. Element [20A]: "a plurality of light emitting diodes (LEDs)"

For the same reasons discussed above in the context of Element [1A] of the '501 patent claim 1, this limitation is met by Lumidigm.

c. Element [20B]: "at least four photodiodes configured to receive light emitted by the LEDs, the four photodiodes being arranged to capture light at different quadrants of tissue of a user"

For the same reasons discussed above in the context of Element [28C] of the '502 patent, the evidence shows that this limitation is met by Lumidigm.

d. Element [20C]: "a protrusion comprising a convex surface"

For the same reasons discussed above in the context of the "protrusion" limitation of '501 patent claim 1 (Element [1C]), the evidence clearly and convincingly shows that Lumidigm's disclosures, in view of the prior art, provide a reason to modify Lumidigm's "optical surface" to form a protrusion comprising a convex surface, and a reasonable expectation of success in doing so.

e. Element [20D]: "and a plurality of through holes, each through hole including a window and arranged over a different one of the at least four photodiodes"

For the same reasons discussed above in the context of Element [19C] of the '502 patent, the evidence is insufficient to show, clearly and convincingly, that the prior renders obvious a protrusion comprising a plurality of through holes where each through hole is "arranged over a different one of the at least four photodiodes," in combination with all other elements of this claim.

f. Element [20E]: "one or more processors configured to receive one or more signals from at least one of the photodiodes and determine measurements of oxygen saturation of the user"

For the same reasons discussed above in the context of the preamble of '502 patent claim 19, the undersigned finds that the "one or more processors" limitation of '648 patent claim 20 is not met by Lumidigm, because one of ordinary skill would not have been able, without undue experimentation, to configure Lumidigm's wristwatch to determine measurements of oxygen saturation.

g. Element [24]: "wherein the protrusion comprises opaque material configured to substantially prevent light piping"

Claim 24 of the '648 patent depends from claim 20, further requiring that "the protrusion comprises opaque material configured to substantially prevent light piping." For the same reasons discussed above in the context of the "opaque lateral surface" limitation of '501 patent claim 1 (Element [1E]), the undersigned finds that "opaque material configured to substantially prevent light piping" is disclosed by Lumidigm, but not in combination with all the other elements of claim 20.

6. '648 Patent Claim 30

Claim 30 of the '648 patent depends from claim 20, further requiring that "the protrusion further comprises one or more chamfered edges." Apple contends that chamfered edges were well-known in the art. *See* Tr. (Warren) at 1228:24-1229:10. Apple further submits that chamfered edges are depicted in Seiko 131 and in Cramer. *See* RX-0666 at Fig. 5; RX-0670 at Fig. 3; Tr. (Warren) at 1236:3-16. Dr. Warren explained that such features would be implemented for comfort, in accordance with Lumidigm's teaching that modifications to the sensor surface could be made "to incorporate ergonomic features." Tr. (Warren) at 1228:24-1229:10 (quoting RX-0411 at 7:57-63). Dr. Warren further testified that "a person of ordinary skill would understand that chamfered edges have been around for many decades as a means to soften transitions between surfaces and make items such as watches more wearable." *Id.* at 1236:17-1237:3.

Complainants argue that Lumidigm fails to disclose or suggest a chamfered edge. CIB at 142-43. Complainants argue that the chamfered edges disclosed in Cramer are not on the alleged protrusions. *Id.* at 147. Similarly, Complainants argue that the chamfered edges disclosed in Seiko 131 are not on the alleged protrusion. *Id.* at 150. Complainants argue that Apple has failed to show why a person of ordinary skill would have been motivated to use a chamfered edge in Lumidigm's wristwatch embodiment with a reasonable expectation of success. CRB at 76-78.

In consideration of the parties' arguments, the evidence shows that chamfered edges were known in the prior art, and one of ordinary skill in the art would have reason to implement a chamfered edge on the sensor surface of Lumidigm's wristwatch for ergonomic reasons with a reasonable expectation of success. The record contains numerous examples of chamfered edges

in the prior art, including on the front face of Lumidigm's wristwatch and on the back face of Cramer's wristwatch. *See* RX-0411 at Fig. 8B; RX-0670 at Fig. 3.[54] This is clear evidence that chamfered edges were used in wristwatches and would have been known to persons of ordinary skill in the art. *See* Tr. (Warren) at 1228:24-1229:10, 1236:17-1237:3. Lumidigm provides an express motivation to modify the curvature of its sensor surface "to incorporate ergonomic features that allow for good optical and mechanical coupling with the tissue being measured, or for other technical or stylistic reasons." RX-0411 at 7:58-63.

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Although the prior art provides a reason to incorporate a chamfered edge into a protrusion on the back face of a wristwatch, with a reasonable expectation of success, the evidence fails to show that this limitation in combination with the other limitations of claim 30 (including all limitations of independent claim 20) are rendered obvious. Accordingly, Apple has not shown that claim 30 of the '648 patent is invalid for obviousness.

7. Objective Indicia of Non-Obviousness

Complainants contend that the asserted claims of the Poeze patents are not obvious in view of certain objective indicia of non-obviousness, including skepticism and failure of others, unexpected results, copying, and commercial success. CIB at 158-75; CRB at 85-96. For the

[54] Complainants argue that the chamfered edges in Cramer are not on the alleged convex portions of the protrusion, CIB at 147, but claim 30 does not require the chamfered edge and the convex surface to be on the same part of the protrusion—the claim language recites "a protrusion comprising a convex surface," and "wherein the protrusion further comprises one or more chamfered edges." *See* '648 patent claim 20, claim 30.

reasons set forth below, the evidence regarding the objective indicia of non-obviousness do not weigh significantly against an obviousness finding.

a. Skepticism and Unexpected Results for Convex Protrusions

Complainants contend that there was skepticism in the industry for convex protrusions, citing evidence from Apple's development of the Apple Watch wherein Apple engineers identified [redacted]. *See* CX-1789C; CX-1790C. [redacted] CX-0114C at 2-3. An Apple patent application filed in July 2016 described benefits of a convex protrusion: "A convex shape can enable improved contact with the user's skin and can be more comfortable for the user than other shapes." CX-1569 at 9:35-37. Another Apple patent filed in May 2016 described a protrusion "configured to create pressure to skin." CX-1806 at ¶ [0033]. "By applying localized pressure to the individual's skin, the pressure gradient across arterial walls can be reduced, which can lead to an increase in pulsatile (AC) signal." *Id.* at ¶ [0032].

Complainants also contend that the results of a convex protrusion were unexpected within Cercacor. *See* CIB at 162. Mr. Kiani testified that Cercacor engineers were surprised that they achieved a stronger signal when trying to measure hemoglobin and glucose levels using a protrusion that applied pressure to a finger. Tr. (Kiani) at 98:9-99:16. Complainants argue that this result conflicts with a prior art patent, U.S. Patent No. 6,801,799 (CX-1733, "Mendelson"), which warned against pressure on the skin during pulse oximetry measurements. *See* CX-1733 at 2:47-57 ("[V]ariations in contact pressure between the sensor and the skin can cause large

errors in reflection pulse oximetry (as compared to transmission pulse oximetry) since some of the blood near the superficial layers of the skin may be normally displaced away from the senor housing towards deeper subcutaneous structures."); *see* Tr. (Madisetti) at 1374:9-12. Complainants also cite the testimony of Robert Rowe, one of the Lumidigm inventors, who described a shape that matches the skin, *e.g.*, a concave shape to match a cylindrical body part, as a way to achieve "good coupling." RX-0279C (Rowe Dep. Tr.) at 69:8-21.

Apple disputes Complainants' interpretation of Apple's engineering documents, asserting that Apple engineers [redacted] RRB at 66-67. [redacted] Tr. (Block) at 905:23-907:24. With respect to the documents describing the effect of [redacted] CX-0281C (Block Dep. Tr.) at 218:16-219:5. Apple argues that there is no evidence in the prior art for skepticism regarding a convex protrusion. RIB at 146-47; RRB at 67-68. Apple submits that the Mendelson patent cited by Dr. Madisetti does not disclose or discuss a convex protrusion. *See* Tr. (Warren) at 1244:18-1245:7 (discussing CX-1733/RX-0688). Apple cites another prior reference, Nippon, which describes the benefits of pressure on the skin for increasing signal strength. RX-0665 at 5:12-17, Fig. 3b; *see* Tr. (Warren) at 1245:8-16. Apple further cites the convex protrusions disclosed in Seiko 131 and Cramer. *See* RX-0666 at 3:22-28, 19:6-8, Fig. 28; RX-0670 at 5:45-51, Fig. 3, Fig. 6; *see* Tr. (Warren) at 1194:15-1195:5, 1245:1-1246:12. Apple argues that Mr. Kiani's surprise regarding the effect of a convex protrusion does not reflect the knowledge of one of skill in the art. RRB at 67. Apple disputes Complainants' characterization of Mr. Rowe's testimony, which did not explicitly reference any

concave shape. *Id.* With respect to the Apple patent applications describing convex protrusion, Apple argues that these features were not individually claimed to be novel. *Id.* at 68.

