

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

IPR2024-00241
Patent 10,687,743 B1

Before RICHARD H. MARSCHALL, DAVID COTTA, and
ALYSSA A. FINAMORE, *Administrative Patent Judges*.

COTTA, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining Some Challenged Claims Unpatentable

35 U.S.C. § 318(a)

Dismissing Petitioner's Motion to Exclude and
Patent Owner's Motion to Strike

37 C.F.R. § 42.64(c)

Granting Petitioner's Motions to Seal

37 C.F.R. §§ 42.14, 42.54(a)

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition to institute an *inter partes* review (“IPR”) of claims 1–25 (the “challenged claims”) of U.S. Patent No. 10,687,743 B1 (Ex. 1001, “the ’743 patent”). Paper 3 (“Petition” or “Pet.”). Masimo Corporation (“Patent Owner”) filed a Preliminary Response. Paper 7. With our authorization, Petitioner filed a Preliminary Reply to Patent Owner’s Preliminary Response, and Patent Owner filed a Preliminary Sur-reply. Paper 10; Paper 11.

We instituted trial on July 9, 2024. Paper 12 (“Institution Decision” or “Inst. Dec.”). During trial, Patent Owner filed a Patent Owner Response (Paper 19, “PO Resp.”), Petitioner filed a Reply (Paper 27, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 41, “PO Sur-reply”).¹

With our prior authorization (Ex. 3003), Patent Owner filed a Motion to Strike portions of Petitioner’s Reply (Paper 31, “PO MTS”), to which Petitioner filed an Opposition (Paper 36, “Pet. MTS Opp.”).

Petitioner filed a Motion to Exclude (Paper 38, “Pet. MTE”), to which Patent Owner filed an Opposition (Paper 40, “PO MTE Opp.”).

Petitioner filed several Motions to Seal various papers filed in this proceeding. Papers 24, 28, 43, 45, 48.

¹ Patent Owner’s Response, Petitioner’s Reply, and Patent Owner’s Sur-reply include material that the parties assert is confidential. The record includes redacted, public versions of all three documents. *See* Paper 23 (Patent Owner’s Response), Paper 32 (Petitioner’s Reply), and Paper 46 (Patent Owner’s Sur-reply).

An oral hearing was held on April 16, 2025, a transcript of which has been entered into the record. Papers 50 (public session, “Tr.”), 51 (confidential session).

After oral argument, we authorized Patent Owner to file specific evidence that it contends responds to new prior art references identified and new arguments raised in Petitioner’s Reply. Exs. 3004, 3005, 3007. In addition, we authorized Patent Owner to file a Supplemental Brief (Ex. 3007), which it filed on May 9, 2025 (Paper 49, “PO Supp. Br.”).²

We have jurisdiction under 35 U.S.C. § 6(b). After considering the full record developed through trial, we determine that Petitioner has proved by a preponderance of the evidence that claims 1–8, 11, 12, 14–16, 18, 19, and 21–25 are unpatentable. We further determine that Petitioner has not established by a preponderance of the evidence that claims 9, 10, 13, 17, and 20 are unpatentable. Our reasoning is explained below, and we issue this Final Written Decision under 35 U.S.C. § 318(a). In addition, we grant Petitioner’s Motions to Seal (Papers 24, 28, 43, 45, 48), we dismiss as moot Patent Owner’s Motion to Strike (Paper 31), and we dismiss as moot Petitioner’s Motion to Exclude (Paper 38).

A. Real Parties-in-Interest

Petitioner identifies itself, Apple Inc., as the real party-in-interest. Pet. 88. Patent Owner identifies itself, Masimo Corporation, as the real party-in-interest. Paper 4, 1.

² Patent Owner’s Supplemental Brief includes material that the parties assert is confidential. The record includes a redacted, public version of Patent Owner’s Brief. See Paper 49.

B. Related Matters

The parties identify as a related matter the following lawsuit involving the '743 patent: *Apple Inc. v. Masimo Corp.*, No. 1:22-cv-01378-MN-JLH (D. Del.) (hereafter "Delaware Litigation"). Pet. 88; Paper 4, 1. Petitioner also identifies as a related matter ITC proceeding Inv. No. 337-TA-1276 that concerns the '743 patent. Pet. 88.

Petitioner also challenged claims of the '743 patent in IPR2024-00242. We denied institution in that case. IPR2024-00242, Paper 12.

Patent Owner also identifies the following patents and applications claiming priority to, or sharing a priority claim with, the '743 patent: U.S. Patent No. 10,448,871 B2 (issued from U.S. Application No. 15/195,199 ("the '199 Application")); U.S. Patent No. 10,470,695 B2 (issued from U.S. Application No. 16/226,249); U.S. Patent No. 10,638,961 B2 (issued from U.S. Application No. 16/532,061); U.S. Patent No. 10,646,146 B2 (issued from U.S. Application No. 16/532,065); U.S. Patent No. 10,722,159 B2 (issued from U.S. Application No. 16/791,963); U.S. Patent No. 10,687,744 B1 (issued from U.S. Application No. 16/835,712); U.S. Patent No. 10,687,745 B1 (issued from U.S. Application No. 16/835,772; also under Reexamination Request 90/019,457); and U.S. Application No. 16/871,874. Paper 4, 1; Paper 8, 1.

Patent Owner also identifies the following PTAB proceedings in which Petitioner has challenged patents asserted by Patent Owner in the Delaware Litigation: IPR2024-00290 (challenging U.S. Patent No. 8,190,223 B2); IPR2024-00296 (challenging U.S. Patent No. 10,984,911 B2); IPR2024-00243 (challenging U.S. Patent No. 10,722,159 B2); IPR2024-00244 (challenging U.S. Patent No. 10,722,159 B2); IPR2024-

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00293 (challenging U.S. Patent No. 10,736,507 B2); IPR2024-00294 (challenging U.S. Patent No. 10,736,507 B2). And Petitioner identifies as relevant the following PTAB proceedings in which it has challenged Patent Owner's patents: IPR2020-01722 (challenging U.S. Patent No. 10,470,695 B2); IPR2022-01291 (challenging U.S. Patent No. 10,687,745 B1); and IPR2022-01292 (challenging U.S. Patent No. 10,687,745 B1). Pet. 89.

C. The '743 Patent

The '743 patent is directed to a non-invasive, optical-based physiological monitoring device. Ex. 1001, code (57). In one embodiment, the device is utilized to measure a patient's arterial blood oxygen saturation, sometimes shorthand as "SpO2." *See id.* at 1:20–25, 1:53–2:3, 2:15–17. In other embodiments, the device is utilized to measure other blood constituent characteristics. *See id.* at 2:39–49 (stating the device can measure "oxygen, carboxyhemoglobin, methemoglobin, total hemoglobin, glucose, proteins, lipids, a percentage thereof (e.g., saturation), pulse rate, perfusion index, oxygen content, total hemoglobin, Oxygen Reserve Index™ (ORI™) or . . . many other physiologically relevant patient characteristics").

Figure 3 of the '743 patent is reproduced below.

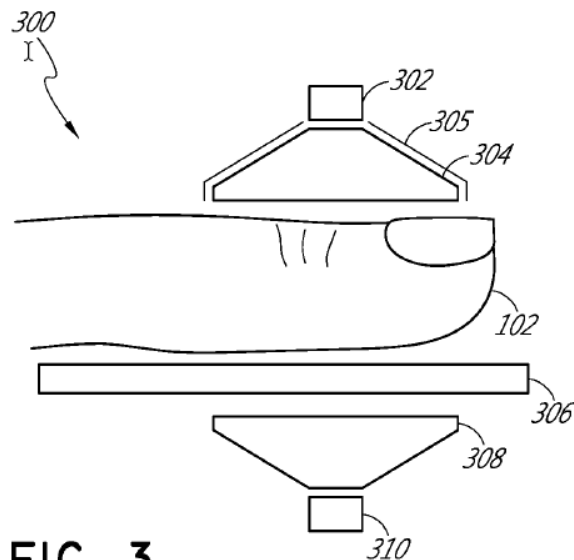


Figure 3 is a schematic side view of pulse oximetry sensor 300 and tissue measurement site 102 (i.e., a patient's fingertip). *Id.* at 5:12–14, 7:4–9. Sensor 300 includes “a reflector 305,” “an emitter 302, a light diffuser 304, a light-absorbing detector filter 306, a light concentrator 308, and a detector 310.” *Id.* at 7:12–18.

Emitter 302 emits light toward tissue site 102, and diffuser 304 spreads the light over an area. *See id.* at 7:12–14, 7:30–49. “In some embodiments, the light diffuser 304 is a beam shaper that can homogenize the input light beam from the emitter 302, shape the output intensity profile of the received light, and define the way (e.g., the shape or pattern) the emitted light is distributed to the tissue measurement site 102.” *Id.* at 7:44–49; *see also id.* at 7:63–66 (“Advantageously, the diffuser 304 can receive emitted light in the form of a point optical source and spread the light to fit a desired surface area on a plane defined by the surface of the tissue measurement site 102.”). Reflector 305 prevents the emitted light from

escaping out of the top portion of diffuser 304, thereby maximizing the light that reaches tissue site 102. *Id.* at 7:14–29.

The light enters tissue site 102, interacts with the patient's blood flowing through the tissue site, and exits the tissue on the opposite side from which the light entered the tissue. *Id.* at Fig. 3, 6:55–64, 7:6–22. Filter 306 is coated with a “light-absorbing” material “such as, for example, black pigment,” and it has an opening (not shown in Figure 3) through which the transmitted light may pass to reach light concentrator 308 and light detector 310. *Id.* at 7:12–14, 8:32–38, 8:54–59; *see also id.* at 9:31–51 (describing light absorbing filter 306 in Figure 4A as having a “rectangular opening 402,” through which light may pass to light concentrator 308 and light detector 310). Detector 310 outputs a signal responsive to the transmitted light, and the signal is communicated to a processor which utilizes the signal to determine a physiological parameter of interest, such as blood oxygen saturation. *Id.* at 9:19–30; *see also id.* at 12:1–14:29 (describing embodiment depicted in Figure 8).

Figures 7A and 7B of the '743 patent are reproduced below.

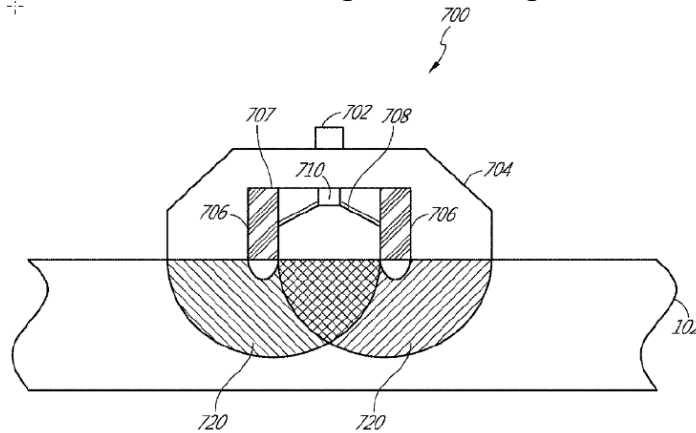


FIG. 7A

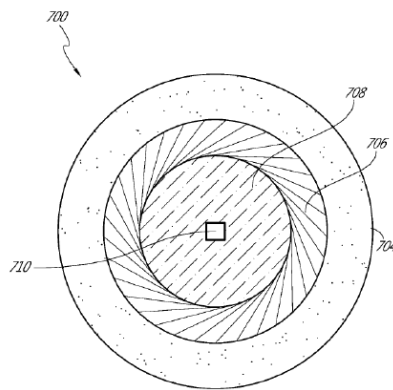


FIG. 7B

Figure 7A is a schematic side view of pulse oximetry sensor 700 and tissue measurement site 102, and Figure 7B is a schematic top view of sensor 700 with some components removed. *Id.* at 5:28–33, 10:40–42, 11:54–56. The '743 patent describes sensor 700 as useful in connection with a tissue site having a “relatively flat surface, such as, for example a wrist, because the emitter 702 and detector 710 are . . . located [on] the same side of the tissue measurement site 102.” *Id.* at 10:43–49. Sensor 700 includes light diffuser 704 and light concentrator 708, and components 702, 704, 708, and 710 function substantially the same as corresponding components 302, 304, 308, and 310 of sensor 300 as described above. *Id.* at 10:49–11:9, 11:21–43. One difference, however, is that diffuser 704 spreads the light “over a wide,

donut-shaped area . . . outlined by the light diffuser 704” (seen best in Figure 7B) to enter tissue site 102. *Id.* at 10:65–11:6. Sensor 700 additionally includes light blocker 706 and cover 707, which prevent light from emitter 702 from passing directly into light detector 710 without first traversing light path 720 within tissue site 102. *Id.* at 11:10–20, 11:44–67.

D. Challenged Claims

The ’743 patent includes 25 claims, all of which Petitioner challenges here. Independent claims 1 and 22 are illustrative of the subject matter of the challenged claims and are reproduced below.

1. *[Ipre]* A physiological measurement device comprising:

[1a] one or more emitters configured to emit light in an initial light pattern;

[1b] an optical transmission material configured to be positioned between the one or more emitters and a tissue measurement site, wherein the optical transmission material is configured to alter a direction of at least a portion of the light emitted from the one or more emitters to shape an output light pattern by which the emitted light is directed toward a surface of the tissue measurement site, wherein the output light pattern comprises a different geometric shape than the initial light pattern;

[1c] a plurality of detectors configured to detect at least a portion of the light after passing through tissue, the plurality of detectors further configured to output at least one signal responsive to the detected light;

[1d] a light block configured to prevent at least a portion of the light emitted from the one or more emitters from reaching the plurality of detectors without first reaching the tissue;

[1e] a surface comprising a dark-colored coating, the surface positioned between the plurality of detectors and the tissue, 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; and

[1f] a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signals.

22. [22pre] A physiological measurement device comprising:

[22a] one or more emitters configured to emit light;

[22b] a diffuser configured to be positioned between the one or more emitters and a tissue measurement site;

[22c] a circular shaped light block;

[22d] a plurality of detectors configured to detect at least a portion of the light after the light passes through a portion of the tissue measurement site bounded by the light block, wherein the plurality of detectors are arranged in an array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site bounded by the circular shaped light block, wherein the plurality of detectors are further configured to output at least one signal responsive to the detected light;

[22e] wherein the light block is configured to prevent at least a portion of light emitted from the one or more emitters from reaching the plurality of detectors without first reaching tissue; and

[22f] a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of the user responsive to the one or more signals.

Ex. 1001, 15:32–62, 17:29–18:18 (with bracketed designations added by Petitioner (*see* Pet. vii–xvi)).

E. Asserted Grounds of Unpatentability

Petitioner asserts that claims 1–25 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §³	Reference(s)/Basis
1–6, 9–13, 24, 25	103	Iwamiya, ⁴ Sarantos ⁵
7	103	Iwamiya, Sarantos, Utter ⁶
8	103	Iwamiya, Sarantos, Han ⁷
14–21	103	Iwamiya, Sarantos, Utter, Han
22–23	103	Iwamiya

Petitioner relies on the Declarations of Brian W. Anthony, Ph.D. Exs. 1003, 1079. Patent Owner relies on the Declarations of Vijay K. Madiseti, Ph.D. Exs. 2002, 2100, 2120. In its post-hearing Supplemental Brief, Patent Owner relies on the Declarations of R. James Duckworth, Ph.D., filed in the -1291 IPR. Exs. 2121, 2122.

³ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. §§ 102, 103 effective March 16, 2013. The date of the earliest patent document to which the ’743 patent claims priority is July 2, 2015. *See* Ex. 1001, codes (63), (60). Because that date falls after the effective date of the applicable AIA amendments, we apply the AIA versions of §§ 102 and 103 here.

⁴ Iwamiya et al., US 8,670,819 B2, issued Mar. 11, 2014 (Ex. 1004, “Iwamiya”).

⁵ Sarantos et al., US 9,392,946 B1, issued July 19, 2016 (Ex. 1005, “Sarantos”).

⁶ Utter, II, US 8,446,275 B2, issued May 21, 2013 (Ex. 1006, “Utter”).

⁷ Han et al., US 2016/0058312 A1, published Mar. 3, 2016 (Ex. 1008, “Han”).

II. ANALYSIS

A. Legal Principles

To prevail in its challenges, Petitioner must prove unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d). “In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burdens of proof in an *inter partes* review).

Petitioner relies on obviousness in its challenges. Pet. 1–2. A claim is unpatentable as obvious under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the claimed invention pertains. 35 U.S.C. § 103; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, objective indicia of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In determining the level of skill in the art, we consider the problems encountered in the art, the art’s solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner describes a person of ordinary skill in the art (“POSA”) as follows:

A person of ordinary skill in the art relating to the subject matter of the ’743 Patent (“[POSA]”) would have had a working knowledge of physiological monitoring technologies. A [POSA] 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 had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline.

Pet. 6–7 (citations omitted).

Patent Owner does not challenge Petitioner’s definition of the level of skill in the art, but argues that Petitioner “failed to show unpatentability under any proposed level of skill.” PO Resp. 6–7 (noting that we adopted Petitioner’s definition in the Institution Decision but not challenging that definition).

Petitioner’s definition of the POSA is consistent with the level of skill reflected in the ’743 patent and the asserted prior art. Accordingly, we adopt Petitioner’s description. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining “the prior art itself [may] reflect[] an

appropriate level” as evidence of the ordinary level of skill in the art) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

C. Claim Construction

We interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). Under this standard, we construe the claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* We address only those claim terms that are necessary to resolve the dispute before us. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

Here, we address arguments relating to: (1) the claim term “opening” and (2) claim language requiring a “plurality of detectors” that are “arranged in an array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site bounded by the circular shaped light block.”

1. “Opening”

The term “opening” appears in independent claims 1 and 14. Ex. 1001, 15:55, 16:59. Petitioner submits that “no claim terms need be construed to resolve issues of controversy in the present Petition.” Pet. 7. Patent Owner contends that as applied to the term “opening” in independent

claims 1 and 14, Petitioner's position in this proceeding is inconsistent with Petitioner's claim construction in the Delaware Litigation and that Petitioner's challenge fails as a result. PO Resp. 8–11; PO Sur-reply 1–3. We address the parties' arguments below.

We begin by considering whether there is a dispute with respect to the meaning of the term “opening.” We determine that there is not. Neither party contends that the term “opening” needs to be construed. Pet. 7 (arguing “no claim terms need to be construed”); PO Resp 8–11 (arguing that Petitioner interprets the term “opening” differently here and in the Delaware Litigation, but not advancing a claim construction or arguing that the claims need to be construed); PO Sur-reply 3 n.2 (“Because [the] Petition fails as a procedural matter, the Board need not decide the correct construction.”). Indeed, in this proceeding, the parties ascribe the same meaning to the term “opening.” Pet. Reply 1 (“For the term ‘opening,’ [Petitioner] properly applied the prior art to the challenged claims consistent with the positions taken by [Patent Owner] for infringement purposes” that “an ‘opening’ is an area through which light is configured to pass, which could be empty space or transparent material.”); PO Sur-reply 3 n.2 (“[Patent Owner] maintains the correct construction is the construction it offered in the district court, which encompasses both empty space and transparent material.”). Accordingly, we decline to provide an express claim construction for the term “opening.”

We turn now to Patent Owner's argument regarding Petitioner's allegedly inconsistent positions. Patent Owner argues that, in the Delaware Litigation, Petitioner's expert “opined that the plain meaning of ‘opening’ is ‘empty space,’ and that ‘[a POSA] would not regard solid material as an

‘opening.’” PO Resp. 9 (alteration in original) (citing Ex. 2098 ¶ 465), 13 (quoting Ex. 2037 ¶ 482). Patent Owner describes Petitioner’s position as “materially inconsistent” with its position here that Iwamiya’s optical filter, comprised of a solid material, falls within the scope of “opening.” *Id.* at 9. As a result, Patent Owner argues, Petitioner failed to comply with the Board’s rules requiring “that a petition explain ‘[h]ow the challenged claim is to be construed’ and ‘[h]ow the construed claim is unpatentable.’” *Id.* at 8 (citing 37 C.F.R. § 42.104(b)(3)–(4)). We disagree.

Patent Owner correctly notes that our rules require that Petitioner explain how the challenged claim is construed and how the claim is unpatentable. 37 C.F.R. § 42.104(b)(3)–(4). Petitioner complied with these requirements by explaining that Iwamiya’s optical filter 17 and Sarantos’s window 2278 both meet the claim requirement for an “opening.” Pet. 30 (arguing that Sarantos’s “window 2278, . . . satisfies the definition of ‘opening’ that Masimo has advanced for purposes of infringement”), 31–32 (arguing that Iwamiya’s optical filter 17 is “‘configured to transmit a specific wavelength band of 900 nm or more,’ and thus, ‘is configured to allow at least a portion of light reflected from the tissue to pass through to the surface’” (emphasis omitted)). By identifying Sarantos’s window 2278 and Iwamiya’s optical filter 17 as meeting the requirement for an “opening,” Petitioner made clear that, in this proceeding, it was construing the term “opening” to encompass transparent material. Accordingly, we find that Petitioner has explained both “[h]ow the challenged claim is to be construed” and “[h]ow the construed claim is unpatentable” in compliance with 37 C.F.R. § 42.104(b)(3)–(4).

As we did in our Institution Decision (Inst. Dec. 17), we acknowledge that Petitioner’s interpretation of the term “opening” in its invalidity assertions here is potentially inconsistent with its interpretation of “opening” in its non-infringement positions in the Delaware Litigation.⁸ Since our Institution Decision, however, neither party has offered an express construction of “opening” in this proceeding, and, as discussed above, both parties agree that the term “opening” encompasses transparent material like that in Sarantos’s window 2278 and Iwamiya’s optical filter 17. Further, as discussed above, Petitioner has explained, with particularity, how and why it contends the challenged claims are unpatentable. Accordingly, we do not find in Petitioner’s allegedly inconsistent positions, a basis for finding Petitioner’s showing in this proceeding deficient.

2. *“Plurality of detectors . . . arranged in an array”*

Claim 22 requires “a plurality of detectors . . . arranged in an array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site bounded by the circular shaped light block.” Ex. 1001, 18:1–9. Petitioner does not propose an express construction for this claim language. Pet. 7. Patent Owner contends that we should construe this language, as we did in the Institution Decision, to exclude arrangements of two or three detectors. PO Resp. 7.

Our Institution Decision relied heavily on statements made during prosecution when addressing this limitation. Inst. Dec. 17–19. During

⁸ We issued our Institution Decision before *Cambridge Mobile Telematics, Inc. v. Sfara, Inc.*, IPR2024-00952, Paper 12 (PTAB Dec. 13, 2024) issued or was designated precedential.

prosecution of the '199 Application,⁹ its claim 1 was amended to recite: a “tissue measurement site . . . having an at least partially circular shape bounded by a light block”; the light block comprising “an annular ring having a circular shape”; and a “plurality of detectors . . . arranged in an array having a spatial configuration corresponding to the shape of the irradiated portion of the tissue measurement site.” Ex. 2057, 311. Patent Owner argued to the Examiner that the “array” limitation had support in the '199 Application specification because:

The ordinary meaning of the claim term “correspond” means to “have a close similarity; match or agree almost exactly” or “be analogous or equivalent in character, form, or function” or “represent.” New Oxford American Dictionary, 390 (3rd Edition 2010). Consistent with this exemplary definition and the originally-filed application, the phrase “arranged in an array having a spatial configuration corresponding to the shape of the irradiated portion of the tissue measurement site” . . . would be understood by a person having ordinary skill in the art as requiring a sufficient number of detectors such that, when arranged together in an array, can “match,” “have a close similarity,” or “represent” the “at least partially circular shape” of the irradiated portion of the tissue measurement site. . . .

In order for the claimed “plurality of detectors” to “match” or “represent” an “at least partially circular shape” or an “annular shape,” the “plurality of detectors” must include sufficient detectors to represent such shapes. For example, six or more detectors could be arranged in an annular shape and meet the recited limitation. ***However, two detectors, for example, can only be arranged in a spatial configuration representing a line and three detectors, for example, can only be arranged in a spatial configuration representing a line or a***

⁹ The '743 patent claims priority to U.S. Application No. 15/195,199 (the “'199 Application”), filed on June 28, 2016. See Ex. 1001, code (63).

triangle. Thus, when read in view of the originally-filed application, the recited “plurality of detectors” would be understood by a person having ordinary skill in the art as including a sufficient number of detectors to represent the desired geometric shape.

Id. at 320–322 (emphasis added).

The plain and ordinary meaning of the “plurality of detectors . . . arranged in an array” language in claim 22 is that the detectors are arranged to have a spatial configuration that corresponds to the circular shape of the light block. Ex. 1001, 18:1–9. Considered in light of the prosecution history, the current record supports Patent Owner’s position that this language requires more than three photodiodes, because two photodiodes “can only be arranged in a spatial configuration representing a line” (not a circle), and three photodiodes “can only be arranged in a spatial configuration representing a line or a triangle” (not a circle). Ex. 2057, 322. Petitioner does not dispute this. Pet. Reply 1–3 (addressing claim construction without discussing this claim language). Accordingly, we construe the “plurality of detectors . . . arranged in an array” claim language to exclude arrangements of two or three detectors.

D. Overview of the Asserted Prior Art Relevant to Disputed Issues

Petitioner contends that each of the asserted references discussed below is prior art. Pet. 2. Patent Owner does not contest the prior-art status of these references. *See generally* PO Resp.

1. *Iwamiya (Ex. 1004)*

Iwamiya discloses a light-based biological information detecting apparatus. *See* Ex. 1004, code (57), 1:17–22. In one embodiment, the

measured biological information is a patient's "pulse wave." *Id.* at 1:34–42, 4:13–16, 8:61–9:7.

Figure 4 of Iwamiya is reproduced below.

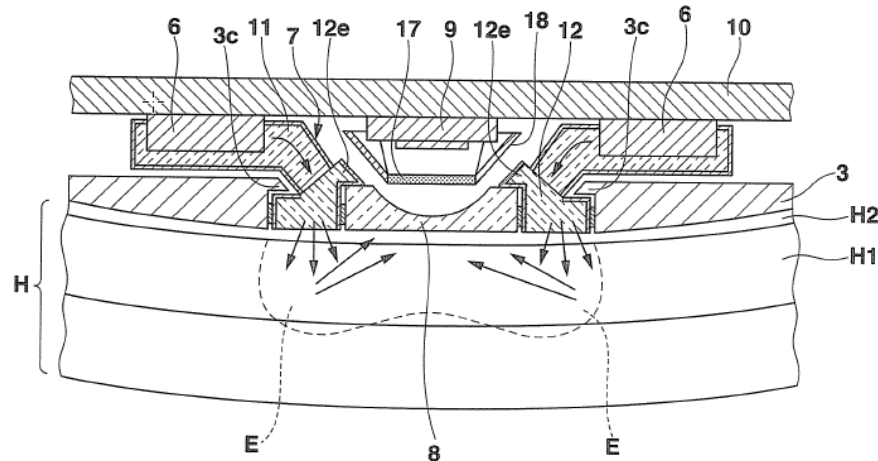


Figure 4 is a cross-sectional view of a wristwatch case including back cover 3, and enclosing biological information detecting apparatus 5 (shown in Figure 1), pressed against a patient's skin H. *See id.* at Figs. 1–4, 4:5–16, 5:54–6:21, 9:61–63.

Detecting apparatus 5 comprises several components mounted on circuit board 10. *See id.* at 6:22–31. Two light emitting units 6, located at the 3 o'clock and 9 o'clock positions of the watch face, emit observation light to enter annular light guide unit 7. *See id.* at 6:7–14, 6:34–39, 6:49–52. Unit 7 comprises light guiding ring portion 11 and diffusion ring portion 12, which guide the light to the surface of skin H, as shown by arrows in Figure 4. *See id.* at 6:10–14, 6:41–7:24, 10:18–33. Diffusion ring portion 12 "is formed in almost a ring shape, using a clouded or milky resin with a light diffusing property" in order to "uniformly diffuse and irradiate the observation light over a wide area of a ring shape with respect to the skin H." *Id.* at Fig. 2, 7:4–24, 10:25–33. Unit 7 includes reflection layers 13 and

15 on its external surfaces to prevent observation light from leaking out of unit 7 except where the bottom surface of diffusion ring portion 12 contacts skin H. *See id.* at Fig. 3, 6:62–7:3, 7:41–49, 8:14–19.

The light emitted from light emitting units 6 enters skin H, interacts with the patient's blood flowing through the skin in annular irradiation area E, and back-scatters to exit the skin from the same surface it entered the skin, all as shown by arrows in Figure 4. *See id.* at 1:28–34, 2:26–31, 6:14–21.

The back-scattered light enters scattered light taking unit 8, which is a transparent lens to focus the light on light receiving unit 9. *See id.* at 6:14–21, 7:50–8:13, 10:62–11:3, 12:55–67. The focused light encounters optical filter 17 mounted on the lower side of light shielding frame 18. *See id.* at 8:38–42. Light that passes through filter 17 reaches light receiving unit 9, which outputs a signal responsive to the received light, and the signal is communicated (not shown in Figure 4) to a processor that utilizes the signal to determine biological information of interest, such as a pulse wave. *See id.* at 6:17–21, 8:29–37; *see also id.* at 8:58–9:43 (Figure 10 illustrates a circuit configuration of the biological information detecting apparatus, including unit 9 sending signals to CPU 20.).

Iwamiya discusses how previously known pulse wave measuring devices generally used observation light wavelengths “shorter than 600 nm” (nanometers), because absorbance of light by hemoglobin in the blood is “very high” below 600 nm versus longer wavelengths. *Id.* at 1:43–52. However, according to Iwamiya, when the patient's skin contains a large

amount of melanin,¹⁰ then observation light in the ultraviolet to visible band (i.e., below about 700 nm)¹¹ may be absorbed by melanin pigment instead of hemoglobin, so biological information such as a pulse wave cannot be measured accurately. *See id.* at 1:53–2:6.

Accordingly, Iwamiya’s light emitting units 6 emit infrared light at a wavelength of 940 nm, “where absorbance of melanin[] pigment contained in the skin H is low.” *Id.* at Fig. 6, 6:31–34, 10:15–18, 10:34–38, 11:43–49. Similarly, “light receiving unit 9 has a spectral sensitivity characteristic of reacting strongest with light of a specific wavelength band of about $\lambda = 940$ nm,” with a “gradually lowered” sensitivity at lower wavelengths. *Id.* at 8:29–37, Fig. 9. In addition, optical filter 17 “transmit[s]” light wavelengths greater than 900 nm and “shield[s]” light wavelengths less than 900 nm, in order to “alleviate[] an influence from a measurement change due to external light, such as sunlight.” *Id.* at 8:42–57, 11:3–8, 13:1–23.

2. *Sarantos (Ex. 1005)*

Sarantos discloses a fitness monitor worn on a user’s wrist like a wristwatch, which utilizes photoplethysmography (PPG) sensors (i.e., light-based sensors) to measure the wearer’s heart rate. *See* Ex. 1005, code (57), 1:7–24, 1:36–56 (describing prior art monitor 100 shown in Fig. 1), 6:66–7:23 (describing Sarantos’s monitor 200 shown in Fig. 2). Figure 22 of Sarantos is reproduced below.

¹⁰ Iwamiya indicates this may occur, for example, if the patient has a dark skin color. *See* Ex. 1004, 1:64–66.

¹¹ The visible light band spans about 400–700 nm, and the ultraviolet light band falls below the visible band with a maximum wavelength of about 400 nm). *See* Ex. 1004, Fig. 6.

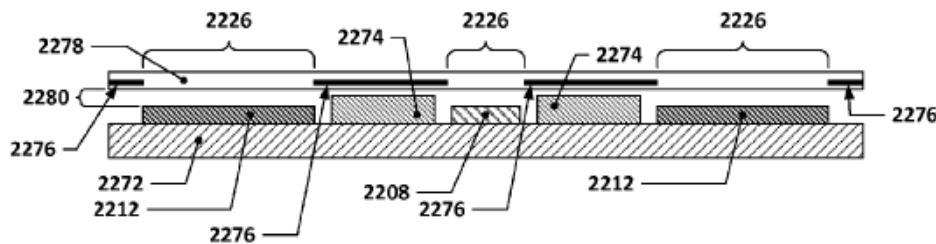


Figure 22 is a cross-sectional view of a PPG sensor. *See id.* at 6:52–54, 16:60–62. The PPG sensor has central light source 2208 flanked by two photodetector elements 2212 disposed on substrate 2272, with walls 2274 disposed in between. *See id.* at 17:1–3, 17:26–32. In this way, the sensor “may be held against a person’s skin, e.g., by being held in place with a strap” so light emitted by light source 2208 shines “into the person’s skin, where the light then diffuses into the surrounding flesh and is then emitted back out of the person’s skin and into the . . . photodetector elements 2212” to measure the person’s heart rate. *Id.* at 17:16–25, 17:39–42.

Sarantos’s PPG sensor includes window 2278 composed of a transparent material such as acrylic, “with an in-mold label 2276 embedded within it.” *Id.* at 17:3–6. Label 2276 “may be black or otherwise rendered opaque to light to prevent light from entering or exiting the PPG sensor through the window 2278 except through window regions 2226.” *Id.* at 17:6–10. Also, “other masking techniques, such as a painted or silk-screened mask applied to the window 2278, may be used.” *Id.* at 17:10–12. In this way, “label 2276 or the masking may prevent stray light from other sources, e.g., ambient light, from reaching . . . photodetector elements 2212 and affecting the heart rate signal obtained by the PPG sensor.” *Id.* at 17:12–16.

E. Ground 1: Obviousness Over the Combination of Iwamiya and Sarantos

Petitioner asserts that claims 1–6, 9–13, 24, and 25 would have been obvious over the combination of Iwamiya and Sarantos. Pet. 7–48 (“Ground 1”). For the reasons discussed below, we find that Petitioner has established, by a preponderance of the evidence, that claims 1–6, 11, 12, 24, and 25 would have been obvious over the combination of Iwamiya and Sarantos but that Petitioner has not established that claims 9, 10, and 13 would have been obvious.

1. Claim 1

Petitioner asserts that claim 1 would have been obvious over the combination of Iwamiya and Sarantos and sets forth an element-by-element comparison of the challenged claim to the asserted art. Pet. 18–33. Patent Owner disputes two aspects of Petitioner’s showing as to claim 1. First, Patent Owner argues that a POSA would not have been motivated to combine Iwamiya and Sarantos as set forth in the Petition. PO Resp. 11–23. Second, Patent Owner argues that Petitioner does not identify in the combination of Iwamiya and Sarantos an “opening defined in the dark-colored coating” configured to allow light to “pass through the surface.” *Id.* at 23–26. As to Petitioner’s showing for limitations that Patent Owner does not dispute, we have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that they are disclosed by the combination of Iwamiya and Sarantos for the reasons set forth in the Petition. We address the disputed issues below.

a) Motivation to include a “dark-colored coating” on Iwamiya’s light shielding frame

Claim 1 requires “a surface comprising a dark-colored coating . . . positioned between the plurality of detectors and the tissue.” Ex. 1001, 15:53–58. Petitioner asserts that this limitation is satisfied by the combination of Iwamiya’s light shielding frame and Sarantos’s black or opaque coating, such as its in-mold label or its silk-screened mask. Pet. 11–17 (explaining combination), 28–32 (addressing “dark-colored coating” limitation). More specifically, Petitioner contends:

[A POSA] would have been motivated to implement Iwamiya’s light shielding frame 18 to include a black or opaque dark-colored coating such as an in-mold label, silk-screened mask, or other technique (as taught by Sarantos) such that the resulting coated light shielding frame has improved characteristics for shielding the photodiodes from stray light, thereby minimizing the amount of light that reaches the photodiodes 9 from LEDs 6 without first being reflected off the user’s skin, thus increasing accuracy of the sensor.

Id. at 13 (citing Ex. 1003 ¶ 48). According to Petitioner, the POSA would have understood that Sarantos’s dark coating would not only block light, but also limit reflections, which would “improv[e] the light blocking functionality of the resulting device.” *Id.* at 13–14. Petitioner also asserts that “Iwamiya is silent as to the material or coating used to implement the light shielding frame 18” and, thus, the POSA, seeking to implement Iwamiya’s device would have “looked to other references, such as Sarantos, . . . to identify materials and/or coatings for implementing Iwamiya’s light shielding frame 18 to best block errant light from reaching the photodiodes 9.” *Id.* at 15.

Patent Owner argues that a POSA would not have been motivated to add a dark-colored to Iwamiya's light shielding frame because (1) there was no reason to look beyond Iwamiya for a light shielding material; and (2) Petitioner's alleged benefits in adding the dark-colored coating lacked support. *See* PO Resp. 11–23.

In IPR2022-01291, the Board found Petitioner's proposed reasons why the POSA would have used Sarantos's dark coating on Iwamiya's light shielding frame persuasive. Petitioner advances much the same rationale here, and we find Petitioner's reasoning persuasive on this record for the same reasons the Board did in IPR2022-01291. As the Board explained:

[W]e agree with [Petitioner's] position that Iwamiya provides no detail concerning the *structural* configuration of frame 18, apart from the illustrations of frame 18 in Figures 1–4. Iwamiya simply identifies the frame as “a light shielding frame,” which is a functional description apart from the word “frame.” Ex. 1004, 8:38–47. We do not discern, and [Patent Owner] does not cite, any disclosure in Iwamiya concerning a specific material or structure of frame 18 that achieves the light shielding function. Thus, Iwamiya leaves it to a person of ordinary skill in the art to choose a material or structure to incorporate within frame 18 to shield light away from reaching light receiving unit 9 without passing through optical filter 17. *See id.* at 8:38–57, Fig. 4. We find [Petitioner's] reliance on Sarantos as disclosing a suitable light-shielding material or structure for use with Iwamiya's frame 18 is invited by Iwamiya's disclosure. . . .

Sarrantos in turn provides a light-based sensor incorporating photodetector elements 2212 shielded from stray light by in-mold label 2276, or alternatively by a painted or silk-screened mask. *See* Ex. 1005, Fig. 22, 17:1–25. In particular, these structures “may be black or otherwise rendered opaque to light to prevent light from” reaching photodetector elements 2212 except through window regions 2226, such as

“stray light” from sources other than light source 2208. *Id.* at Fig. 22, 17:6–16. That function is similar to the function of Iwamiya’s light shielding frame 18 shielding light away from reaching light receiving unit 9 without passing through optical filter 17, discussed above. . . .

We conclude that Iwamiya’s leaving the selection of a light-shielding material or structure to incorporate within frame 18 open to the designer’s choice, coupled with Sarantos’s disclosure of a dark-colored coating as performing a light-shielding function, provides ample motivation for [Petitioner’s] combination. Thus, we are persuaded by Dr. Anthony’s testimony to this effect. *See* Ex. 1003 ¶¶ 40–42;^[12] Ex. 1042 ¶¶ 7–8; *KSR*, 550 U.S. at 417 (“[A] court must ask *whether the improvement is more than the predictable use of prior art elements according to their established functions.*” (emphasis added)). “A person of ordinary skill is also a person of ordinary creativity, not an automaton,” and “in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420–21.

Ex. 2035, 38–39.

Patent Owner argues that a POSA would have had no reason to add a dark-colored coating due the presence of an opaque, light shielding frame in Iwamiya. PO Resp. 11–18. More specifically, Patent Owner contends that Petitioner’s “motivation to combine Iwamiya with a dark-colored coating was premised on the wrong assumption that ‘Iwamiya lacks [] express disclosure of materials that would be suitable to achieve the desired “light

¹² Petitioner also relies on the testimony of Dr. Anthony in this proceeding. *See generally* Ex. 1003. The testimony from Dr. Anthony that the Board in IPR2022-01291 cited corresponds to Ex. 1003 ¶¶ 45–53 in this proceeding. The material cited in this proceeding includes substantially all of the material relied upon by the Board in IPR2022-01291 as well as some additional testimony elaborating on why the POSA would have employed a dark coating on Iwamiya’s light shielding frame 18.

shielding” function of frame 18.” PO Sur-reply 3 (alteration in original). According to Patent Owner, “Iwamiya does, in fact, disclose reflective materials for light shielding.” *Id.* For example, Patent Owner points to Iwamiya’s disclosure that “holder portion 43 of the light receiving unit 33 is formed of a metal with a light shielding property, such as aluminum, and its surface is subject to alumite treatment to have a reflection function.” PO Resp. 14–15 (quoting Ex. 1004, 18:61–65). Indeed, Patent Owner argues that the Board in IPR2022-01291 recognized holder portion 43 as providing an example of a structure that “may be used in frame 18 to perform its light shielding function.” *Id.* at 14 (citing Ex. 2035, 40–41). Because Iwamiya already discloses a light shielding material, Patent Owner argues, a POSA “would have had no reason to turn to a different reference.” PO Sur-reply 3. Instead, a POSA “would have chosen metal . . . for the light shielding frame 18 precisely because the frame itself is ‘light shielding’ and Iwamiya described metal as providing a ‘light shielding property.’” PO Resp. 17 (citing Ex. 1004, 18:61–64; Ex. 2100 ¶ 64).

The Board addressed much the same argument in IPR2022-01291 and found it unpersuasive. Ex. 2035, 40–41. We find it unpersuasive for the same reasons. Namely, we find that frame 18 and holder portion 43 are different structures used in different embodiments. Ex. 1079 ¶¶ 10–12 (Dr. Anthony testifying these are different embodiments); Ex. 1080, 88:1–94:8 (Dr. Madisetti agreeing these are different embodiments). Patent Owner argues that frame 18 and holder portion 43 are “analogous structures.” PO Resp. 16. Even if that were true, Iwamiya’s disclosure that “holder portion 43 of the light receiving unit 33 is formed of a metal with a light shielding property, such as aluminum” (Ex. 1004, 18:61–65) simply provides one

example of a material that can be used to perform Iwamiya’s functionally-described “light-shielding frame 18” (*id.* at 8:38–42). Accordingly, even crediting Patent Owner’s argument that metal provides another solution to the problem of how to implement a light shield, implementing a known solution, like using a dark coating, to predictably solve that problem would have been obvious. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014) (“Our precedent . . . does not require that the motivation be the best option, only that it be a suitable option from which the prior art did not teach away.” (emphasis omitted)); *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (“The prior art’s mere disclosure of more than one alternative does not constitute a teaching away from . . . alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed.”); *KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does not more than yield predictable results.”).

Patent Owner argues that the POSA “would have understood that light shielding frame 18 is already opaque without the need to add a separate coating to accomplish that function.” PO Resp. 18 (citing Ex. 2100 ¶ 66). According to Patent Owner, “given that the frame 18 itself is light shielding, a [POSA] would have had no reason to add a separate dark-colored coating to the frame.” *Id.*

We do not agree with this argument because, although Iwamiya describes its light shielding frame as opaque, it does not speak to how its opacity is achieved, i.e., what materials and/or coatings are employed in order to render its frame opaque. Sarantos teaches that one way to achieve opacity is to use a black “in-mold label” or “other masking techniques, such

as a painted or silk-screened mask.” Ex. 1005, 17:6–12. We view Petitioner’s proposal to use Sarantos’s specific materials, i.e., in-mold label or other masking techniques, as implementing the opacity of Iwamiya’s light shielding frame rather than adding to it. Pet. 15 (“[W]hile Iwamiya is silent as to the material or coating used to implement the light shielding frame 18, Sarantos teaches that a dark-colored coating or material provides the best light blocking functionality. APPLE-1005, 17:1-16. Therefore, a [POSA] implementing Iwamiya’s device would have looked to other references, such as Sarantos, which describes a similar wrist-worn physiological sensor, to identify materials and/or coatings for implementing Iwamiya’s light shielding frame 18 to best block errant light from reaching the photodiodes 9.”); Ex. 1003 ¶ 51.

Patent Owner argues that Petitioner’s “argument rests on *adding* a coating that was not previously disclosed.” PO Resp. 17 (citing Ex. 1004, 8:38–42; Pet. 13). According to Patent Owner, “[i]f Iwamiya were actually silent about the material of the frame (it is not), a [POSA] would have looked for a material that could provide the structure of the frame 18—not a coating.” *Id.* (citing Ex. 2100 ¶ 63). Patent Owner cites the testimony of Dr. Madisetti to support this assertion, but Dr. Madisetti simply repeats the content of the Petition. As such, we give his opinion on this issue little weight. *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (Decision Denying Institution) (precedential) (finding that conclusory testimony that “does not cite to any additional supporting evidence or provide any technical reasoning to support [that testimony] . . . is entitled to little weight”); *see also* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on

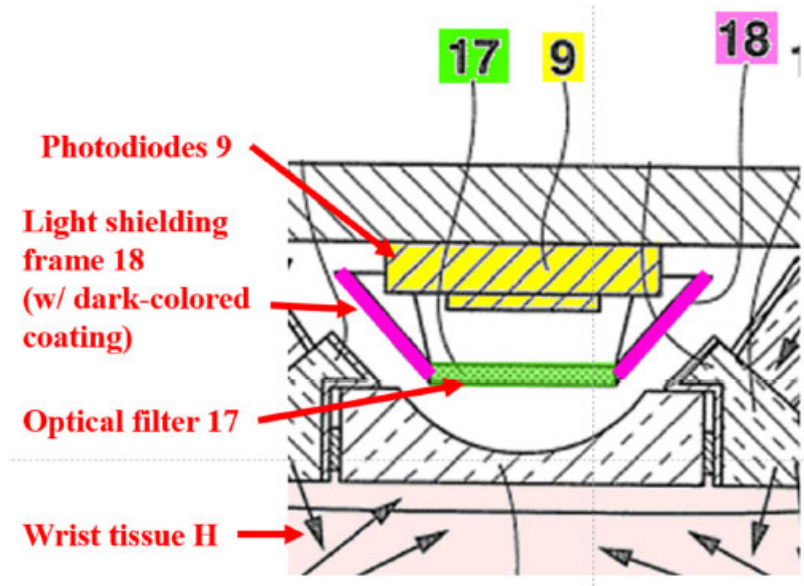
which the opinion is based is entitled to little or no weight.”). On this record, we see no basis for distinguishing between two known ways of shielding light: using a material that itself shields light and using structure coated with a light blocking material.