In reply, Complainants argue that Mendelson teaches the undesirability of displacing blood away from the sensor, which would be caused by a convex protrusion. CRB at 91. Complainants contend that Nippon fails to disclose a convex protrusion and was considering during the prosecution of the Poeze patents. *Id.* at 91-92. Complainants submit that Mr. Rowe's testimony is consistent with the teachings in Mendelson and that Mr. Kiani's testimony regarding the surprising benefits of a convex protrusion is consistent with the advantages described in Apple's patent applications. *Id.* at 92-94.

In consideration of the parties' arguments, the evidence does not show that there was skepticism in the industry regarding convex surfaces. As discussed above in the context of the "protrusion" limitation of '501 patent claim 1, there is no evidence in the prior art that convex surfaces were disfavored before the invention of the Poeze patents. The parties have identified prior art physiological sensors with concave, convex, and flat surfaces, which is convincing evidence that the shape of the sensor surface was a design choice for persons of ordinary skill in the art "to match the profile of a device in which it is mounted, to incorporate ergonomic features that allow for good optical and mechanical coupling with the tissue being measured, or for other technical or stylistic reasons." RX-0411 at 7:57-63; *see also* RX-0666 at 3:22-28, Fig. 28; RX-0670 at 5:45-51, Fig. 3; RX-0665 at 5:12-17, Fig. 3b. The Apple engineering documents that Complainants cite to show alleged skepticism are not clearly directed to the accused convex protrusions, and the undersigned agrees with Apple that this evidence should be discounted in view of the evidence that the back surface of the Apple Watch had a convex shape even before the pulse oximetry feature was implemented. *See* RRB at 66-67.

In addition, the undersigned finds that Complainants have not shown that a gain in signal strength with convex surfaces was an unexpected result that demonstrates non-obviousness. Complainants have identified evidence that both Cercacor engineers and Apple engineers were [redacted] but the evidence in the prior art is mixed on the question of whether this result should have been unexpected. *Compare* CX-1733 at 2:47-57 (describing "large errors" caused by "variations in contact pressure") *to* RX-0665 at 5:12-17 (recognizing that a detector that "protrudes into the tissue slightly" has the effect of "increasing the signal strength of the detected signal.").[55] Moreover, to the extent that an improvement in signal strength is attributable to the increased pressure caused by a convex protrusion, the record shows that this effect was recognized in the prior art: Seiko 131 identifies a convex surface that improves "positive contact between the body surface and outside surface of the light transmittance plate." RX-0666 at 3:22-28, Fig. 28.; and Nippon describes increased signal strength from a protrusion into the tissue. RX-0665 at 5:12-17, Fig. 3b. The Federal Circuit has discounted evidence of unexpected results when the result was produced by a feature known in the prior art. *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1385 (Fed. Cir. 2015) ("[T]he offered secondary consideration actually results from something other than what is both claimed and novel in the claim, so there is no nexus to the merits of the claimed invention." (citing *In re Huai–Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (internal quotations removed)).

[55] In the pulse oximeter described in the specification of the Poeze patents, the benefits of a convex protrusion are attributed to the reduced thickness of the finger—not the pressure on the skin. *See* JX-0001 at 21:9-34 (describing signal gain in the context of the Beer Lambert law, which relates transmittance to the path length traveled by the light: "In an embodiment where the protrusion 305 is a convex bump, the thickness of the finger can be reduced to 10 mm (from 12 mm) for some fingers and the effective light mean path is reduced to about 16.6 mm from 20 mm.").

b. Skepticism and Failures Measuring Pulse Oximetry at the Wrist

Complainants further cite evidence that the [redacted] in the Apple Watch is evidence that measuring pulse oximetry at the wrist would have been non-obvious. CIB at 165-72; CRB at 85-88. Complainants identify evidence that Apple [redacted]. *See* CX-1793C ([redacted]). Paul Mannheimer was hired to be Apple's sensor architect in 2014, and he expressed skepticism that pulse oximetry could be successfully implemented in a wristwatch. Tr. (Mannheimer) at 996:25-997:5. Stephen Waydo, the director of Apple's team for health algorithms, also expressed skepticism that blood oxygen could be measured on the wrist, calling the development this feature "extremely challenging." Tr. (Waydo) at 938:21-24. This skepticism was shared by other Apple engineers. *See* CX-0295C (Shui Dep. Tr.) at 108:13-21; CX-0283C (Lefort) at 198:8-199:2. Apple did not implement a blood oxygen feature in any of the first six Apple Watches that were commercially released from 2015 to 2019. Tr. (Mannheimer) at 1013:7-20. [redacted] CX-0177C at 13; *see* Tr. (Mannheimer) at 1015:9-19; Tr. (Land) at 982:3-983:12. Apple engineers filed for a patent on a sensor window design for the Apple Watch in July 2016, which issued as U.S. Patent No. 10,702,211 in July 2020. CX-1569. The first Apple Watch with a pulse oximetry feature was released in September 2020: the Apple Watch Series. RX-0333.

Apple argues that the skepticism of its engineers regarding the implementation of pulse oximetry in the Apple Watch was related to "[redacted]." RRB at 52-53. Dr. Warren cited

evidence that his own students had built pulse oximeters that could take measurements at the wrist as early as 2002. Tr. (Warren) at 1216:10-25; RX-0632; RX-0504; RX-0508. Apple further argues that the evidence regarding the Apple Watch is irrelevant, because the Poeze Patents provide no teachings for measuring blood oxygen on the wrist. RRB at 68.

In consideration of the parties' arguments, the undersigned finds that the skepticism of Apple engineers regarding pulse oximetry at the wrist (and discussed in Part IV.G.2.a *supra*) is consistent with the finding *supra* that Lumidigm's wristwatch embodiment, as modified in view of the combinations Apple proposes, does not disclose or render obvious a device for measuring blood oxygenation at the wrist. However, while this evidence is highly relevant to the obviousness determination for the reasons discussed in Parts IV.G.2-6 above,[56] this evidence does not weigh significantly in terms of objective indicia of non-obviousness because the asserted claims apply to any "user-worn device," including user-worn devices that are not on the wrist. *See Therasense Inc. v. Becton Dickinson and Co.*, 593 F.3d 1325, 1336 (Fed. Cir. 2010) (objective evidence of non-obviousness should be "commensurate in scope with the claims which the evidence is offered to support"); *id.* (evidence of long-felt but unsolved need to solve "short fill" problem did not weigh against obviousness finding where the claims "are not limited to sensors that prevent short fill");'501 patent at 11:45-48 ("In some embodiments, the measurement site 102 is located somewhere along a non-dominant arm or a non-dominant hand, e.g., a right-handed person's left arm or left hand."); *id.* at 8:21-23 (discussing "measurement sites, including, for example, a finger, toe, hand, foot, ear, forehead, or the like"); *id.* at 10:22-24

[56] As discussed *supra*, Apple's obviousness arguments rely on the wristwatch embodiment of Lumidigm as the primary reference.

("[m]any of the foregoing arrangements allow the sensor to be attached to the measurement site while the device is attached elsewhere on the patient, such as the patient's arm").[57]

c. Apple's Alleged Copying of Masimo Technology

Complainants further allege that Apple copied Masimo's patented technology in its development of the pulse oximetry feature in the Apple Watch. CIB at 172-73; CRB at 94-96. Complainants cite testimony and evidence showing that Apple [redacted]. *See* Tr. (Waydo) at 945:10-946:6; CX-0125C; CX-0126C. Beginning in 2013, Apple met with Masimo employees [redacted]. *See* CX-1793C ([redacted]); CX-0185C at 20 ([redacted]); Tr. (Kiani) at 104:14-22, 107:1-108:18. Apple hired several Masimo employees, including Masimo's Chief Medical Officer, Michael O'Reilly, and one of the named inventors of the Poeze patents, Steve Lamego. *See* Tr. (Kiani) at 110:23-111:23; CX-1615C. Complainants allege that Apple sought to obtain Masimo's technology by hiring Dr. Mannheimer from Nellcor, a Masimo competitor that was found to have infringed Masimo's patents in 2004. CIB at 168-69. Complainants submit that Apple has provided no credible explanation for the convex shape of the back crystal in the design of the Apple Watch and argue that an inference of copying is appropriate. CRB at 95. Complainants cite evidence that [redacted]. *See* CX-0285C (Dua Dep. Tr.) at 105:22-107:9; CX-0096C. Complainants further submit that [redacted]

[57] In addition, the asserted claim of the '501 patent is not limited to devices that perform pulse oximetry.