For the reasons discussed above, we find that Petitioner has established by a preponderance of the evidence that the POSA would have been motivated to combine Iwamiya and Sarantos in the manner set forth in the Petition.

*b) “An opening defined in the dark-colored coating”
that “allow[s] . . . light . . . to pass through”*

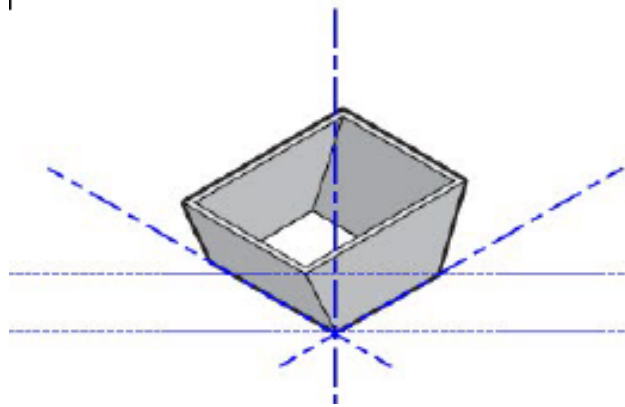
Claim 1 requires “an opening defined in the dark-colored coating” that is “configured to allow at least a portion of light reflected from the tissue to pass through the surface.” Ex. 1001, 15:53–58. Before considering the parties’ contentions with respect to this claim limitation, it is helpful to consider the configuration of the structures in Iwamiya that Petitioner contends meet this limitation. The annotated and excerpted version of

Iwamiya's Figure 4 provided in the Petition, and reproduced below, helps to illustrate Petitioner's contentions.



Pet. 31. Figure 4 shows a cross-sectional view in which the back cover of Iwamiya's wristwatch contacts the skin of an arm. Ex. 1004, 4:13–16. In the annotated version of Figure 4, Petitioner has colored light shielding frame 18 magenta, optical filter 17 green, photodiode 9 yellow, and wrist tissue H pink. Pet. 31. As shown in Figure 4, optical filter 17 is mounted on light shielding frame 18. Ex. 1004, 8:38–42.

Iwamiya's "light shielding frame 18 has four sides, each with its own surface." PO Sur-reply 6. Patent Owner provides its own isometric drawing, reproduced below, showing the configuration of Iwamiya's light shielding frame 18.



Id. at 7. The isometric drawing illustrates what is “essentially a box without a top” or bottom. *Id.* at 8. The four sides of the “box” are trapezoids, and the box is wider at the top than at the bottom. As Patent Owner points out, “none of the four side surfaces of the light shielding frame 18 includes an opening.” *Id.* at 7. However, the top and bottom of the structure are open such that light can pass through the box, entering at the top and exiting at the bottom (or vice versa).

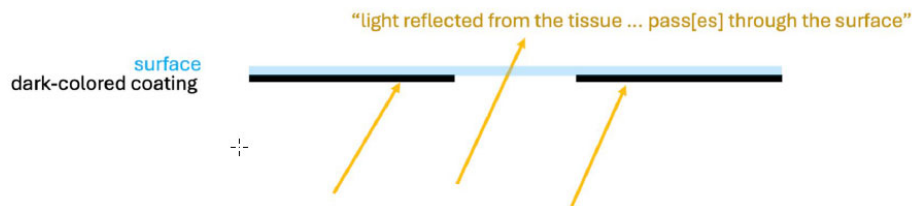
Although not shown in Patent Owner’s isometric drawing, “the light shielding frame 18 holds the optical filter 17 at the bottom of the rectangular box, on a plane largely perpendicular to each of the four sides of the light shielding frame.” *Id.* at 8. Thus, Patent Owner points out, “Iwamiya’s optical filter 17 sits on a different plane and has a surface different than the four sides of the light shielding frame 18.”¹³ *Id.*

¹³ As Patent Owner points out, Petitioner incorrectly labeled Iwamiya’s light shielding frame 18 in its Reply, highlighting concave lens 8 rather than frame 18. PO Sur-reply 4–5. At oral argument, Petitioner acknowledged this error. Tr. 14–15. We do not deem this mistake to be material as the Petition consistently identifies Iwamiya’s light shielding frame 18 and optical filter 17 rather than concave lens 8 in connection with the claim language at issue.

Petitioner contends that Iwamiya “describes an ‘optical filter 17’ that is ‘mounted on the lower side of a light shielding frame 18’ [the surface] between the photodiodes 9 and the tissue H.” Pet. 31 (quoting Ex. 1004, 8:39–42; Ex. 1003 ¶ 71). Petitioner also asserts that Iwamiya describes its optical filter 17 as “configured to allow at least a portion of light reflected from the tissue to pass through” this surface to the photodiodes 9. *Id.* at 31–32 (citing Ex. 1004, 8:42–44; Ex. 1003 ¶ 72). We agree. We find that when Sarantos’s dark-colored coating is applied to Iwamiya’s light shielding frame 18—i.e., to the structure Petitioner identifies as the surface—there is an opening defined in the dark-colored coating and occupied by optical filter 17 within four-sided frame 18 that allows light to pass through that surface. *See* Ex. 1004, Fig. 4, 8:42–44 (“As illustrated in F[igure] 8, the optical filter 17 is configured to transmit light of a specific wavelength band of 900 nm or more.”); Ex. 1003 ¶¶ 67–72 (explaining that Iwamiya “is configured to allow at least a portion of light reflected from the tissue to pass through to the photodiodes 9”).

Patent Owner argues that optical filter 17 is “not an ‘opening *defined in the dark-colored coating* [but] . . . [r]ather, it is a separate structure that is mounted to the light shielding frame.” PO Resp. 24 (citing Ex. 1004, 8:38–42; Ex. 2100 ¶ 77). According to Patent Owner, “the plain language of the claim requires that light ‘pass *through the surface*.’” *Id.* at 25 (citing Ex.

2100 ¶ 78). Patent Owner illustrates its argument using a figure, reproduced below.



In the figure above, Patent Owner uses a thick blue line to depict a “surface.” Beneath the bottom left and bottom right ends of the “surface” are thick black lines, which Patent Owner has labeled “dark-colored coating.” The center portion of the “surface” does not have a “dark-colored coating.” In the figure, three tan diagonal arrows, representing light, extend upward from the bottom of the figure. The middle arrow bisects the thick black lines representing a dark-colored coating, and thus “passes through,” the thick blue line representing a “surface.” The left and right arrows contact the dark-colored coating and do not pass through the surface.

A question posed in our Institution Decision and answered in Patent Owner’s Response helps to illustrate Patent Owner’s position. In our Institution Decision, we asked “whether the claim requires light to actually penetrate the ‘surface’ it passes through . . . or whether it is instead sufficient that light is allowed to pass through an opening in the surface.” Inst. Dec. 32. Patent Owner responded that it is not sufficient that light pass through an opening in the surface “because the [claimed] opening is ‘defined in the dark-colored coating,’ not in the ‘surface,’ and the opening must allow light to ‘pass through *the surface*.” PO Resp. 26; *see also* Tr. 57–58 (Patent Owner’s counsel arguing: “It’s not an issue of light passing next to or

adjacent to the surface or, you know, through empty space . . . the light still has to pass through the surface.”).

Applying this reasoning to the Iwamiya/Sarantos combination, Patent Owner argues that light does not pass through light shielding frame 18 (the structure Petitioner identifies as the claimed “surface”) because it instead passes through optical filter 17. PO Resp. 26. As noted above, Patent Owner describes Iwamiya’s optical filter as a “separate structure that is mounted to the light shielding frame” rather than an “opening *defined in the dark-colored coating.*” *Id.* at 24.

We do not find Patent Owner’s reasoning persuasive because Petitioner does not contend that Iwamiya’s optical filter 17 meets the “opening” limitation, as Patent Owner suggests when it argues that optical filter 17 “not an ‘opening *defined in the dark-colored coating.*’” PO Resp. 24. Petitioner relies on an opening in frame 18, not optical filter 17, to meet the claimed “opening”: “[b]ecause Sarantos’s dark-colored coating is applied to Iwamiya’s light shielding frame in the combination, there is an opening defined in the dark-colored coating that allows light to pass through the surface.” Pet. Reply 9 (citing Ex. 1003 ¶¶ 67–72; Ex. 1079 ¶ 15–17); *see also id.* at 8–9 (“[L]ight shielding frame 18 ‘surround[s]’ the light receiving units 9 and has an opening that allows light to pass through the surface.” (second alteration in original)); Ex. 1079 ¶¶ 15–17. This structure satisfies the claim limitation, and the presence of optical filter 17 within the opening does not change that outcome because it still allows light to pass through the opening in the surface, frame 18. *See* Pet. 31–32; Ex. 1004, Fig. 4; Ex. 1003 ¶¶ 71–72; Pet. Reply 8. Light passes through Iwamiya’s frame 18 in the

same way light (or air, or a liquid) would pass through a box with holes cut in both ends. For this reason alone, Patent Owner's argument fails.

In addition, as Petitioner points out, and as Patent Owner acknowledges, Patent Owner's argument regarding this issue implicitly requires that the claimed "opening" include a transparent or translucent material—i.e., a physical barrier that the light contacts on one side and emerges from on the other side. Pet. Reply 9 ("[Patent Owner's] arguments . . . imply that the claimed opening is required to include a transparent or translucent material."); Tr. 57–58 (Patent Owner's counsel arguing: "It's not an issue of light passing next to or adjacent to the surface or, you know, through empty space . . . the light still has to pass through the surface."). This creates a problem for Patent Owner because, despite describing the dimensions and shape of the opening in great detail, "there is not a single embodiment within the '743 patent that describes the opening as including material." Pet. Reply 10; Ex. 1001, 8:32–53, 9:31–10:10 (all describing the dimensions, shape, and/or relative position of the "opening" without mentioning any material used in the opening); *see also id.* at Figs. 4A, 4B, 5; Ex. 1079 ¶ 20 (testimony of Dr. Anthony regarding the absence of disclosure in the '743 patent of the "opening" including material).

Even if we were to accept Patent Owner's position that light must penetrate a transparent or translucent material in order to "pass through" a surface, Dr. Anthony explains, that in Iwamiya, "light shielding frame 18 and optical filter 17 together define a surface" with an opening that light passes through." Ex. 1079 ¶ 21; *see also* Pet. Reply 10 (citing Ex. 1079 ¶ 21). Dr. Anthony illustrates this point using as annotated version of Iwamiya's Figure 3 (reproduced below).

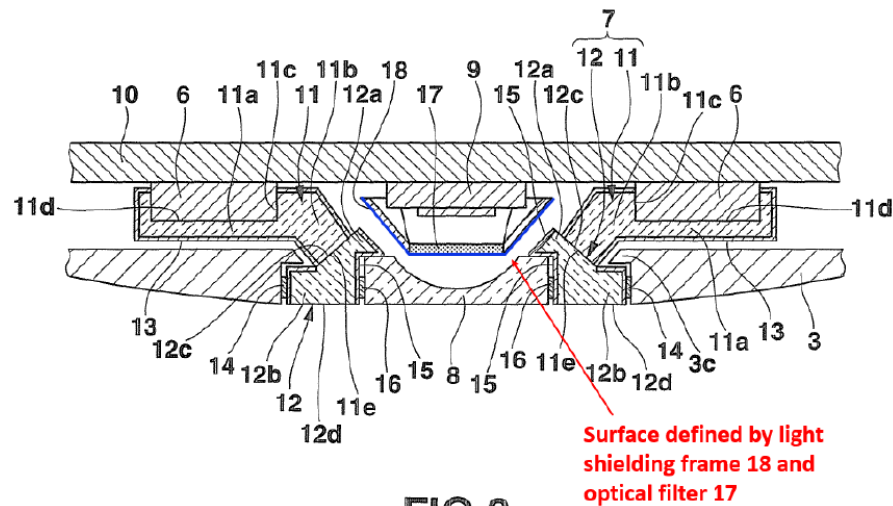


FIG.3

Figure 3 is a cross-sectional view of an embodiment of Iwamiya's optical biological information detecting apparatus. Ex. 1004, 4:5–12. In the annotated version, Dr. Anthony marked the lower surface of frame 18 and filter 17 with contiguous blue lines that together form an angular bowl. Dr. Anthony labels the contiguous lines “[s]urface defined by light shielding frame 18 and optical filter 17.” Ex. 1079 ¶ 21. We agree with Petitioner that “the combination of Iwamiya's light shielding frame 18 and optical filter 17 provides . . . a surface” that light passes through. Pet. Reply 10.

For the reasons discussed above, we find that Petitioner has established by a preponderance of the evidence that Iwamiya's frame 18, (which corresponds to the claimed surface) includes an opening that allows light to pass through the frame/surface.

c) Conclusion with respect to claim 1

Having reviewed all of the arguments and evidence of record, we find that Petitioner has demonstrated, by a preponderance of the evidence, that the POSA would have been motivated to combine Iwamiya and Sarantos in the manner Petitioner proposes and that such combination discloses all of the

limitations of claim 1. Patent Owner does not rely on objective indicia of nonobviousness with respect to claim 1. *See* PO Resp. 56–61 (arguing objective indicia only in the context of dependent claim 18). Accordingly, we determine that Petitioner has established, by a preponderance of the evidence, that claim 1 would have been unpatentable as obvious over the combination of Iwamiya and Sarantos.