[redacted]

See Tr. (Waydo) at 932:19-933:4; CX-0127C; CX-0097C at 3; CX-0094C.

Apple argues that the pulse oximetry features of the Apple Watch could not have been copied from the Poeze patent claims, because the applications reciting these claims were not filed until after the Apple Watch Series 6 had been released. RIB at 140. Apple further argues that it could not have copied the patented features from any Masimo product, because the first Masimo product embodying the asserted claims was not released to the public until January 2022—during discovery in this investigation. *Id.* Apple's engineers have consistently testified that they did not copy Masimo or any other company's technology. *Id.* at 140-41 (citing Tr. (Block) at 902:10-12, 914:1-7; Tr. (Waydo) at 932:6-9, 933:8-11; Tr. (Land) at 972:19-22, 991:23-25; Tr. (Venugopal) at 833:13-17; Tr. (Mehra) at 893:15-17; Tr. (Mannheimer) at 1007:22-1008:7; CX-0283C (Charbonneau-Lefort Dep. Tr.) at 171:21-173:8, 201:10-19; CX-0285C (Dua Dep.) at 160:20-161:5). Apple contends that [redacted] was not related to the development of the pulse oximetry feature for the Apple Watch and argues that there is no evidence that this product practices any asserted claim. RIB at 142. [redacted]. *Id.* at 143; RRB at 70 (citing Tr. (Diab) at 243:9-17; Tr. (Scruggs) at 446:8-23). Apple submits that none of the employees hired from Masimo contributed to the design of the pulse oximetry feature in the Apple Watch. RIB at 142-43. (citing Tr. (Land) at 972:23-973:3, Tr. (Waydo) at 950:1-15; Tr. (Venogupal) at 833:14-17. Apple explains that [redacted] during the development of the Apple Watch to avoid the disclosure of information regarding an "unreleased feature." CX-0285C (Dua Dep. Tr.) at

105:22-107:9. With respect to Dr. Waydo's discussion of [redacted], Apple submits that this was related to the problem of taking measurements during motion, which was not implemented in the Apple Watch. CX-0299C (Waymo Dep. Tr.) at 173:3-174:8; Tr. (Waydo) at 932:6-18.

In consideration of the parties' arguments, the undersigned finds no significant credible evidence that Apple copied Masimo's patented technology. Complainants accuse numerous former Masimo employees of copying Masimo's technology but fails to identify the patented features that were allegedly copied. Complainants' theory that Apple's hiring of Dr. Mannheimer from Nellcor was motivated by a desire to copy Masimo's technology lacks evidentiary support. The allegation that Apple copied the convex shape of the Apple Watch's back crystal from Masimo is purely speculative, and as discussed above, such convex surfaces were known in the prior art. Complainants fail to identify which features of the [redacted] pulse oximeters used as benchmarks were allegedly copied by Apple, and there is no evidence that any of these products practices asserted claims of the Poeze patents. Complainants' allegations are insufficient to demonstrate copying. *See Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) ("Not every competing product that arguably falls within the scope of a patent is evidence of copying. Otherwise every infringement suit would automatically confirm the nonobviousness of the patent."); *see also Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010) ("Our case law holds that copying requires evidence of efforts to replicate a specific product, which may be demonstrated through internal company documents, direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a

replica, or access to the patented product combined with substantial similarity to the patented product.").

d. Commercial Success of Apple Watch Products

Complainants allege that the commercial success of the Apple Watch Series 6 and 7 products is objective evidence of non-obviousness. CIB at 173-75; CRB at 95-96. According to Complainants' expert Daniel McGavock, sales of the Apple Watch Series 6 far exceeded the sales of previous Apple Watches, and Apple advertised the blood oxygen feature as the key differentiator of the Series 6 over the Series 5. Tr. (McGavock) at 1416:10-21, 1422:8-1425:13; CX-0252; CX-1451; CX-1532; CX-1289. Mr. McGavock referenced third party reviews identifying the blood oxygen feature as the key feature for the Apple Watch Series 6. Tr. (McGavock) at 1418:21-1419:8 (citing CX-1634; CX-1301). Dr. Madisetti agreed with Mr. McGavock that there was a nexus between the blood oxygen feature of Apple Watch Series 6 and its commercial success. Tr. (Madisetti) at 1380:14-1381:4.

Apple argues that the commercial success of the Apple Watch Series 6 and 7 is attributable to many features. RIB at 144; RRB at 71; *see* Tr. (Warren) at 1242:16-25; Tr. (Land) at 970:10-971:6. According to Deidre Caldbeck, Apple's Director of Product Marketing for the Apple Watch, pulse oximetry is "not even in the top 30 use apps on Apple Watch." CX-0275 (Caldbeck Dep. Tr.) at 65:21-22, 66:3-12. Apple argues that its marketing materials describe many different features of the Apple Watch Series 6 in addition to pulse oximetry. *See, e.g.*, CX-1447; CX-0252; CX-1532; CX-1451. Apple further points out that Mr. McGavock cited certain third-party reviews of the Apple Watch that criticized the pulse oximetry feature of the Apple Watch Series 6. *See* Tr. (McGavock) at 550:20-551:17 (citing CX-1616; CX-1293; CX-1409).

In consideration of the parties' arguments and the record evidence, the undersigned finds that the Apple Watch Series 6 was commercially successful and that this may be due in some part to its blood oxygen monitoring features. There is no dispute that the Apple Watch Series 6 was commercially successful. *See* Tr. (McGavock) at 1419:9-1420:1; CX-1285 (*AppleInsider*: "Apple Watch far outsold all other smartwatches in Q4 2020"). Apple's marketing materials upon introduction of the Apple Watch Series 6, as well as certain third-party reviewers, identified the measurement of blood oxygen as a key new feature. *See, e.g.,* CX-0252; CX-1289; CX-1451; CX-1301 (*New York Times*: "The new Apple Watch can be summed up in two words: blood oxygen."); CX-1643 (*Independent*: "it's the blood oxygen sensor that dominated the introduction, and which is the new feature that Apple has spent the most time talking about.").

The evidence does not persuasively indicate, however, that the sales of the Apple Watch Series 6 are largely attributable to the blood oxygen feature, as market analysts have recognized the Apple Watch's "blend of sleek design, good usability on a small screen, and a growing portfolio of health and fitness apps." CX-1644 (Strategy Analytics). Moreover, it is not clear that the Apple Watch Series 6 was significantly more successful than other smartwatches, because the growth in Apple's smartwatch sales from 2020 to 2021 is in line with the growth of smartwatch sales across the industry. *See id.* (Apple's growth in smartwatch sales is 46%, and the overall industry growth in smartwatch sales is 47%). This evidence shows that much of the success of the Apple Watch Series 6 can be attributed to the growing market for smartwatches rather than the specific implementation of the pulse oximetry feature claimed in the patents-at issue. *See id.* ("Online sales of fitness-led devices that help to support personal healthcare remain popular and are the main driver of the smartwatch boom."); *see also* CX-0275 (Caldbeck Dep.) at 65:21-22, 66:3-12 (blood oxygen app in Apple Watch is "not even in the top 30 used

apps on Apple Watch"). The Federal Circuit has discounted evidence of commercial success in such circumstances, where "the evidence does not show that the commercial success was the result of claimed and novel features." *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1313 (Fed. Cir. 2006) (recognizing that the commercial success was due in part to "aesthetic appeal and improved comfort" and features that were known in the prior art).

The undersigned thus finds that there is little evidence of a significant nexus between Apple's commercial success and the allegedly nonobvious features of the asserted Poeze patent claims, particularly for claim 12 of the '501 patent (which is not limited to blood oxygen measurements). Accordingly, this commercial success does not meaningfully affect the obviousness analysis discussed above.

H. Invalidity – Written Description and Enablement

Apple contends that the asserted claims of the Poeze patents are invalid for lack of written description and/or enablement pursuant to 35 U.S.C. § 112, relying on the testimony of Dr. Warren. RIB at 147-53; RRB at 73-76; Tr. (Warren) at 1246:24-1248:4. Complainants dispute Apple's allegations, identifying support in the specification of the Poeze patents and relying on the testimony Dr. Madisetti. CIB at 175-83; CRB at 100-105; Tr. (Madisetti) at 1347:14-1353:25. For the reasons discussed below, the evidence shows, clearly and convincingly, that '502 patent claim 28 and '648 patent claim 12 are invalid for lack of written description. The evidence does not show, clearly and convincingly, that the other asserted claims are invalid for lack of written description and/or lack of enablement.

1. Combination of LEDs, Photodiodes, and Openings (All Asserted Claims)

Apple argues that all of the asserted claims of the Poeze patents are invalid for lack of written description because the specification fails to disclose an embodiment that includes "(a)

multiple LEDs, (b) multiple photodiodes, and (c) a protrusion with a plurality of openings, positioned or arranged over the photodiodes, each of which includes an opaque lateral surface or is lined with an opaque material." RIB at 148. Apple further argues that the specification fails to disclose sets of three or more LEDs or three or more photodiodes. *Id.* at 147-51; RRB at 73-75; *see* Tr. (Warren) at 1246:24-1247:7

Complainants identify Fig. 7B of the Poeze patents, which depicts two emitters 104, two photodiodes 106, one or more opening(s) 703, a protrusion 705b that is a "convex bump," and a shielding enclosure 790. JX-001 at 27:13-41.

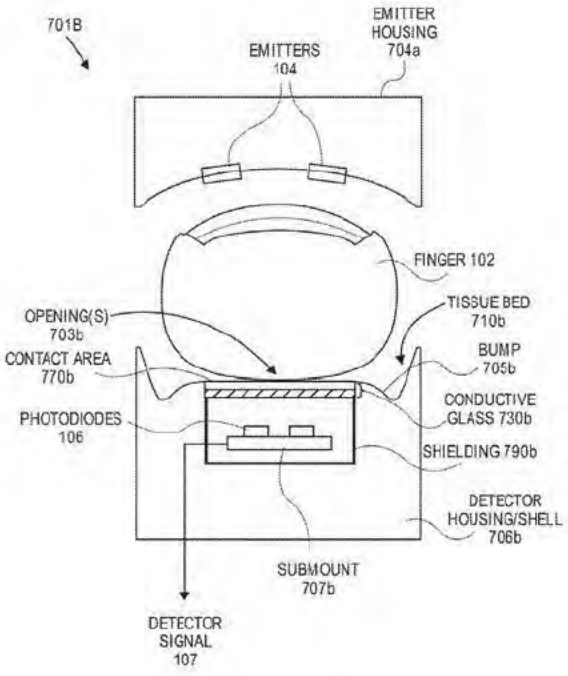

FIG. 7B

Id. at Fig. 7B. Figure 7B depicts two emitters and two detectors. *Id.* There are "one or more openings 703b," and "each of the openings 703 can include a separate window of the conductive glass 703b." *Id.* at 27:18-24. The specification provides that "shielding enclosure 790b . . . can have all the features of the shielding enclosure 790a." *Id.* at 27:28-29. "The shielding or

enclosure a can include an opaque material to not only reduce electrical noise, but also ambient optical noise." *Id.* at 27:1-3. The specification expressly provides that the sensors 701 depicted in Figure 7A and 7B "can be implemented with any of the sensors 101, 201, 301 described above." *Id.* at 26:25-26. One embodiment of sensor 301 is depicted in Figure 3C, which shows four photodetectors in four separate openings. *Id.* at 19:38-48.

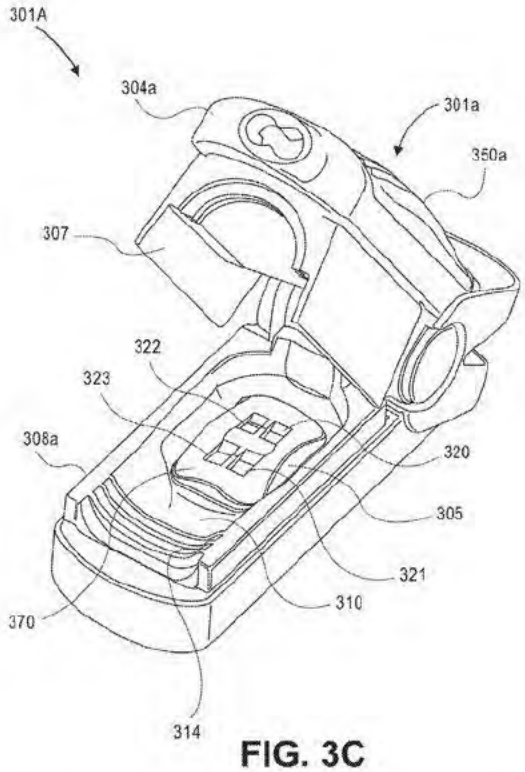

FIG. 3C

Id. at Fig. 3C. Complainants cite a disclosure from another part of the specification describing a "system 100 that comprised four LEDs in emitter 104 and four independent detector streams from detectors 106." *Id.* at 44:22-29, Fig. 21. Moreover, in Figure 13, "n emitters and n detectors are shown," although "the number of emitters and detectors need not be the same in certain implementations." *Id.* at 33:37-39, Fig. 13. Dr. Madisetti testified that these disclosures

provide full written description support for multiple LEDs, three or more photodiodes, and opaque lateral surfaces. Tr. (Madisetti) at 1347:18-1349:6.

In consideration of the parties' arguments, the evidence fails to show, clearly and convincingly, that the asserted claims reciting three or more LEDs, three or more photodiodes, and a protrusion with a plurality of openings over the photodiodes with opaque lateral surfaces lack written description. The specification of the Poeze patents expressly states that Figure 3C and Figure 7B are not distinct embodiments—"[t]he features of the sensors 701 can be implemented with any of the sensors 101, 201, 301 described above. JX-001 at 26:25-26. Figure 3C clearly depicts four photodiodes in separate openings. *Id.* at 19:38-48, Fig. 3C. Figure 7B clearly depicts these openings in a convex protrusion with opaque lateral surfaces. *Id.* at 27:13-41, Fig. 7B. Although Figure 7B only depicts two emitters, the specification describes sensor 101 including an emitter 104, which "can include one or more sources of optical radiation, such as LEDs . . . ." *Id.* at 12:5-9. In one embodiment, "the emitter 104 can emit optical radiation at three (3) or more wavelengths . . . ." *Id.* at 12:35-44. Moreover, the specification discloses that the number of emitters can match the number of detectors in the context of Figure 13, which is described as "an example multi-stream operation of the system of FIG. 1." *Id.* at 6:45-47, 33:37-39, Fig. 1, Fig. 13. In view of these disclosures, the evidence fails to clearly and convincingly show that the inventors lacked possession of a device with three or more LEDs, three or more photodiodes, and a protrusion with a plurality of openings over the photodiodes with opaque lateral surfaces. *Cf. Invidior Inc. v. Dr. Reddy's Labs., S.A.*, 930 F.3d 1325, 1349 (Fed. Cir. 2019) (finding disclosure "reasonably conveyed to a skilled artisan" the claimed films, and noting that "[t]he specification need not recite the claimed invention *in haec verba*").

Accordingly, the undersigned finds that Apple has not shown by clear and convincing evidence that the asserted claims of the Poeze patents are invalid for lack of written description with respect to the limitations requiring three or more LEDs, three or more photodiodes, and a protrusion with a plurality of openings over the photodiodes with opaque lateral surfaces.

2. Four Sets of at Least Three LEDs ('502 patent claim 22)

Apple contends that '502 patent claim 22 is invalid for lack of written description, because the specification fails to disclose four sets of at least three LEDs. RIB at 151; RRB at 75. Dr. Warren testified that he found no such disclosure in the specification of the Poeze patents. Tr. (Warren) at 1247:8-12. Apple argues that Figure 7B only depicts two emitters and the specification's reference to "sets of optical sources" is insufficient to disclose the claimed "at least four emitters . . . wherein each of the plurality of emitters comprises a respective set of at least three LEDs." JX-002 at claim 22.

Complainants argue that Dr. Warren's conclusory testimony is insufficient to show lack of written description. CIB at 180. Dr. Madisetti identified disclosures in the specification where multiple emitters are disclosed and the emitters are described as sets of optical sources. Tr. (Madisetti) at 1349:7-1350:3. In particular, the specification provides that "the emitter 104 can include one or more sources of optical radiation, such as LEDs . . . ." JX-001 at 12:5-8. And "[i]n an embodiment, the emitter 104 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation." *Id.* at 12:9-12. The specification incorporates by reference a patent application, U.S. Application No. 2006/0211924, which describes an array of emitters. *Id.* at 12:16-20. Figure 13 describes sets of emitters that are numbered to match the number of detectors. *Id.* at 33:37-39, Fig. 13.

Here, the evidence of record fails to show, clearly and convincingly, that four sets of at least three LEDs claimed in '502 patent claim 22 lack written description in the specification of the Poeze patents. Although there is no explicit disclosure of the claimed four sets of at least three LEDs, the specification provides that "the emitter 104 can include one or more sources of optical radiation, such as LEDs . . . ." JX-001 at 12:6-9. The specification also provides that the "emitter 104 can include sets of light-emitting diodes (LEDs) as its optical source." JX-001 at 13:16-17; *see also id.* at 12:9-12 ("In an embodiment, the emitter 104 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation."). Figure 13 depicts multiple "emitter set(s)" numbered 1 through n. *Id.* at 33:18-51.