2. *Claim 5*

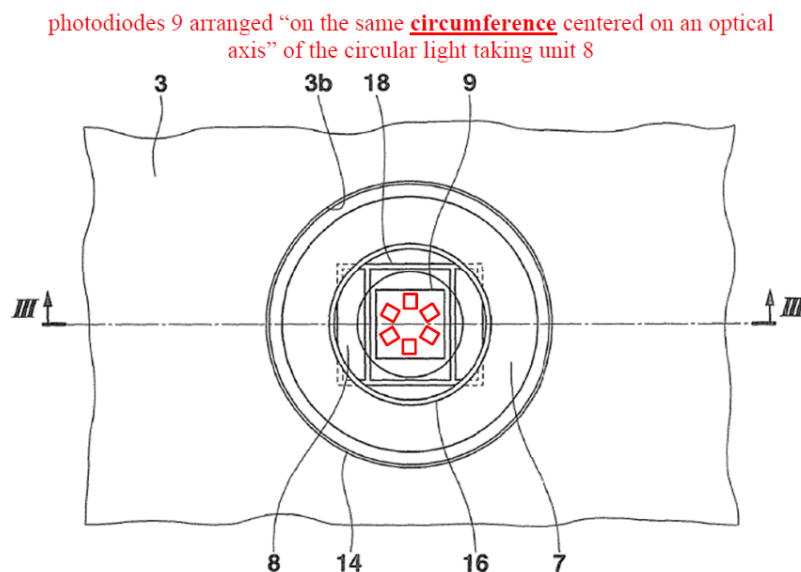
Claim 5 depends from claim 1 and further recites that “the plurality of detectors are arranged in an array having a spatial configuration corresponding to a shape of a portion of the tissue measurement site bounded by the light block.” Ex. 1001, 16:5–9. Petitioner contends that Iwamiya discloses a “plurality of detectors . . . arranged in an array” as required by claim 5. Pet. 25–27, 36–40. More specifically, Petitioner contends that although Iwamiya only exemplifies devices with one light receiving unit 9 (i.e., detector), “Iwamiya clearly discloses that a plurality of light receiving units 9 can be implemented.” *Id.* at 26 (citing Ex. 1004, 14:36–41); Ex. 1003 ¶ 64. As to the claimed spatial configuration, Petitioner relies on Iwamiya’s disclosure of “plural light receiving units 9 . . . disposed on the same circumference centered on an optical axis of the scattered light taking unit 8.” Ex. 1004, 14:32–41. Petitioner explains:

That Iwamiya’s plural photodiodes 9 are arranged in “a spatial configuration corresponding to a [circular] shape” is evident from the fact that the photodiodes 9 are arranged “on the same ***circumference*** centered on an optical axis” of the circular light taking unit 8. [Ex. 1004], 14:36–41. From this disclosure, a [POSA] would have understood and it would have been obvious that the photodiodes 9 are thus arranged in an array

having a spatial configuration corresponding to the circular shape of the tissue measurement site encircled by the circular light block.

Pet. 37 (citing Ex. 1003 ¶ 81) (first alteration in original).

Petitioner illustrates its understanding of how the POSA would have interpreted Iwamiya's disclosure of "plural light receiving units 9 . . . disposed on the same circumference" using an annotated version of Figure 2, reproduced below.



Id. at 38. Figure 2 is a plan view of an embodiment of Iwamiya's optical biological information detecting apparatus. Ex. 1004, 4:5–10. Petitioner annotates Figure 2 by adding the legend "photodiodes 9 arranged 'on the same circumference centered on an optical axis' of the circular light taking unit 8" at the top of the figure and by drawing six red photodiodes arranged in a circle at the center of scattered light taking unit 8. Pet. 38. Although Petitioner illustrates six photodiodes in its annotated figure, Petitioner notes that "Iwamiya leaves the choice of the number of photodiodes to a [POSA], who would have known that more than a small plurality of photodiodes (e.g., more than 2-3) were commonly employed in pulse oximeters before the '743

Patent for purposes such as increasing detection area and light sensitivity.”

Id. at 39 (citing Ex. 1003 ¶ 82).

Patent Owner argues that Petitioner “relies on Iwamiya’s vague description of an alternate embodiment.” PO Resp. 63. According to Patent Owner, this is insufficient because “Iwamiya does not illustrate how these photodetectors would be arranged, and whether they would be ‘in an array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site bounded by the circular shaped light block’ as claimed.” *Id.* at 63–64 (citing Ex. 2100 ¶ 134).¹⁴

The Board in IPR2022-01291 addressed much the same issue, and we agree with that analysis. In that case, the claim language at issue required a “plurality of photodiodes . . . 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.” Ex. 2035, 114. The Board found that Iwamiya met that limitation, explaining:

Iwamiya expressly discloses that its wrist-worn sensor device shown in Figures 1–4 includes “light receiving unit 9” which “is composed of a silicon photo diode”—that is, unit 9 is composed of a single photodiode. Ex. 1004, 4:5–16, 8:20–28; *see also id.* at 14:32–36 (“In the first embodiment . . . *one* light receiving unit is provided.” (emphasis added)).

Iwamiya also expressly discloses, albeit not in any of its

¹⁴ Unlike claim 22 (addressed *infra* § II.I.1), claim 5 does not require that the photodetectors be arranged in an “array having a spatial configuration corresponding to a shape of the portion of the tissue measurement site bounded by the *circular* shaped light block.” Ex. 1001, 18:5–8 (emphasis added). However, Petitioner asserts that the POSA would understand Iwamiya’s photodetectors to be so arranged. Pet. 36–40. Accordingly, our analysis focuses on whether the POSA would, in fact, have understood Iwamiya’s photodetectors to be arranged in a circle.

figures, that Iwamiya’s “invention is not limited thereto” and “plural light receiving units 9 [i.e., plural photodiodes] may be two-dimensionally disposed . . . in the scattered light taking unit 8.” *Id.* at 14:32–39. In addition, “the plural light receiving units 9 are preferably disposed on the same circumference centered on an optical axis of the scattered light taking unit 8.” *Id.* at 14:39–41.

We find the foregoing descriptions plainly disclose using more than one (“plural”) photodiodes 9, which are disposed in a circular array having its center located at the optical axis of the scattered light taking unit 8 (“disposed on the same circumference centered on”). In particular, Iwamiya states its photodetectors 9 are disposed on “the *same* circumference” (emphasis added), which must be a circle rather than an oval or some other more generic circumference, because the “same” term reflects a constant radius from the center. This also is consistent with the generally circular configuration of Iwamiya’s biological information detecting apparatus, as best seen in Figure 2, and with Iwamiya’s disclosure that its light receiving unit(s) 9 are placed “in the vicinity of the focal position on an optical axis of the scattered light taking unit 8.” *Id.* at Figs. 1–4, 5:57–66, 8:20–28.

Id. at 123–124 (alterations in original).

Here, Petitioner directs us to the same disclosure in Iwamiya that the Board in IPR2022-01291 found to disclose an almost identical claim limitation. Pet. 25–27, 36–40. We find that Petitioner has established, by a preponderance of the evidence, that Iwamiya discloses a plurality of photodetectors arranged as claimed for the same reasons the Board in IPR2022-01291 found Iwamiya to disclose the corresponding limitation in the patent challenged in that proceeding.

Patent Owner argues that Petitioner’s understanding of how the POSA would have interpreted Iwamiya’s disclosure of “plural light receiving units 9 . . . disposed on the same circumference” is wrong, in part because it relies on the incorrect assumption such an arrangement would increase sensitivity. PO Resp. 64; *see also* Ex. 1004, 14:32–39 (disclosure of Iwamiya at issue).

Patent Owner explains:

[Petitioner] argued that a [POSA] would have understood [the arrangement depicted in annotated Figure 2, reproduced above] would “increas[e] detection area and light sensitivity.” Pet., 39. But those arguments defy common sense. A [POSA] would not have understood such an arrangement to increase detection area or light sensitivity at all. EX2100, ¶¶135-136. Instead, [Petitioner’s] proposed arrangement reduces the overall detection area by more than 50% and leaves a large empty spot in the center without photodetector coverage. *Id.*, ¶136.

Id. at 64–65 (fourth alteration in original). This argument is not persuasive because it misunderstands Petitioner’s position. Petitioner attributes increased sensitivity to increasing the number of photodiodes not to the disposition of photodiodes in a circle. Pet. 39 (“Iwamiya leaves the choice of the number of photodiodes to a [POSA], who would have known that more than a small plurality of photodiodes (e.g., more than 2-3) were commonly employed in pulse oximeters before the ’743 Patent for purposes such as increasing detection area and light sensitivity.” (citing Ex. 1003 ¶ 82)).

Patent Owner argues that Iwamiya uses a “scattered light taking unit 8, which is a transparent lens to focus the light on light receiving unit 9” and that it would “make no sense for Iwamiya’s sensor design to focus light to a spot without photodetector coverage,” like the empty spot at the center of a circle of photodiodes. PO Resp. 65 (citing Ex. 1004, 6:14–21, 7:50–8:13,

10:62–11:3, 12:55–67; Ex. 2100 ¶ 137). Instead, according to Patent Owner, a POSA would have interpreted Iwamiya’s disclosure of “plural light receiving units 9 . . . disposed on the same circumference” to “refer to the photodetectors’ relative location (*i.e.*, that a circle can be drawn through the center of each of the photodetectors).” *Id.* Patent Owner then proposes alternative ways to dispose photodetectors “on the same circumference,” including by placing them in a “triangular array” and in a “square-shaped array.” *Id.* at 66. According to Patent Owner, and Dr. Madiseti, “[m]ore than four photodetectors could not be ‘disposed on the same circumference’ without running into the problem of leaving an empty spot in the center without photodetector coverage.” *Id.* at 67 (citing Ex. 2100 ¶ 139). Therefore, Patent Owner argues, a POSA “would not have understood Iwamiya’s description . . . to describe an array of photodetectors” in a circular array as claimed.” *Id.*

This argument is unavailing. We acknowledge Dr. Madiseti’s testimony that arranging the photodiodes in a circle leaves a “large empty spot” in the center of the circle, which “would be severely detrimental to sensor performance.” Ex. 2100 ¶ 137. However, we are not persuaded that the potential for an empty spot would have caused the POSA to understand Iwamiya’s disclosure of photodiodes “disposed on the same circumference” to refer to a non-circular arrangement. We also acknowledge that one could conceive of arrangements of photodetectors—like the “triangular array” and the “square-shaped array” posited by Patent Owner—that are, technically speaking, disposed on the same circumference. PO Resp. 66; Ex. 2100 ¶¶ 138–139. However, such an interpretation of Iwamiya’s disclosure seems unduly strained. We agree with Dr. Anthony that “the use of the most

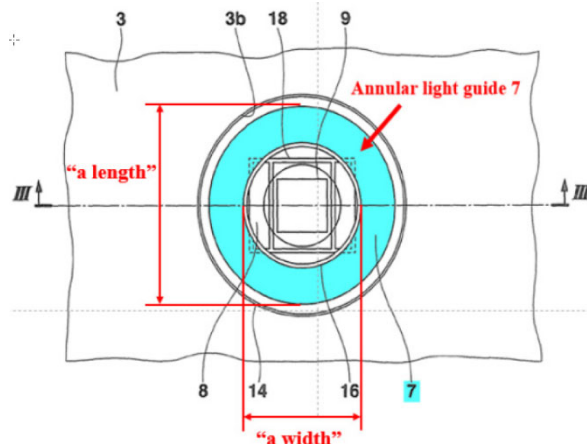
logical inference that a [POSA] would have drawn from the use of the term ‘circumference’ by Iwamiya (rather than describing the photodiodes as being in a square or triangular arrangement) is that the photodiodes were arranged in a circle about the circumference.” Ex. 1079 ¶ 24; *see also* Pet Reply 29 (citing Ex. 1079 ¶ 24).

For the reasons discussed above, having considered the evidence and arguments of record, we find that Petitioner has established by a preponderance of the evidence that Iwamiya discloses photodiodes arranged in an array having a spatial configuration corresponding to the circular shape of the tissue measurement site encircled by a circular light block, thus meeting the additional requirements of claim 5. Accordingly, we determine that Petitioner has established by a preponderance of the evidence that the combination of Iwamiya and Sarantos would have rendered claim 5 obvious.

3. *Claim 9*

Claim 9 depends from claim 1 and further recites that “the output light pattern comprises a width and a length, . . . wherein the width is different than the length.” Ex. 1001, 16:19–21. Petitioner identifies two different ways that Iwamiya discloses this requirement: the first illustrated by Iwamiya’s Figure 2, and the second illustrated by Iwamiya’s Figure 3.

Petitioner contends that Figure 2 of Iwamiya, as annotated by Petitioner and reproduced below, illustrates that Iwamiya discloses outputting a light pattern having a different length and width.

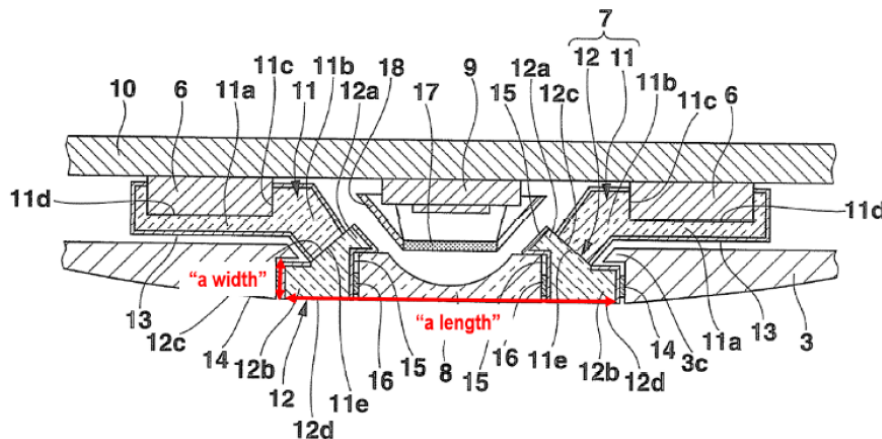


Pet. 41. As discussed above, Figure 2 is a plan view of an embodiment of Iwamiya's optical biological information detecting apparatus. Ex. 1004, 4:5–10. In this annotated version of Figure 2, Petitioner highlights annular light guide 7 in blue. Pet. 41. Petitioner labels a “width” of the light guide corresponding to the diameter of the inner portion of the annular light guide and a length corresponding to the diameter of the outer portion of the annular light guide. *Id.* Petitioner contends that the light guide “causes the light to irradiate an annular portion of the tissue.” *Id.* at 40.

Petitioner's position that Figure 2 shows that the annular light guide causes the light to irradiate a light pattern having a different length and width is not supported by a preponderance of the evidence. The light pattern emitted by the device depicted in Iwamiya's Figure 2 is itself an annulus, as Petitioner itself concedes. *Id.* (“Iwamiya's annular light guide unit 7 changes the shape of the light emitted from individual light emitting units 6 to an annular/ring shape . . . and causes the light to irradiate an annular portion of tissue.”); *see also* Ex. 1004, 4:9–12, 6:11–17, 7:4–24, Figs. 2, 3

(describing element 7 as an “annular light guide unit” and identifying emission surface 12d where unit 7 projects light to enter the user’s tissue, which, as seen from considering Figures 2 and 3 together, would form an annulus). This is fatal to Petitioner’s argument because, as Dr. Madisetti testifies that “an annulus does not have a width and a length. It has an inner and outer radius (or inner and outer diameter).” Ex. 2100 ¶ 82. Moreover, the inner and outer diameters of Iwamiya’s annulus are the same in all directions. Accordingly, the POSA would not understand Figure 2 to show that Iwamiya’s device outputs a light pattern having a different length and width.

Petitioner, alternatively, contends that Figure 3 of Iwamiya, as annotated by Petitioner and reproduced below, illustrates that Iwamiya discloses outputting a light pattern having a different length and width.



Pet. 42. As discussed above, Figure 3 is a cross-sectional view of an embodiment of Iwamiya’s optical biological information detecting apparatus. Ex. 1004, 4:5–12. Petitioner annotates Figure 3 by adding labels corresponding to “a width” and “a length.” Pet. 42. The dimension Petitioner labels “a width” corresponds to an internal dimension of a portion of the light guide that seems more appropriately described as a “height.”

Petitioner's reliance on Figure 3, which depicts the same embodiment as Figure 2 (Ex. 1001, 4:5–12), does not fix the problem discussed above that the light pattern output by Iwamiya's device is an annulus, which lacks a length and width. In addition, Petitioner's mapping to Figure 3 suffers from the additional deficiency that, as Dr. Madisetti explains, the interior dimension that Petitioner labels "width" "is not the width of the output light pattern." Ex. 2100 ¶ 84.

In its Reply, Petitioner provides additional annotated figures to identify multiple additional "lengths" and "widths." Pet. Reply 30. We do not consider these additional proposed lengths and widths because they are new argument. Additionally, Patent Owner argues that Petitioner is estopped from contesting this issue because Petitioner litigated the same issue in IPR2022-01465, lost, and did not appeal. PO Sur-reply 25–26. We need not consider this argument because Petitioner loses on the merits.

For the reasons discussed above, we find that Petitioner has not established by a preponderance of the evidence that the combination of Iwamiya and Sarantos would have rendered the physiological measurement device of claim 9 obvious.

4. *Claim 10*

Claim 10 depends from claim 1 and further requires that "the output light pattern comprises an oval shape." Ex. 1001, 16:22–23. Petitioner cites to its mapping for claim 9 and asserts that "Iwamiya's annular light guide unit 7 changes the shape (and pattern) of the light emitted from individual light emitting units 6 ***to a different second shape, such as an annular shape***, and causes the light to irradiate an annular portion of tissue." Pet. 42. Petitioner asserts that "[a]ccordingly, it would have been obvious to a

[POSA] that, in [the Iwamiya/Sarantos combination], ‘***the output light pattern comprises an oval shape.***’” *Id.* (citing Ex. 1003 ¶ 88).¹⁵

Patent Owner argues that Iwamiya’s light guide is an “annulus formed by two concentric circles,” not an oval. PO Resp. 29. We agree with Patent Owner. Iwamiya emits a light pattern in the shape of an annulus and an annulus is not an oval. *Id.*; Ex. 2100 ¶ 85; *supra* § II.E.3.

Petitioner argues that Iwamiya discloses that the its light guide unit 7 comprises a “‘light guiding ring portion 11 . . . [that] is formed in *almost a ring shape*’ including a flat ring portion 11a and an inclined ring portion 11b.” Pet. Reply 32 (alterations in original) (citing Ex. 1004, Figs. 2, 3, 6:40–52). Petitioner thus suggests that, like an oval, Iwamiya’s light guide deviates from a ring shape. But the quoted language relates to the internal geometries of the light guide, not the light pattern output by the light guide. Ex. 1004, 6:40–52; Figs. 2, 3. As discussed in connection with claim 9, considering Figures 2 and 3 together supports that the light output by Iwamiya’s light guide has an annular shape. *See supra* § II.E.3; *see also* Ex. 1004, 6:7–21 (“As illustrated in F[igures] 3 and 4, . . . an annular light guide unit 7 . . . guides the observation light emitted from the light emitting units 6 and ***annularly diffuses and irradiates the observation light with respect to skin H.***” (emphasis added)). Indeed, Petitioner acknowledges as much in its Petition. Pet. 40 (“Iwamiya’s annular light guide unit 7 changes the shape of

¹⁵ For clarity, Petitioner does not contend that it would have been obvious to *modify* Iwamiya to output a light pattern having an oval shape. Pet. 42. Rather, Petitioner contends that it would have been obvious that Iwamiya’s “output light pattern comprises an oval shape.” *Id.*; Ex. 1003 ¶ 88 (testimony of Dr. Anthony to the same effect).

the light emitted from individual light emitting units 6 to an annular/ring shape . . . and causes the light to irradiate an annular portion of tissue.”).

Accordingly, the preponderance of the evidence supports that Iwamiya’s light guide outputs a light pattern having an annular shape. A light pattern having an annular shape does not meet the requirement of claim 10 for a light pattern that “comprises an oval shape.” Ex. 2100 ¶ 85 (testimony of Dr. Madisetti to the same effect). For this reason, we find that Petitioner has not established by a preponderance of the evidence that claim 10 would have been obvious over the combination of Iwamiya and Sarantos.

5. *Claims 11 and 24*

Claim 11 depends from claim 1 and further recites that “the physiological parameter is oxygen saturation.” Similarly, claim 24 depends from claim 22 and further recites that the “the physiological parameter is oxygen saturation.”¹⁶ Petitioner contends that the combination of Iwamiya and Sarantos would have rendered claims 11 and 24 obvious. Patent Owner opposes.

The parties’ arguments on claims 11 and 24 are extensive. To facilitate discussion, we break them down into three categories: 1) whether Sarantos discloses measuring oxygen saturation, 2) whether the POSA

¹⁶ Petitioner challenges claim 22 in Ground 5 but challenges claim 24, which depends from claim 22, in Ground 1. We deem this a harmless error because the basis for Petitioner’s challenge is clear. Petitioner contends that Iwamiya (which is included in Ground 1) by itself discloses or suggests all of the limitations of claim 22 (Pet. 69–70 (Petitioner, in Ground 5, asserting obviousness of claim 22 over Iwamiya alone)) and relies on Sarantos as helping to render the additional limitation recited in claim 24 obvious (*id.* at 43–46, 49).

would have been motivated to combine Iwamiya and Sarantos to arrive at the device recited in claims 11 and 24, and 3) whether the POSA would reasonably have expected success.

a) Does Sarantos disclose measuring oxygen saturation?

Petitioner relies on Sarantos as disclosing measuring oxygen saturation. Sarantos discloses:

[P]hotoplethysmographic techniques may also be used to measure other physiological parameters besides heart rate, such as blood oxygenation levels. It may, in such situations, be desirable to utilize an LED that predominantly emits light in the red or infrared spectrum for such purposes. Thus, it may be desirable to include separate light-emitting devices that are each able to emit different wavelengths of light; each light-emitting device may be used to supply light for a different type of photoplethysmographic measurement.

Ex. 1005, 13:44–53.

Patent Owner asserts that “Iwamiya does not disclose measuring oxygen saturation at all because it discloses the use of only a single wavelength of light, which is insufficient to measure oxygen saturation” and that “[n]either Iwamiya nor Sarantos discloses the determination of oxygen saturation at a user’s wrist.” PO Resp. 30. Patent Owner acknowledges that Sarantos makes “passing mention of ‘techniques’ to measure ‘other physiological parameters’ like oxygenation using ‘red *or* infrared’ light,” but points out that “Sarantos only refers to red ‘or’ infrared LEDs disjunctively.” *Id.* at 31. According to Patent Owner, “oxygen saturation is not measured using either ‘red or infrared’ light. Rather, the measurement uses red ***and*** infrared light.” *Id.* Therefore, Patent Owner argues, the POSA “would have understood that Sarantos does not disclose measuring oxygen saturation.”

Id. As further evidence to support that Sarantos does not disclose measuring oxygen saturation, Patent Owner points to Sarantos’s statement that it is “not tailored for use in other spectrums, such as the red or infrared spectra.” *Id.* at 32 (citing Ex. 1005, 18:42–51). Patent Owner’s argument that Sarantos does not disclose measuring oxygen saturation is unavailing.

Sarrantos teaches that “photoplethysmographic techniques may . . . be used to measure other physiological parameters besides heart rate, such as blood oxygenation levels.” Ex. 1005, 13:44–47. In arguing that Sarantos is limited to the use of only a single wavelength of light for measuring oxygen saturation, Patent Owner reads Sarantos too narrowly. Sarantos discloses that in situations such as when measuring blood oxygen levels, “[i]t may . . . be desirable to include an LED that predominately emits light in the red or infrared spectrum.” *Id.* at 13:44–49; *see also id.* at 18:42–48 (disclosing that “[l]ight sources emitting light in the green spectrum are particularly well-suited for photoplethysmographic techniques for measuring heart rate” but “other photoplethysmographic techniques, such as techniques for measuring blood oxygenation levels, may be most effective using light of dramatically different wavelengths, such as in the red wavelengths, e.g., 660 nm, or in the infrared spectrum”). We recognize that Sarantos uses the term “or” rather than “and,” but find that, in this instance, the term “or” is used inclusively rather than disjunctively. This interpretation is supported by Sarantos’s disclosure of using multiple wavelengths of light. *See, e.g., id.* at 13:49–53 (disclosing “it may be desirable to include separate light-emitting devices that are each able to emit different wavelengths of light”). It is also supported by Dr. Anthony’s credible testimony that “the term ‘or’ is generally read to be inclusive unless specified otherwise, especially when

being read by engineers.” Ex. 1079 ¶ 26; *see also* Pet. Reply 11 (citing Ex. 1079 ¶¶ 26–27; Ex. 1003 ¶¶ 89–93). And it is consistent with the knowledge in the art to use “one or more wavelengths” of light to detect oxygen saturation. Ex. 1001, 1:61–2:3 (’743 patent’s background section teaching that pulse oximetry relies on transmitting “optical radiation of one or more wavelengths into a tissue site”); Ex. 1028 ¶ 52 (reference from 2006, disclosing that “a pulse oximetry device with a light source . . . that typically includes LEDs that generate both red ($\lambda \sim 660$ nm) and infrared ($\lambda \sim 900$ nm) radiation”);¹⁷ Ex. 1013, 77 (reference from 1997 entitled “Design of Pulse Oximeters,” disclosing that “[t]he designer should keep in mind the wavelengths of interest in pulse oximetry (660 nm and 940 nm) when deciding on an appropriate photodiode”); Ex. 1033, 1:38–42 (reference from 2008, stating: “[p]ulse oximeter devices typically contain two light emitting diodes: one in the red band of light (660 nanometers) and one in the infrared band of light (940 nanometers)”).

Accordingly, we find that the preponderance of the evidence supports that the POSA would have understood that Sarantos discloses measuring blood oxygen saturation.

b) Motivation to combine

Based on Sarantos’s disclosure of measuring blood oxygen saturation, Petitioner contends that, “a [POSA] would have been motivated to determine

¹⁷ Exhibit 1028 is a subject of Patent Owner’s Motion to Strike, which we dismiss as moot. *See supra* § III. Patent Owner’s Motion challenges Petitioner’s reliance on Exhibit 1028 in a different context than it is used here. Nonetheless, we note that our consideration of Exhibit 1028 is not necessary to our determination on this issue and that we would reach the same conclusion even without taking Exhibit 1028 into account.

oxygen saturation using Iwamiya’s physiological sensor . . . in order to expand the range of physiological parameters measured by Iwamiya’s sensor, thereby improving the functionality and utility of the sensor.” Pet. 43 (citing Ex. 1003 ¶ 90; Ex. 1005, 13:40–14:22). According to Petitioner, the POSA’s “desire to expand the capabilities of Iwamiya’s device by adding a red wavelength to measure oxygen saturation in addition to pulse rate also would have justified any design tradeoffs necessary to implement oxygen saturation measurements.” *Id.* at 45.

We agree with Petitioner that Sarantos would have provided the POSA with motivation to expand the functionality of Iwamiya’s sensor to include measuring oxygen saturation. Patent Owner argues that Petitioner’s proposed motivation is “generic” and also argues, at length, that Iwamiya teaches away from the claimed combination. We address both arguments below.

Patent Owner argues that Petitioner’s proposed “motivation is generic and says nothing more than the combination would have added oxygen saturation as a feature.” PO Resp. 38. According to Patent Owner, Petitioner “raised the same generic motivation to modify Iwamiya based on Sarantos during the ITC Investigation and the ITC rejected it as too generic.” *Id.* (citing Ex. 2093, 230).

We disagree with Patent Owner that the motivation identified by Petitioner in this proceeding is “too generic.” Sarantos expressly teaches that its photoplethysmographic techniques can be used to detect multiple physiological parameters using the same device, including, specifically, blood oxygenation levels. Ex. 1005, 13:44–48. Dr. Anthony testifies that applying this teaching to Iwamiya’s device would “expand the range of

physiological parameters measured by Iwamiya's sensor, thereby improving the functionality and utility of the sensor." Ex. 1003 ¶ 90. We find this motivation sufficiently specific and persuasive. *See KSR*, 550 U.S. at 417 ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.").

Patent Owner argues that "Iwamiya teaches away from using visible light, including red light, in its sensor design and included multiple design aspects specifically designed to avoid visible light." PO Resp. 32. According to Patent Owner, melanin absorbs eight times more light in the red spectrum and twenty times more light in the green spectrum than it does 940 nm infrared light. *Id.* at 34. To avoid the problem that melanin absorbs light, Patent Owner argues, "Iwamiya tailors multiple aspects of its sensor design to measurement of 940 nm infrared light." *Id.* For example, Patent Owner asserts, Iwamiya uses a detector that has "very little sensitivity to measurements using visible light," and "includes an optical filter 17 that transmits light above 900 nm but blocks light below 900 nm from being detected by the detector." *Id.* at 35.

Petitioner responds that "Iwamiya discloses detecting pulse rate using a **single** wavelength of infrared light at 940 nm" but "never criticizes, discredits, or otherwise discourages the use of two wavelengths of red and infrared light **for the purpose of measuring oxygen saturation.**" Pet. Reply 13. Petitioner then points out that its proposed combination would continue to use Iwamiya's preferred 940 nm wavelength because "940 nm light is also commonly used for determining oxygen saturation." *Id.* at 13–

14. According to Petitioner, the device resulting from the proposed combination “would have retained the advantages of the original with respect to measuring pulse rate of users with high melanin in the skin.” *Id.* at 14. In addition, Petitioner argues, “even if such a teaching away existed (it does not), it applies only to users having ‘a large amount of melanin[] pigment’ and therefore the proposed modifications would be suitable for other users.” *Id.*

We agree with Petitioner that Iwamiya does not teach away from the claimed device. We acknowledge that Iwamiya teaches that “if a large amount of melanin[] pigment is contained in the epidermis, the observation light may be absorbed by the melanin[] pigment.” Ex. 1004, 1:57–59. We further acknowledge that Iwamiya teaches that using a wavelength of 940 nm light avoids this problem. *See, e.g., id.* at 10:34–38 (“[E]ven though the epidermis H2 contains the large amount of melanin[] pigment, the observation light is of an infrared band of $\lambda_p=940\text{nm}$. For this reason, the amount of light absorbed by the melanin[] pigment is small.”). However, as Petitioner points out, the Iwamiya/Sarantos combination device would retain the 940 nm light source. Pet. Reply 13–14; Ex. 1079 ¶ 33. And Iwamiya never criticizes or disparages the known technique of using multiple light sources. Ex. 1079 ¶ 32 (explaining that Iwamiya does not criticize using two wavelengths and that the POSA would have been aware of the benefits of doing so). As we noted *supra* § II.E.5.a, it was known in the art to use “one or more wavelengths” of light to detect oxygen saturation. *See, e.g.,* Ex. 1005, 13:44–53 (Sarantos, teaching that when using photoplethysmographic techniques to measure parameters other than heart rate, such as blood oxygenation levels, “it may be desirable to emit different

wavelengths of light; each light emitting device may be used to supply light for a different type of photoplethysmographic measurement”). For these reasons, we find that Iwamiya does not teach away from adding an additional light source to its existing 940 nm light source.

In addition, we agree with the Board decision in IPR2022-01291 that Iwamiya’s teachings with respect to melanin only apply to users with a large amount of melanin in their skin. The Board explained:

[T]o the extent Iwamiya teaches away from using visible light such as red light in its device, this teaching away applies only to users having “a large amount of melanin[] pigment” in their skin, “for example, in the case of a person of dark skin color.” Ex. 1004, 1:53–2:6, 6:31–34, 10:34–38, 11:43–49. Thus, so far as Iwamiya is concerned, using visible observation light in a biometric sensor will work for users having less than a “large amount” of melanin in their skin. *See, e.g., id.* at 1:28–52 (discussing how wristwatch type sensors had “generally used” light with a wavelength shorter than 600 nm to determine heart rate prior to Iwamiya’s use of infrared light (940 nm) to determine heart rate); *id.* at Fig. 6 (illustrating light absorption coefficients of oxy-hemoglobin and melanin in the visible light range (400–700 nm) and the near infrared light range (700–1000+ nm)). Federal Circuit “precedent . . . does not require that the motivation be the *best* option, only that it be a *suitable* option from which the prior art did not teach away.” *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014)).