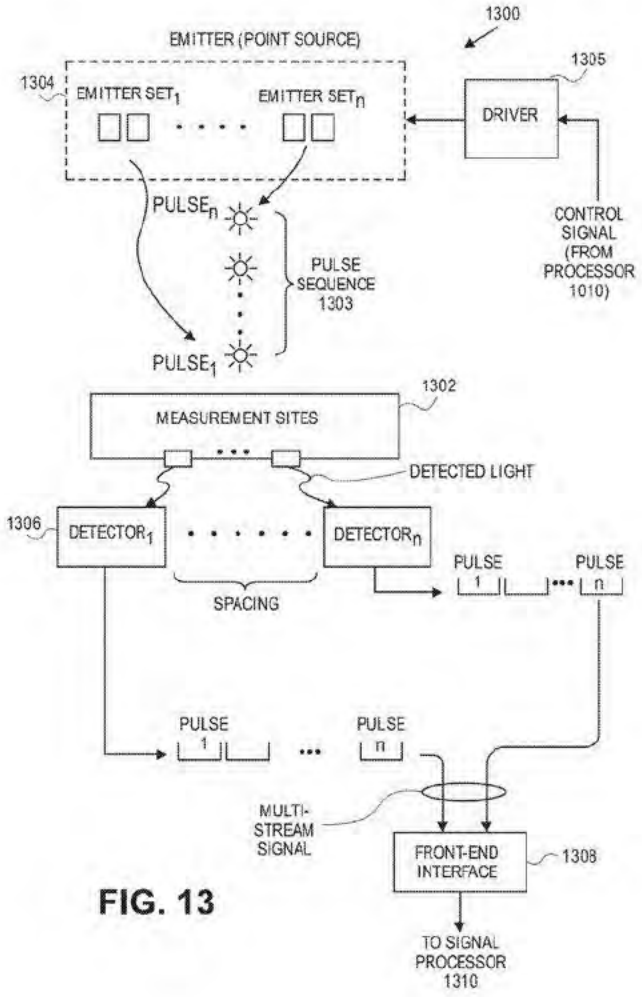

FIG. 13

Id. at Fig. 13. As discussed above, Figure 13 provides written description support for at least four sets of emitters, because the number of emitters matches the number of detectors, and the specification discloses at least four detectors. *See id.* at 33:37-39, Fig. 13. The specification further provides written description support for three LEDs in each set by referring to "sets of light-emitting diodes (LEDs)" with both "sets" and "LEDs" plural. *See id.* at 13:16-17; *see also id.* at 12:9-12 ("sets of optical sources"). Apple has not identified any reason that one of ordinary skill would read the plural "LEDs" as being limited to sets of two, and sets of three or more would be consistent with the disclosure that the emitters can be arranged in an array. *See id.* at 12:17-25.[58] In view of these disclosures, the evidence fails to clearly and convincingly show that the inventors lacked possession of a device with four sets of at least three LEDs. *Cf. Invidior v. Dr. Reddy's Labs.*, 930 F.3d at 1349.

Accordingly, Apple has not shown by clear and convincing evidence that '502 patent claim 22 is invalid for lack of written description with respect to the claimed four sets of three LEDs.

3. Separate Sets of LEDs Emitting at a First Wavelength and a Second Wavelength ('502 patent claim 28; '648 patent claim 12)

Apple contends that '502 patent claim 28 and '648 patent claim 12 are invalid for lack of written description, because the specification fails to disclose separate sets of LEDs emitting at the same "first wavelength" and "second wavelength." RIB at 151-52; RRB at 75. Dr. Warren testified that he found no disclosure for this limitation in the specification of the Poeze patents. Tr. (Warren) at 1247:13-17. Apple argues that the specification's reference to "sets of optical

[58] U.S. Patent Application Publication No. 2006/0211924 is incorporated by reference as an example of emitters arranged in an array.

sources" is insufficient to disclose the claimed two sets of LEDs each with "an LED configured to emit light at a first wavelength and an LED configured to emit light at a second wavelength." JX-002 at claim 28; JX-003 at claim 12.

Complainants argue that Dr. Warren's testimony is conclusory and insufficient to show lack of written description. CIB at 179. Dr. Madisetti identified disclosures in the specification of the Poeze patents "including sets of LEDs with different wavelengths." Tr. (Madisetti) at 1349:7-1350:3. In their briefing, Complainants point to the two emitters depicted in Figures 7A and 7B and the disclosure that "[i]n an embodiment, the emitter 104 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation." JX-001 at 12:9-12, Fig. 7A, Fig. 7B. Complainants also cite other disclosures describing different arrangements of emitters. *See id.* at 9:60-63, 12:13-25, 13:16-21, 21:51-54, 33:30-38, 38:8-22.

In consideration of the parties' arguments, the evidence of record shows, clearly and convincingly, that there is insufficient written description support for the limitations in '502 patent claim 28 and '648 patent claim 12 describing two sets of LEDs that each have LEDs emitting light at the same "first wavelength" and the same "second wavelength." This limitation does not merely require that there be two sets of LEDs, each emitting light at two different wavelengths—the claim language requires matching wavelengths in each set of LEDs, and there is no such disclosure in the specification of the Poeze patents. Complainants primarily rely on a disclosure in the specification that "[i]n an embodiment, the emitter 104 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation." JX-001 at 12:9-12; CIB at 180. Another part of the specification describes an embodiment where "the plurality of sets of optical sources may each comprise at least one top-emitting LED and at least one super luminescent LED." *Id.* at 9:60-62. But while these portions of the specification describe sets of

LEDs that are capable of emitting at different wavelengths, there is no disclosure of two separate sets of LEDs using the same wavelengths in each set.[59]

The specification repeatedly describes multiple wavelengths of light in sets of LEDs, but there is no disclosure of matching wavelengths between sets of LEDs. When describing emitters that are capable of emitting visible and near-infrared optical radiation, the specification describes two different wavelengths, three different wavelengths, or up to eight different wavelengths. *Id.* at 12:60-13:7. The specification does not describe any two LEDs having the same wavelength, however, instead emphasizing "a variety of wavelengths of visible or near-infrared optical radiation." *Id.* Similarly, when describing emitters using super luminescent LEDs and top emitting LEDs, the specification describes the different capabilities of these LEDs. *See id.* at 13:16-25 (describing "top-emitting LEDs emitting light at about 850 nm to 1350 nm" for optical radiation and "SLEDs or side-emitting LEDs to transmit near infrared optical radiation because these types of sources can transmit at high power or relatively high power.").

Consistent with Dr. Warren's testimony, these disclosures would not convey to persons of ordinary skill in the art that sets of LEDs with matching wavelengths were part of the alleged invention—there is no suggestion that two LEDs emit the same wavelengths or any benefit ascribed to such a pairing. This is similar to the claim limitation that was found invalid for lack of written description in *Purdue Pharma L.P. v. Faulding Inc.*, where the Federal Circuit found "nothing in the written description . . . that would suggest to one skilled in the art that the [claimed] ratio is an important defining quality of the formulation, nor does the disclosure even

[59] As discussed above in the context of obviousness, LEDs meeting this limitation are explicitly disclosed in the prior art in Lumidigm. *See* RX-0411 at 6:43-48. The Federal Circuit has held, however, that "it is the specification itself that must demonstrate possession," and "a description that merely renders the invention obvious does not satisfy the requirement." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1352 (Fed. Cir. 2010).

motivate one to calculate the ratio." 230 F.3d 1320, 1327 (Fed. Cir. 2000); *see also Ariad*, 598 F.3d at 1352 (noting that a description that "merely renders the invention obvious does not satisfy the requirement").[60]

Accordingly, the evidence shows, clearly and convincingly, that '502 patent claim 28 and '648 patent claim 12 are invalid for lack of written description.

4. Touch-Screen Display ('502 patent claim 28)

Apple contends that '502 patent claim 28 is invalid for lack of enablement, because the specification fails to enable a "touch-screen display" that "displays indicia responsive" to any "measurement." RIB at 152; RRB at 75-76. Dr. Warren testified that he only found two brief references to touch-screens in the patent specification. Tr. (Warren) at 1247:18-23. Apple argues that these disclosures are insufficient to enable a person of ordinary skill in the art to use a touch-screen on a user-worn device to display an oxygen saturation measurement. RIB at 152. Complainants argue that the specification discloses a touch-screen as one example of a user interface and further provides that physiological measurements can be shown on a display. CIB at 181-82; CRB at 104; *see* Tr. (Madisetti) at 1352:5-24, 1381:7-1382:8.