Ex. 2035, 65 (second and third alterations in original). We agree with and adopt this analysis.

Patent Owner argues that the Board’s decision in IPR2022-01291 engaged in speculation “about how Iwamiya might work when changing its device to use red light.” PO Resp. 37. According to Patent Owner “no evidence” supports that the POSA would have proceeded “against

Iwamiya’s express criticisms and develop a device that might only work on persons with light skin color but stop working at some unknown skin tone.”

Id. We do not find Patent Owner’s criticism persuasive because Iwamiya makes clear that melanin is only a problem when there are large amounts of melanin present. Ex. 1004, 1:57–59 (Iwamiya, disclosing that “if a large amount of melanin[] pigment is contained in the epidermis, the observation light may be absorbed” and “biological information . . . cannot be accurately detected” (emphasis added)). There is no evidence in Iwamiya or elsewhere that such concerns apply when the epidermis does not contain “a large amount of melanin[].” *Id.*

Having considered all of the arguments and evidence of record, we find that Iwamiya does not teach away from using visible light, including red light, in its sensor design. To the contrary, we find that a preponderance of the evidence supports that the POSA would have been motivated to determine oxygen saturation using Iwamiya’s physiological sensor in order to expand the range of physiological parameters measured.

c) Reasonable expectation of success

According to Petitioner, a POSA would have “reasonably expected success in adapting Iwamiya’s sensor . . . by using LEDs that emit light in the red or infrared spectrum and modifying the optical filter 17 to let light of corresponding wavelengths pass to obtain oxygen saturation measurements.” Pet. 43–44 (citing Ex. 1003 ¶ 90). Petitioner contends that the POSA would have reasonably expected success because “wrist-worn pulse oximetry sensors, such as that described in Sarantos, were well-known in the art.” *Id.* at 45 (citing Ex. 1003 ¶ 93; Ex. 1008 ¶¶ 26, 34; Ex. 1005, 13:40–14:22, Fig. 2). As further support for this proposition, Petitioner cites “engineering and

scientific papers describing real-world studies and experimental results that conclusively establish the feasibility of measuring oxygen saturation at the wrist.” *Id.* (citing Ex.1033; Ex. 1034; Ex. 1035; Ex. 1036); *see also* Ex. 1003 ¶ 93 (testimony of Dr. Anthony describing these references).

Patent Owner disputes that the POSA would have reasonably expected success on several grounds. In this regard, Patent Owner’s arguments, and the dispute between the parties, focus on three topics: 1) whether the prior art references cited by Petitioner (in addition to Sarantos and Iwamiya) support a reasonable expectation of success, 2) whether testimony and documents from engineers involved in designing the Apple Watch detract from a reasonable expectation of success, and 3) whether the absence of commercial products detracts from a reasonable expectation of success. We address each of these three topics in turn.

Before turning to Patent Owner’s arguments, however, we are mindful that the correct inquiry centers on whether a skilled artisan would have combined the art with a reasonable expectation of success in arriving at what is actually claimed. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2014). One need not show a reasonable expectation of success concerning features or results that the claims do not require. *Id.* Claims 11 and 24 require determining oxygen saturation, but they do not specify any performance benchmarks for doing so, such as a degree of accuracy of measurement. Ex. 1001, 16:24–25, 18:28–29. Nor do these claims impose any requirements on the, size, shape, or overall form factor of the device that takes the measurements. *Id.*

(1) *References teaching determination of
oxygen saturation*

Petitioner argues that “over a dozen references of record demonstrate [the] feasibility of measuring oxygen saturation at the wrist.” Pet. Reply 15. According to Petitioner, “these references demonstrate that a [POSA] would have reasonably expected success implementing the combinations to determine oxygen saturation at the wrist before the ’743 Patent.” *Id.* Patent Owner disputes this, offering reference-specific arguments as to why the references cited by Petitioner do not support a reasonable expectation of success. PO Resp. 19–22. We address the parties’ reference-specific arguments below.

The Petition cited Määttälä,¹⁸ Li,¹⁹ Cai,²⁰ and Rulkov²¹ as support for the proposition that “real-world studies and experimental results . . . conclusively establish the feasibility of measuring oxygen saturation at the wrist.” Pet. 45; *see also* Ex. 1003 ¶ 93 (testimony of Dr. Anthony discussing expectation of success in view of these references). For example, Petitioner contends that Määttälä “identified an ‘optimum place’ on a user’s ‘wrist so

¹⁸ Määttälä et al., *Optimum Place for Measuring Pulse Oximeter Signal in Wireless Sensor-Belt or Wrist-Band*, 2007 International Conference on Convergence Information Technology (Ex. 1036, “Määttälä”).

¹⁹ Li et al., *A Wireless Reflectance Pulse Oximeter With Digital Baseline Control for Unfiltered Photoplethysmograms*, IEEE Transactions on Biomedical Circuits and Systems, Vol. 6, No. 3 (June 2012) (Ex. 1034, “Li”).

²⁰ Cai et al., *Implementation of a Wireless Pulse Oximeter Based on Wrist Band Sensor*, 3rd International Conference on Biomedical Engineering and Informatics (2010) (Ex. 1035, “Cai”).

²¹ Rulkov et al., US 7,468,036 B1, issued Dec. 23, 2008 (Ex. 1033, “Rulkov”).

that it would provide reliable oxygen saturation (SpO₂) readings’ for its wrist band to achieve ‘many benefits.’” Pet. Reply 16. According to Petitioner, “[i]n Cai, the authors ‘confirmed the feasibility of our oximeter’ that employed ‘[a] wrist located reflectance sensor.’” *Id.* (second alteration in original). And Petitioner cites Li as teaching that its “pulse oximeter ‘gather[ed] high integrity data at . . . wrist . . . locations from a group of 48 subjects’” and “confirmed ‘suitable PPGs’ for measuring blood oxygenation at the wrist.” *Id.* at 17 (alterations in original). Finally, Dr. Anthony explains that Rulkov “describes a pulse oximetry monitoring device that can be worn on the wrist, and also references several patent documents by other inventors that disclose such a device.” Ex. 1003 ¶ 93.

In its Reply, Petitioner cites and discusses three additional references as supporting a reasonable expectation of success: Pang,²² Fontaine,²³ and Brady.^{24, 25} Petitioner explains that “Pang describes a ‘wrist pulse oximeter .

²² Pang et al., *A Neo-Reflective Wrist Pulse Oximeter*, IEEE Access, Digital Object Identifier 10.1109/Access.2104.2382179, published Dec. 18, 2014 (Ex. 1014, “Pang”).

²³ Fontaine et al., *Reflectance-Based Pulse Oximeter for the Chest and Wrist*, Worcester Polytechnic Institute (Apr. 2013), available at <https://digital.wpi.edu/show/6969z2326> (Ex. 1042, “Fontaine”).

²⁴ Brady et al., US 2006/0253010 A1, published Nov. 9, 2006 (Ex. 1028, “Brady”).

²⁵ Patent Owner moves to strike these references and the briefing discussing them. *See infra* § III. As noted below in our discussion of the Motion to Strike, we dismiss the Motion as moot. Petitioner also string cites, but does not discuss, several more references. Pet. Reply 15–16, 19–20. Because they are not necessary to this Decision, and because their citation arguably violates our rules against incorporation by reference, we do not consider references in the string cites bridging pages 15–16 and 19–20 of Petitioner’s

. . that detected the pulse wave signal efficiently’ (confirmed by ‘experimental results’) such that ‘oxygen saturation can then be calculated.’” Pet. Reply 17 (alteration in original) (emphasis omitted). Fontaine, according to Petitioner, “demonstrates that in 2013, a group of undergraduates were ‘able to accurately measure within an error of + 1% and $\pm 3\%$ for SpO₂ and PR [pulse rate] respectively from the wrist.” *Id.* at 18 (alteration in original). And Brady “demonstrates that as of 2006, a [POSA] knew techniques for implementing ‘a wrist worn article for monitoring a user’s vital signs’ including ‘oxygen saturation level data.’” *Id.* at 19.

Patent Owner dismisses Petitioner’s reliance on the references cited in the Petition, contending that none of Määttälä, Li, Cai, and Rulkov establish a reasonable expectation of success. PO Sur-reply 19; PO Resp. 51–54. More specifically, as to Li, Patent Owner argues, “Li does not report any measurement of oxygen saturation from the wrist” and fails to supply measurements of two wavelengths of light necessary to make the calculation. PO Resp. 54. With respect to Cai, Patent Owner argues that it fails to supply the required measurements, instead providing an “R” value that “is not an oxygen saturation determination.” *Id.* at 53–54. As to Määttälä, Patent Owner asserts that it not only fails to show actual determinations of oxygen saturation, but it also noted that “[m]any problems still have to be overcome.” *Id.* at 54 (alteration in original) (quoting Ex. 1018, 1860). Finally, with respect to Rulkov, Patent Owner argues that the

Reply that are not discussed in the briefing as providing support for the proposition for which they are cited. *Id.*

cited passages do not “demonstrate the existence of any device that measured oxygen saturation from the wrist or otherwise demonstrate its feasibility.” *Id.* at 51. In its Sur-reply, Patent Owner summarized its arguments on these references with a single sentence, arguing that “none of those references disclosed an actual calculation of oxygen saturation from the wrist.” PO Sur-reply 19.

In its Sur-reply and post-hearing Supplemental Brief, Patent Owner addresses Pang, Fontaine, and Brady in more detail. With respect to Pang, Patent Owner argues “Pang presented separate red and infrared waveforms only, did not present any oxygen saturation measurements, and relied on simulated, not real data.” PO Supp. Br. 1 (citing Ex. 2120 ¶¶ 110, 112). In addition, according to Patent Owner, Pang “used its own ‘special design’ that does not provide a reasonable expectation of success for the physically different Iwamiya-Sarantos combination.” PO Sur-reply 21. With respect to Brady, Patent Owner argues that it “focused on how to calculate burned calories and does not demonstrate the existence of any device that measures oxygen saturation at the wrist.” PO Supp. Br. 1 (citing Ex. 2120 ¶ 116). With respect to Fontaine, Patent Owner argues that the document is undated and that Petitioner cites no evidence that it was published. *Id.* In addition, Patent Owner contends that its discussion of successful oxygen saturation measurements is hearsay. *Id.* Patent Owner concludes, arguing that Fontaine is “nothing more than undated, unsigned, and ungraded schoolwork that does not inform whether a [POSA] would have reasonably expected success.” PO Sur-reply 21–22.

For the reasons discussed below, we find that at least Pang, Li, Cai, and Määttä support that the POSA would have reasonably expected

success in detecting blood oxygen saturation at the wrist, and we need not reach whether Brady and/or Fontaine further support Petitioner’s arguments. We discuss each of Pang, Li, Cai, and Määttälä in turn.²⁶

Pang describes in December 2014 “a genuine wrist pulse oximeter . . . that can measure the pulse rate and oxygen saturation level in a person’s blood,” which had “been developed and calibrated, and the calibration curve was analyzed.” Ex. 1014, 1562 (Publication Date and Abstract). Pang describes its wrist-worn sensor device, which utilized red and infrared observation light, and included photographs of the device used for testing. *Id.* at 1563–66. Pang concludes its device “detected the pulse wave signal efficiently” such that “oxygen saturation can then be calculated by the ratio of the light intensity change rates under the two different [red and infrared] wavelengths.” *Id.* at 1566. Pang recognizes that “[t]he calibration of an oxygen oximeter can be a complicated task,” and concludes “a second-order relationship between the R value and the oxygen saturation can provide a better fit with the data.” *Id.* at 1566, 1567 (conclusion #4). We find these disclosures provide support for the proposition that the POSA would have had a reasonable expectation of success in utilizing red and infrared light to

²⁶ Our analysis of Li, Cai, Määttälä, and Pang mirrors that of the Board in IPR2022-01291 with minor alterations to reflect differences in the evidence of record. *See* Ex. 2035, 92–95. For readability and convenience, we do not use block quotes or otherwise quote IPR2022-01291 even in instances where the language is identical.

determine oxygen saturation at the wrist in July 2015, which is the earliest-claimed priority date of the '743 patent.

Li, published in June 2012, discloses “a small, low-cost pulse oximeter design appropriate for wearable and surface-based applications that also produces quality, unfiltered photo-plethysmograms (PPGs)” which are “high-fidelity.” Ex. 1034, 269 (Publication Date and Abstract). Further, “[t]his sensor has demonstrated an ability to gather high-integrity data at fingertip, *wrist*, earlobe, palm, and temple locations from a group of 48 subjects (20 to 64 years old).” *Id.* (emphasis added); *see also* Ex. 1014, 1563 (Pang, characterizing Li as having “developed a small and low-cost wireless reflectance oximeter suitable for wearable and surface-based applications including at the wrist location”). Li describes its sensor device, which utilized red and infrared observation light, and provides experimental data using the sensor device at three locations on the wrist. *See* Ex. 1034, 274–275 (describing sensor device using a “bi-color LED” to generate light at 660 nm and 910 nm, shown as “Red” and “Infrared” in Figure 11), 276 (experimental data). Li concludes “all three” wrist locations provided “suitable PPGs,” even though “[a]t present, it is difficult to consistently obtain high quality PPG data from the wrist” due to the pressure required, which Li solved by bending the wrist at a 45° angle. *Id.* at 276. We find that these disclosures provide support for the proposition that the POSA would have had a reasonable expectation of success in utilizing red and infrared light to determine oxygen saturation at the wrist in July 2015.

Cai is a study presented in 2010, entitled “Implementation of a Wireless Pulse Oximeter Based on Wrist Band Sensor.” Ex. 1035, 1897. Cai describes efforts “to develop a wrist band pulse oximeter” implementing

“[a]n oxygen saturation measurement system,” and presents “preliminary . . . experimental results” that “confirmed the feasibility of this wrist-band oximeter.” *Id.* (Abstract); *see also* Ex. 1014, 1562 (Pang, disclosing that “[a] wrist-worn pulse oximeter is described in [Cai] which has illustrated the feasibility of reflectance oximetry based on a sensor mounted onto a wrist band”). Cai describes its wrist-worn sensor device, which utilized red and infrared observation light, and concludes its “system efficiently detected the human pulse wave signal” such that “the oxygen saturation is deduced” from the red and infrared light. Ex. 1035, 1898–99 (Sections III.A–C). Cai also provides experimental results “indicat[ing] that this system can effectively detect the change of oxygen saturation.” *Id.* at 1900. We find that these disclosures provide support for the proposition that the POSA would have had a reasonable expectation of success in utilizing red and infrared light to determine oxygen saturation at the wrist in July 2015.