[60] Complainants argue that Dr. Warren's testimony at hearing was conclusory, but the specification clearly supports Dr. Warren's testimony that there is no disclosure in the specification of two sets of LEDs with matching wavelengths. *See* Tr. (Warren) at 1247:13-17. And Dr. Madisetti did not address this limitation in his rebuttal testimony, only identifying disclosures in the specification describing "sets of LEDs with different wavelengths" but failing to offer any opinion as to whether these disclosures support the claimed two sets of LEDs using the same two wavelengths. *See* Tr. (Madisetti) at 1349:7-1350:3, 1350:22-1352:4. Moreover, the written description analysis is not limited to expert testimony. *See, e.g., University of Rochester v. G.D. Searle & Co., Inc.*, 358 F.3d 916, 927 (Fed. Cir. 2004) ("[A] patent can be held invalid for failure to meet the written description requirement, based solely on the language of the patent specification. After all, it is in the patent specification where the written description requirement must be met.").

In consideration of the parties' arguments, the undersigned finds that the evidence fails to show, clearly and convincingly, the lack of an enabling disclosure for the claimed "touch-screen display" in the specification of the Poeze patents.

To prove a claim is invalid for lack of enablement, "a challenger must show by clear and convincing evidence that a person of ordinary skill in the art would not be able to practice the claimed invention without 'undue experimentation.'" *Amgen Inc. v. Sanofi, Aventisub LLC*, 987 F.3d 1080, 1084 (Fed. Cir. 2021) (internal quotations omitted). Whether undue experimentation is needed is "not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." *Id.* (quoting *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988)). The "*Wands*" factors are: "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." *Id.* at 1084. The Federal Circuit has stated that "after the challenger has put forward evidence that some experimentation is needed to practice the patented claim, the factors set forth in *Wands* then provide the factual considerations that a court may consider when determining whether the amount of that experimentation is either 'undue' or sufficiently routine such that an ordinarily skilled artisan would reasonably be expected to carry it out." *Amgen*, 987 F.3d at 1084-85.

Here, Apple has not presented any argument regarding the majority of the *Wands* factors, instead citing to a single sentence of expert testimony regarding the lack of explicit guidance in the specification. Apple does not provide, for example, any supporting evidence regarding the state of the prior art with respect to touchscreens and their use, or the quantity of experimentation

necessary.[61] Further, the specification discloses a monitoring device 200a that includes a display 210a and "can employ any of a variety of user interface designs, such as frames, menus, touch-screens, and any type of button." JX-001 at 17:20-26. The specification also discloses a monitor 209b, which "can include display 210b that can indicate a measurement for glucose," and "[o]ther analytes and forms of display can also appear on the monitor 209b." *Id.* at 17:67-18:3. This monitor is part of the claimed user-worn device, as "the monitor 209b can include a belt clip or straps (see, e.g., FIG. 2C) that facilitate attachment to a patient's belt, arm, leg, or the like." *Id.* at 17:56-59.

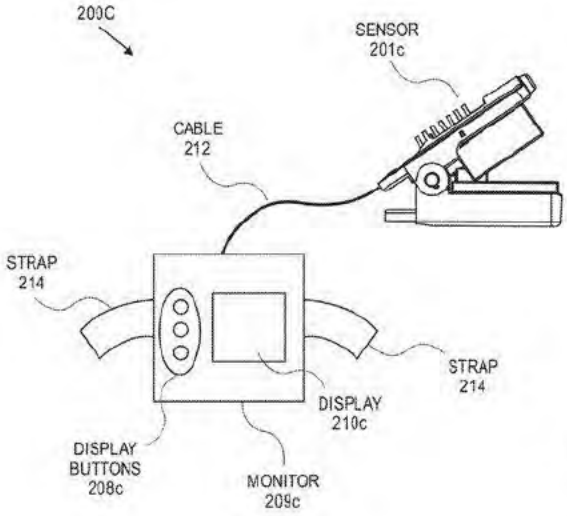

FIG. 2C

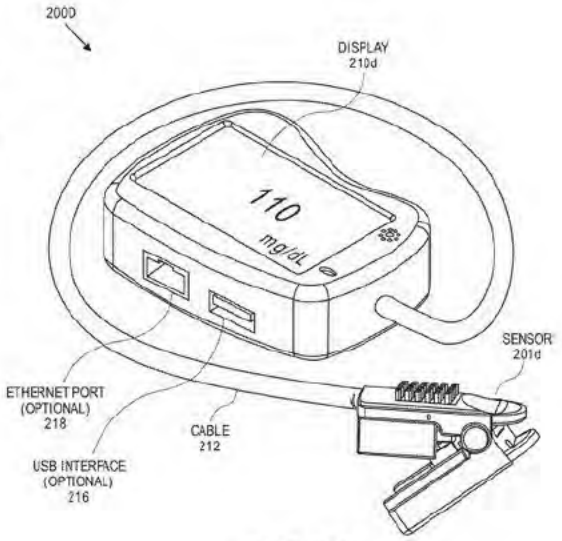

FIG. 2D

Id. at Fig. 2C, Fig. 2D. Although these features are described in the context of different figures, the specification provides that "certain of the features of the monitoring devices 200 shown in FIGS. 2A through 2D can be combined with features of the other monitoring devices shown." *Id.* at 16:39-42. Dr. Madisetti reviewed the disclosures of the patent and testified that "the

[61] To the contrary, Dr. Warren elsewhere testified that a touchscreen "could be incorporated in any visual depiction for a portable device." Tr. (Warren) at 1226:25-1227:7.

touchscreen display and indicia of measurement are fully enabled in the asserted claims." Tr. (Madisetti) at 1381:7-1382:8.

In view of the above, Apple has not shown, clearly and convincingly, that '502 patent claim 28 is invalid for lack of enablement with respect to the claimed "touch-screen display."

5. Light Piping ('501 patent claim 12, '502 patent claim 28, '648 patent claim 24)

Apple contends that '501 patent claim 12, '502 patent claim 28, and '648 patent claim 24 are invalid for lack of enablement with respect to limitations describing opaque surfaces that "avoid" or "reduce" "light piping." RIB at 152-53; RRB at 76. Apple further contends that '648 patent claim 24 is invalid for lack of written description with respect to being "configured to substantially prevent light piping." *Id.* Dr. Warren testified that the specification only provides "a vague correlation" between the use of opaque materials and the reduction of light piping. Tr. (Warren) at 1247:24-1248:4.

Complainants argue that Dr. Warren's conclusory testimony is insufficient to meet Apple's clear and convincing burden. CIB at 182. Complainants submit that the specification explicitly teaches the use of a hard opaque plastic to reduce light piping. *Id.* at 183 (citing JX-0001 at 7:65-8:7, 43:32-36). Complainants further cite an embodiment described in the specification wherein adding height "assists in deflecting light piping through the sensor." JX-0001 at 25:47-62. Dr. Madisetti reviewed these disclosures and offered his opinion that the written description and enablement requirements have been met for each of the "light piping" limitations. Tr. (Madisetti) at 1350:4-21, 1352:25-1353:11.

In consideration of the parties' arguments, the evidence of record fails to show, clearly and convincingly, that the specification of the Poeze patents fails to enable the "light piping" limitations of the asserted claims or lacks adequate written description with respect to '648

patent claim 24. As with the "touchscreen" arguments, Apple has not presented any argument regarding the majority of the *Wands* factors, instead citing to a single sentence of expert testimony regarding the lack of explicit guidance in the specification. *See* RIB at 152-53; CRB at 104-105. Moreover, the specification explicitly teaches that "[t]he protrusion can advantageously include plastic, including a hard opaque plastic, such as a black or other colored plastic, helpful in reducing light noise," and "[s]uch light noise includes light piping." JX-0001 at 7:65-8:7. In reference to the Figure 3 embodiments, a "noise shield" is disclosed that "may be configured to reduce noise, such as from ambient light and electromagnetic noise." *Id.* at 43:30-33. The specification provides that the noise shield "may be constructed from materials having an opaque color, such as black or a dark blue, to prevent light piping." *Id.* at 43:33-36. This teaching is also referenced in the context of Figures 7A and 7B, where the specification describes a "shielding enclosure" that "can include an opaque material to not only reduce electrical noise, but also ambient optical noise." *Id.* at 27:1-3.[62] *See generally* CIB at 182-183.

In view of the above, Apple has failed to show by clear and convincing evidence that any asserted claims are invalid for lack of enablement with respect to the "light piping" limitations.

Further, the undersigned finds that Apple has not shown by clear and convincing evidence that '648 patent claim 24 is invalid for lack of written description with respect to being "configured to substantially prevent light piping." Apple's written description argument is unclear and appears to be based on the same issues discussed with regard to enablement. *See* RIB at 152-53. For the reasons discussed *supra*, including the specification's descriptions

[62] In another embodiment where "an extension" is used "to increase the height of [a] partially cylindrical protrusion," "the added height assists in deflecting light piped through the sensor." JX-001 at 25:43-62.

regarding light piping and the lack of sufficient expert testimony or other record evidence, Apple has not met its burden.

I. Prosecution Laches and Unclean Hands

Apple argues that the Poeze patents are unenforceable due to prosecution laches and the doctrine of unclean hands because of Complainants' delays in patent prosecution. RIB at 153-59; RRB at 77-79.

Apple submits that the provisional applications that led to the Poeze patents were filed in July and August 2008, and Masimo continued to file related continuations and continuations-in-part through July 2010. *See* JX-001; JX-002; JX-003. After a five-year gap (and after the first Apple Watch was released), Masimo filed a new continuation application in December 2015. *See* U.S. Patent App. No. 14/981,290 (cited in JX-001; JX-002; JX-003). Masimo then filed several additional continuation applications between December 2018 and March 2020,[63] and then filed the applications leading to the three asserted Poeze patents on September 24, 2020, within days of the release of the Apple Watch Series 6. *See* JX-001; JX-002; JX-003; RX-0333 (9/15/20 press release announcing Apple Watch Series 6).

Apple argues that the twelve-year delay between the 2008 filings of the original provisional applications and the 2020 filings of the continuation applications for the Poeze patents warrants a determination that the patents are unenforceable due to prosecution laches. RIB at 153-59. Apple submits that Masimo has provided no credible explanation for the long delay in filing the continuation applications and that the totality of the circumstances shows that Masimo lacked diligence in prosecuting the Poeze patents. *Id.* at 155-57. Apple argues that the

[63] Apple argues that these continuation applications were filed after the release of version of the Apple Watch in 2018 and 2019. *See* RDX-1.16.

timing of Masimo's patent application filings shows that the delays in prosecution were intentional—taking advantage of the growth in the market for wearable technology and allowing Masimo to draft claims targeting Apple Watch products after their release. *Id.* at 156-57.

Apple submits that it has suffered prejudice due to Masimo's patent prosecution delays, because Apple invested heavily in the development of the Apple Watch products, including the blood oxygen feature. RIB at 157-58; RRB at 78. Apple argues that Masimo gained an improper litigation advantage by waiting to draft its patent claims until after the release of the Apple Watch Series 6, noting that the prosecuting attorney for the Poeze patents admitted that he had [redacted] of the Apple Watch Series 6 during prosecution. *See* Tr. (Cromar) at 1031:13-22. Apple argues that the prosecution of other patents in the family of the Poeze patents is irrelevant to the inquiry into whether Masimo was diligent with respect to the prosecution of the asserted Poeze patents. RRB at 77-78.

Apple argues that Masimo's conduct with respect to the prosecution of the Poeze patents meets the legal requirements for unenforceability due to prosecution laches and also that this conduct should bar Complainants' claims for relief in this investigation under the doctrine of unclean hands. RIB at 158-59; RRB at 77-79.

Complainants argue that Apple has failed to meet its burden with respect to prosecution laches or unclean hands. CIB at 183-85; CRB at 105-108. Complainants submit that the prosecution of applications in the family of the Poeze patents was continuous throughout the alleged 12-year period identified by Apple. CIB at 183-84. Mr. Cromar testified that there were "a dozen applications being actively prosecuted" during the alleged five-year "gap" between 2010 and 2015. Tr. (Cromar) at 1039:7-12. Complainants' expert on PTO practice and procedure, Robert Stoll, testified that there was a "continuous unbroken chain of patent

prosecution" in the family of the Poeze patents. Tr. (Stoll) at 1415:2-10. Complainants argue that the legal precedent requires considering diligence with respect to all of these related patent applications. CRB at 106. Complainants dispute Apple's timeline tying patent application filings to versions of the Apple Watch, which were released every year from 2015 to 2020. *Id.* at 106-107. Complainants argue that there is nothing improper about drafting claims to cover competitors' products. *Id.* at 107-108. Complainants further argue that there can be no prejudice to Apple because the specification of the Poeze patents was published in February 2010. *See* CX-0137 (U.S. Patent Pub. No. 2010/0030040).

In consideration of the parties' arguments, the undersigned finds that Apple has not carried its burden to show that the Poeze patents should be found unenforceable due to prosecution laches or unclean hands. To establish a defense of prosecution laches, an accused infringer must show: (1) that the patentee's delay in prosecution was unreasonable and inexcusable under the totality of circumstances, and (2) that the accused infringer suffered prejudice attributable to the delay. *Cancer Rsch. Tech. Ltd. v. Barr Labs., Inc.*, 625 F.3d 724, 728-29 (Fed. Cir. 2010). The Federal Circuit has held that "an examination of the totality of the circumstances[] include[s] the prosecution history of all of a series of related patents." *Symbol Techs., Inc. v. Lemelson Med., Educ. & Rsch. Found.*, 422 F.3d 1378, 1386 (Fed. Cir. 2005) ("*Symbol Techs.*").

Here, the record evidence is insufficient to support a finding of unreasonable or inexcusable delay with respect to the prosecution of the Poeze patents. Apple cites a five-year delay in the filing of continuation applications between 2010 and 2015, but there was continuous prosecution activity in the family of the Poeze patents during this time. *See* Tr. (Cromar) at

1038:7-19.[64] The fact that the 2015 continuation application could have been filed earlier is not a sufficient basis for finding of prosecution laches, as the Federal Circuit has recognized that "[t]here are legitimate grounds for refiling a patent application which should not normally be grounds for a holding of laches, and … [t]he doctrine should be applied only in egregious cases of misuse of the statutory patent system . *Symbol Techs.*, 422 F.3d at 1385. The next application in the Poeze patent family was a divisional application (U.S. Patent Application No. 16/212,537) filed in December 2018, and the Federal Circuit has held that "[f]iling a divisional application in response to a requirement for restriction" is a "legitimate reason for refiling a patent application . . . even when one defers the filing of a divisional application until just before the issuance of the parent application." *Id.* In the context of this continuous prosecution activity in the family of the Poeze patents, Apple's arguments tying certain patent application filings to release dates for the Apple Watch is unpersuasive. *See* RDX-1C.16. Apple has failed to identify actions by Masimo that resemble the type of conduct recognized by the Federal Circuit as unjustifiable prosecution delay, such as refiling applications containing previously-allowed claims, repetitive filing of applications that were merely placeholders, or a "consistent pattern of receiving a rejection on an application, filing a continuation application without any amendments, and abandoning the original application." *See Hyatt v. Hirshfeld*, 998 F.3d 1347, 1361-62, 1366-69 (Fed. Cir.

[64] U.S. Patent Application No. 12/497,523, filed on July 2, 2009, issued as U.S. Patent No. 8,347,825 on May 7, 2013; U.S. Patent Application No. 12/497/528, filed on July 2, 2009, issued as U.S. Patent No. 8,577,431 on November 5, 2013; and U.S. Patent Application No. 12/829,352, filed on July 1, 2010, issued as U.S. Patent No. 9,277,880 on March 8, 2016. *See* JX-0001 (identifying continuation applications); JX-004 at 418-26 (information disclosure statement identifying Masimo's pending patent applications and issued patents).

2021).[65] The record evidence in this investigation is insufficient to support a finding of prosecution laches.

Moreover, because the undersigned does not find evidence of bad faith conduct by Masimo during the prosecution of the Poeze patents, there is no basis for any finding of unclean hands. Apple's unclean hands defense is based solely on Masimo's alleged misconduct during the prosecution of the Poeze patents, RIB at 158-59, and Apple does not argue that any particular conduct would be the basis for a finding of unclean hands without a finding of inequitable conduct.

V. U.S. PATENT NO. 10,687,745

The '745 patent is entitled "Physiological Monitoring Devices, Systems, and Methods," naming inventor Ammar Al-Ali and issuing from an application filed on March 31, 2020, claiming priority to a provisional application filed on July 2, 2015, and a non-provisional application filed on June 28, 2016. JX-009.

A. Specification

The specification of the '745 patent describes a method for pulse oximetry wherein an emitter irradiates a surface area on the skin. *See* JX-009 at 6:21-54, Fig. 2. The patent refers to this method as "three-dimensional (3D) pulse oximetry in which the emitted light irradiates a larger volume of tissue . . . as compared to the 2D point optical source approach." *Id.* at 6:21-26.

[65] Apple points to evidence that Masimo's patent prosecution counsel had [redacted] during prosecution, Tr. (Cromar) at 1031:13-22, but the Federal Circuit has held that "there is nothing improper, illegal or inequitable in filing a patent application for the purpose of obtaining a right to exclude a known competitor's product from the market; nor is it in any manner improper to amend or insert claims intended to cover a competitor's product the applicant's attorney has learned about during the prosecution of a patent application." *Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 874 (Fed. Cir. 1988). Moreover, Apple has not provided evidence showing that newly asserted claim limitations were specifically drawn to the Accused Products.

In one embodiment, a "light diffuser 304 receives the optical radiation emitted from the emitter 302 and spreads the optical radiation over an area." *Id.* at 7:42-44.

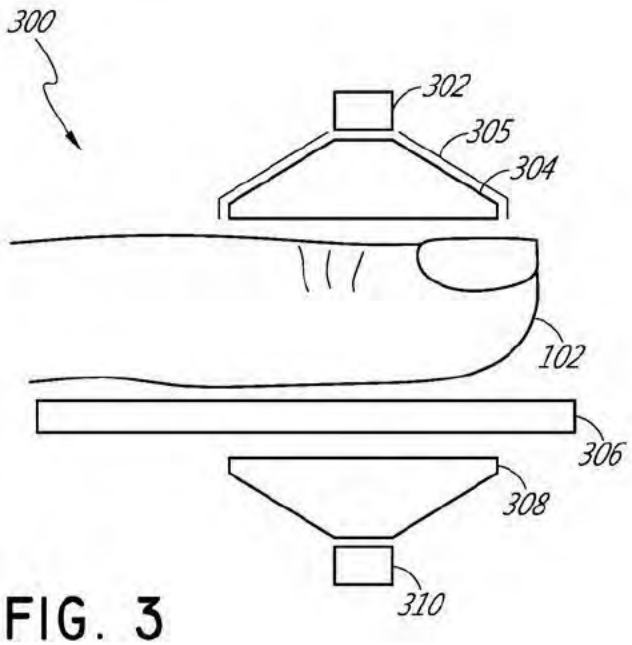

FIG. 3

Id. at Fig. 3. The specification provides examples of the diffuser distributing light "in a predefined geometry (e.g., a rectangle, square, or circle)." *Id.* at 8:9-12. The specification further describes a "light concentrator 308," which "is a structure to receive the emitted optical radiation, after attenuation by the tissue measurement site 102." *Id.* at 9:11-18.

In a separate embodiment, a "3D sensor 700 can be placed on a portion of the patient's body that has relatively flat surface, such as, for example a wrist, because emitter 702 and detector 710 are located on the same side of the tissue measurement site 102." *Id.* at 10:40-51.

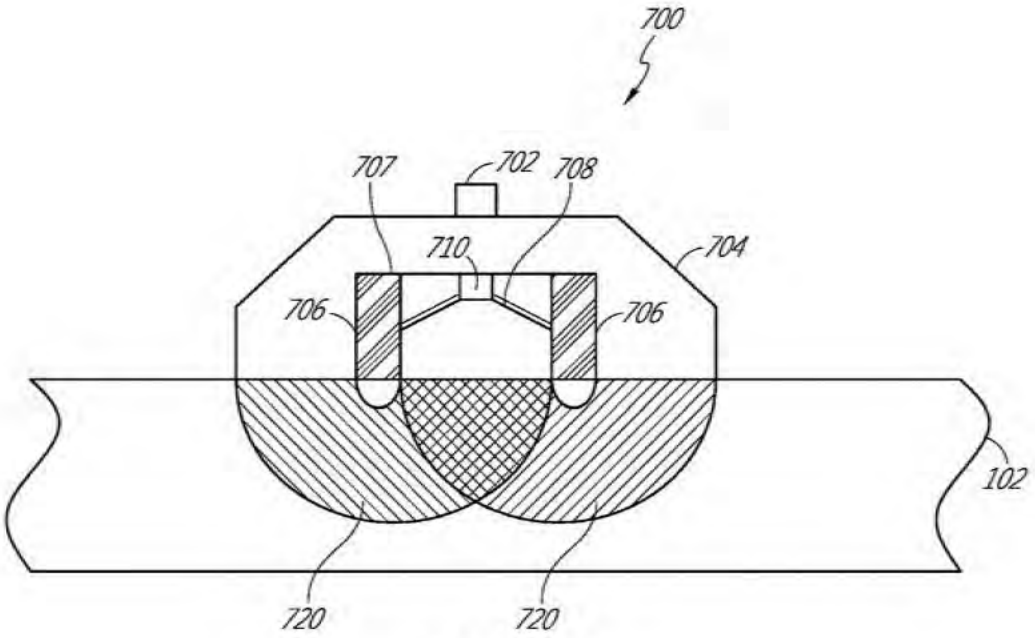

FIG. 7A

Id. at Fig. 7A. This embodiment includes a "light diffuser 704" that "receives the optical radiation emitted from the emitter 702 and homogenously spreads the optical radiation over a wide, donut-shaped area." *Id.* at 10:65-11:9, Fig. 7B. This embodiment further comprises a "light blocker 706" that "includes an annular ring having a cover portion 707 sized and shaped to form a light isolation chamber for the light concentrator 708 and the detector 710." *Id.* at 11:11-13.

B. Claims

Complainants assert infringement of claims 9 and 27, and they rely on claim 18 for domestic industry. Claim 9 depends from claim 1, recited below:

> 1. A physiological monitoring device comprising:
>
> a plurality of light-emitting diodes configured to emit light in a first shape;
>
> a material configured to be positioned between the plurality of light-emitting diodes and tissue on a wrist of a user when the physiological monitoring device is in use, the material configured to change the first shape into a second shape

by which the light emitted from one or more of the plurality of light-emitting diodes is projected towards the tissue;

a plurality of photodiodes configured to detect at least a portion of the light after the at least the portion of the light passes through the tissue, the plurality of photodiodes further configured to output at least one signal responsive to the detected light;

a surface comprising a dark-colored coating, the surface configured to be positioned between the plurality of photodiodes and the tissue when the physiological monitoring device is in use, wherein an opening defined in the dark-colored coating is configured to allow at least a portion of light reflected from the tissue to pass through the surface;

a light block configured to prevent at least a portion of the light emitted from the plurality of light-emitting diodes from reaching the plurality of photodiodes without first reaching the tissue; and

a processor configured to receive and process the outputted at least one signal and determine a physiological parameter of the user responsive to the outputted at least one signal.

JX-009 at 15:31-61.

9. The physiological monitoring device of claim 1, wherein the physiological parameter comprises oxygen saturation.

Id. at 16:21-23. Claim 18 depends from claim 15, recited below:

15. A physiological monitoring device comprising:

a plurality of light-emitting diodes configured to emit light proximate a wrist of a user;

a light diffusing material configured to be positioned between the plurality of light-emitting diodes and a tissue measurement site on the wrist of the user when the physiological monitoring device is in use;

a light block having a circular shape;

a plurality of photodiodes configured to detect at least a portion of the light emitted from the plurality of light-emitting diodes after the light passes through the light diffusing material and a portion of the tissue measurement site encircled by the light block, wherein the plurality of photodiodes are arranged in an array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site encircled by the light block, wherein the plurality of photodiodes are further configured to output at least one signal

responsive to the detected light, and wherein the plurality of light-emitting diodes and the plurality of photodiodes are arranged in a reflectance measurement configuration;

wherein the light block is configured to optically isolate the plurality of light-emitting diodes from the plurality of photodiodes by preventing at least a portion of light emitted from the plurality of light-emitting diodes from reaching the plurality of photodiodes without first reaching the portion of the tissue measurement site;

a processor configured to receive and process the outputted at least one signal and determine a physiological parameter of the user responsive to the outputted at least one signal; and

wherein the physiological monitoring device is configured to transmit physiological parameter data to a separate processor.

Id. at 16:36-17:3.

18. The physiological monitoring device of claim 15, wherein the physiological parameter comprises oxygen saturation.

Id. at 17:10-12. Claim 27 depends from claim 20, recited below:

20. A system configured to measure one or more physiological parameters of a user, the system comprising:

a physiological monitoring device comprising:

a plurality of light-emitting diodes configured to emit light in a first shape;

a material configured to be positioned between the plurality of light-emitting diodes and tissue of the user when the physiological monitoring device is in use, the material configured to change the first shape into a second shape by which the light emitted from one or more of the plurality of light-emitting diodes is projected towards the tissue;

a plurality of photodiodes configured to detect at least a portion of the light after the at least the portion of the light passes through the tissue, the plurality of photodiodes further configured to output at least one signal responsive to the detected light;

a surface comprising a dark-colored coating, the surface configured to be positioned between the plurality of photodiodes and the tissue when the physiological monitoring device is in use, wherein an opening defined in the dark-colored coating is configured to allow at least a portion of light reflected from the tissue to pass through the surface;