Määttälä presented in 2007 a “study . . . done in order to solve the optimum place for integrated pulse oximeter in case of a belt around human chest *or wrist* so that it would provide reliable oxygen saturation (SpO₂) readings for non-invasive constant health monitoring.” Ex. 1036, 1856 (Publication Date and Abstract) (emphasis added). Määttälä concludes: “Results were promising and showed that an easy portable monitoring device is possible but also many problems, that should be overcome, were detected.” *Id.* Määttälä investigates a PPG sensor, utilizing red and infrared light (*see id.* at 1857–58), and determines: “[m]any problems still have to be overcome but this study proves that *wireless integrated pulse oximeter implanted in a chest belt or wrist band is possible to achieve with many benefits and practical applications.*” *Id.* at 1860 (emphasis added). We find

that these disclosures support that, as early as 2007, researchers considered wrist-based blood oxygen saturation determinations to be possible using red and infrared light, although in that early time frame many problems had not yet been overcome.

Patent Owner correctly notes that Pang “relied on simulated, not real data.” PO Supp. Br. 1 (citing Ex. 2120 ¶¶ 110, 112). And Patent Owner is also correct that “none of [Määttälä, Li, and Cai] disclosed an actual calculation of oxygen saturation from the wrist.” PO Sur-reply 19. But as the Board in IPR2022-01291 observed, Patent Owner “does not cite, and we are not aware of, any legal authority that requires *actual* success in the prior art as a prerequisite of obviousness.” Ex. 2035, 96 (citing *Almirall, LLC v. Amneal Pharms. LLC*, 28 F.4th 265, 275 (Fed. Cir. 2022) (“A finding of a reasonable expectation of success does not require absolute predictability of success.”)). Moreover, the references disclose methods to obtain the signals used in the oxygen saturation calculation. The alleged failure to actually use those signals to perform an SpO₂ calculation does not, standing alone, support Patent Owner’s argument that the references fail to support a likelihood of success, particularly where those references expressly disclose that the devices they disclose can be used to calculate SpO₂. *See, e.g.*, Ex. 1035, 1900 (Cai, disclosing: “This oximeter can obtain oxygen saturation.”); Ex. 1036 (Määttälä, disclosing: “[T]his study proves that wireless integrated pulse oximeter implanted in . . . [a] wrist band is possible to achieve.”). We conclude, as did the Board in IPR2022-01291, that Pang, Li, Cai, and Määttälä provide strong support for the proposition that the POSA would have had a reasonable expectation of success in determining oxygen saturation at the wrist in July 2015.

(2) *Testimony and documents relating to
development of the Apple Watch*

Patent Owner argues that testimony elicited during the ITC proceeding from several of Apple’s “key engineers who worked on developing a wrist-worn oxygen saturation sensor at the time of the ’743 [p]atent . . . confirms that as of July 2015, a [POSA] would not have had a reasonable expectation of success in modifying Iwamiya to measure oxygen saturation at the wrist.” PO Resp. 40; *see also id.* at 39–50 (citing Ex. 2100 ¶¶ 94–108 (addressing testimony of Apple engineers and related documents)). In particular, Patent Owner points to the testimony of Mr. Brian Land, Dr. Paul Mannheimer, Dr. Stephen Waydo, and Dr. Tao Shui. *Id.* at 40–43, 45. Patent Owner also points to several documents generated by Apple during the Apple Watch design process. *Id.* at 43–45. We summarize that testimony and documentation below, and analyze the parties’ respective arguments concerning this evidence.²⁷

(a) *Brian Land’s Testimony*

Mr. Brian Land, a “distinguished engineer” at Apple who leads the Health Sensing Hardware development team including health sensors for the Apple Watch, was asked upon direct examination by Apple’s counsel about Apple’s development of a blood oxygen sensor for use in the Apple Watch. *See* Ex. 2076 (Mr. Land’s trial testimony), 954:15–955:9, 962:15–963:21.

²⁷ Our summary of the testimony and documentation elicited from the ITC proceeding mirrors that of the Board in IPR2022-01291 with minor alterations to reflect difference in the evidence of record. *See* Ex. 2035, 71–77. For readability and convenience, we do not use block quotes or otherwise quote IPR2022-01291 even in instances where the language is identical.

Specifically, he was asked: “What were some of the challenges that you and your team faced in developing the blood oxygen sensor for the Apple Watch?” *Id.* at 963:19–21. He responded as follows:

The challenges were -- were many. The first was we had to fit into the small form factor of the watch and we were trying to hit a moving target, because every—it seemed like as every year went by the watch got a little smaller.

And we also had to work across—at the wrist, which was unprecedented—at the time that we kicked off the blood oxygen sensing at the wrist, there were no commercially available products that did blood oxygen sensing at the wrist.

We also had to fit into a product that had very little space for the resources needed were accurate, and, of course, we had to work across all of the human variation that existed in the world. Those were some major challenges.

Id. at 963:22–964:11. Patent Owner asserts the time frame of these development efforts was “late 2014.” PO Resp. 40 (citing Ex. 2076, 962:25–963:9, 964:2–6; Ex. 2084).

(b) *Paul Mannheimer’s Testimony*

Dr. Paul Mannheimer was hired by Apple in 2014 due to his

[REDACTED]
[REDACTED] and he became “one of the [REDACTED] contributors for the blood oxygen development” in the Apple Watch. Ex. 2076 (Mr. Land’s trial testimony), 962:14–963:15; *see also* Ex. 2077 (Dr. Mannheimer’s trial testimony), 994:6–7, 996:25–997:8. Dr. Mannheimer holds a Ph.D. in biomedical engineering, and prior to joining Apple he spent about twenty years developing pulse oximetry sensors, monitoring techniques, and alarm handling techniques, specializing in the physio-optics of pulse oximetry. *See* Ex. 2077, 994:2–25; Ex. 2080 (Dr. Mannheimer’s deposition testimony),

180:22–181:4. Dr. Mannheimer’s first assignment at Apple was “[t]o work on the blood oxygen app, [REDACTED]

[REDACTED] Ex. 2080, 173:9–13; *see also* Ex. 2077, 996:25–997:5 (testifying that he was “asked to look into doing pulse oximetry at the wrist for the Apple Watch”), 1012:12–16 (testifying that he was assigned “to work on [REDACTED]

[REDACTED]. Dr. Mannheimer was asked: “What was your reaction to receiving the assignment of trying to develop a pulse oximeter for the wrist?” Ex. 2080, 173:14–16. He answered:

It was not a complete surprise. I was sort of guessing that was why I was being interviewed, although I only learned of it after joining [Apple]. My first reaction when actually hearing it was internally to my head rolling my eyes, thinking, as I’d thought of it in the past with other clients, like good luck with that.

But I shared with my boss that -- I said, that’s going to be a challenge and to the effect of -- I certainly -- I don’t know if it can be done, but I don’t know if it can’t be done. So let’s go try.

Id. at 173:16–174:6; *see also* Ex. 2077, 1012:17–25 (repeating same testimony).

Dr. Mannheimer was then asked: “Why did you believe it to be a challenge?” Ex. 2080, 174:7–8. He answered:

So the wrist is just enormously different from a physiologic perspective than the fingertip or the forehead or the ear, the more conventional sites for pulse oximetry. [REDACTED]

[REDACTED] signal is just enormously weak.

Id. at 174:9–18; *see also* Ex. 2077, 1013:1–6 (repeating same testimony).

Dr. Mannheimer was also asked how the blood oxygen sensor developed at Apple differed from sensors he had previously worked on, and he answered:

To me, [REDACTED] difference is that it's intended to be used at the wrist. The clinical products that I worked on previously for adults, peds, neonates and fetuses operated on a much more vascularized tissue bed, usually fingers or forehead, or on the fetus it was the cheek.

The wrist is just an incredibly different beast. [REDACTED]

[REDACTED] Shrinking things down to be much smaller package and use substantially less power and to be used by a consumer in a nonprescription environment would ultimately add to additional challenges to think through and work through.

Ex. 2077, 998:15–999:11. Dr. Mannheimer testified that it ultimately took Apple's engineers close to six years to develop the blood oxygen feature for the Apple Watch. *See* Ex. 2080, 174:19–175:5.

(c) Stephen Waydo's Testimony

Dr. Stephen Waydo is the director of Apple's Human Interface Devices Health group, which is responsible for health sensor algorithms in the Apple Watch. *See* Ex. 2078 (Dr. Waydo's trial testimony), 918:3–919:9. Dr. Waydo was asked: "What challenges, if any, are associated with attempting to do pulse oximetry on the wrist as opposed to other parts of the body?" Ex. 2081 (Dr. Waydo's deposition testimony), 166:4–6. He answered:

The wrist is one of the most difficult places on the body to do almost every physiological measurement. [REDACTED]

So the signals we have access to on the wrist are, in general, much smaller [REDACTED]

Furthermore, at the wrist we're doing what's called a reflectance measurement, meaning we're shining light in and capturing what comes back, versus a more traditional oximeter that attaches to a fingertip or an earlobe or a toe or something gets to shine light through the tissue and catch it on the other side. [REDACTED]

Id. at 166:7–167:5; *see also* Ex. 2078 (Dr. Waydo's trial testimony), 938:21–24 (Dr. Waydo was asked “And, in fact, it was extremely challenging to develop the blood oxygen feature in the Apple Watch, correct?” to which he answered “Yes”), 925:23–926:6 (Dr. Waydo testifying that his team of engineers spent “something like 20 or 30,000 hours of engineering time just on [the blood oxygen] algorithm architecture” in the Apple Watch).

Dr. Waydo was also asked: “Can you give an example of one of the challenges your team faced in developing the blood oxygen feature?” Ex. 2078, 923:24–25. He answered:

[REDACTED]
[REDACTED] the wrist, which, in general, is a difficult area to do physiological measurements.

Id. at 924:1–11.

(d) *Tao Shui's Testimony*

Dr. Tao Shui is an engineer at Apple. *See* Ex. 2082 (Dr. Shui's deposition testimony), 11:19–12:11. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] *Id.* at 106:4–108:12. He was asked: “What was . . . the most challenging part of that work?” *Id.* at 108:13–14. He answered:

[REDACTED] challenging part of the work is related to the position of the Apple Watch blood oxygen sensor. The watch is worn on the wrist, and the wrist is well known for its lack of signal. [REDACTED]

[REDACTED]

Id. at 108:15–21.

(e) *Apple's R&D Documentation*

Apple's research and development documentation also discusses technical challenges posed by measuring blood oxygen saturation at the wrist using light-based sensors in the Apple Watch. For example, an internal status update presentation dated July 30, 2015 (*see* Ex. 2085, 1) stated “[t]he wrist is a challenging location [REDACTED] [REDACTED] for “SpO₂ measurement” (*id.* at 6–9, 13). The presentation concludes “[i]nvention is required,” for example:

[REDACTED]

[REDACTED]

[REDACTED] *Id.* at 13. As another example, [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED] (*id.* at 9).

(f) *Analysis*

Patent Owner argues that the testimony of Apple’s engineers supports that the POSA would not have reasonably expected success. PO Resp. 40–43. In particular, with respect to Mr. Land, Patent Owner points to his testimony that measuring oxygen saturation at the wrist was “unprecedented” and that “there were no commercially available products that did blood oxygen sensing at the wrist.” *Id.* at 40 (citing Ex. 2076, 9:62:25–963:9, 964:2–6; Ex. 2084).

With respect to Dr. Mannheimer, Patent Owner focuses on testimony that his first assignment was [REDACTED] and that his reaction to that assignment was to “*roll[] his eyes, thinking . . . good luck with that.*” *Id.* at 41 (citing Ex. 2077, 1012:12–22; Ex. 2080, 173:14–174:1). Patent Owner also points out testimony that Dr. Mannheimer [REDACTED] [REDACTED] and his testimony that he told his boss, in regard to measuring oxygen at the wrist, “*I don’t know if it can be done.*” *Id.* (citing Ex. 2094, 19:10–20; Ex. 2080, 174:2–6; Ex. 2077, 1012:23–25; Ex. 2100 ¶ 102).

With respect to Dr. Waydo, Patent Owner directs us to his testimony that it was “extremely challenging” to develop the blood oxygen feature, so much so that the assignment “intimidated” him. *Id.* at 42 (citing Ex. 2078, 938:3–24). Patent Owner also cites his testimony that “[t]he wrist is one of the most difficult places on the body to do almost every physiological measurement” and his explanation that “the signals we have access to on the

wrist are, in general, much smaller [REDACTED]

[REDACTED] *Id.* (citing Ex. 2081, 166:4–16).

Patent Owner points out that in view of these challenges, Dr. Waydo and his team of highly skilled engineers spent “something like 20 or 30,000 hours of engineering time just on that [oxygen saturation] algorithm architecture.”

Id. at 43 (citing Ex. 2078, 919:1–8, 925:23–926:6).

With respect to Dr. Shui, Patent Owner points to testimony that “the [REDACTED] of his work was that the “watch is worn on the wrist, and the wrist is well known for its lack of signal.” *Id.* (citing Ex. 2082, 108:13–21; Ex. 2100 ¶ 105).

Finally, with respect to Apple’s research and development documents, Patent Owner focuses on the internal status update discussed above, which it characterizes as showing that [REDACTED]

[REDACTED] Patent Owner calls out its statement that “‘*[i]nvention is required*’ to measure oxygen saturation at the wrist.” *Id.* at 45 (citing Ex. 2085, 13). Patent Owner also quotes this document as reporting that

[REDACTED] *Id.* (citing Ex. 2085, 13; Ex. 2094, 79:11–80:1).

Patent Owner explains why the testimony and documents relating to development of the Apple Watch reflect the absence of a reasonable expectation of success as follows:

If measuring oxygen saturation at the wrist actually had been “well-known” in 2015 as Apple alleges (Pet., 25-26), then Apple’s engineers (“world experts who have years of experience designing and shipping PPG sensors”, EX2089, 2) would have been able to implement that technique by that time. EX2100, ¶109. Yet, Apple was not able to do so by 2015, expressed serious doubt about the ability to measure oxygen saturation at the wrist, as explained above. Instead, Apple’s engineers ultimately were unsuccessful in developing such a feature until releasing Apple Watch Series 6 in September 2020. EX2080, 174:19-175:5, EX2088. Accordingly, despite their extraordinary skill in the art, Apple’s engineers did not expect to succeed in measuring oxygen saturation at the wrist by July 2015 and at that time were far from achieving a sensor that could do so. Therefore, as the ITC already found, the testimony of Apple’s engineers demonstrates that a [POSA] would have lacked a lack of reasonable expectation of success in determining oxygen saturation at the wrist. EX2093, 231; EX2100, ¶109.

Id. at 46.

Petitioner disputes the relevance of the testimony and documents relating to development of the Apple Watch on several bases. First, Petitioner argues that “the engineers’ testimony regarding their subjective experiences developing pulse oximetry for the Apple Watch does not bear on whether a [POSA] would have reasonably expected success in performing the claimed function.” Pet. Reply 22 (emphasis omitted). Second, Petitioner contends that there is “no evidence that the engineers were even aware (as a [POSA] would have been) of the majority of prior art references and studies that had established the feasibility of determining oxygen saturation at the wrist before the ’743 Patent.” *Id.* Third, Petitioner argues that Apple Watch design requirements were far more rigorous than the requirements set forth in the claims, which do not impose any limitation

on the degree of accuracy, form factor, or time-frame for acquiring measurement signals. *Id.* at 23.

With respect to Petitioner’s first point, we agree with Petitioner that the questions the Apple engineers were asked in their ITC testimony does not perfectly mirror the question presented here. As the Board in IPR2022-01219 explained:

Apple’s engineers were asked about the challenges they faced in developing an oxygen saturation determination feature in a future iteration of the pre-existing Apple Watch product. *See* Ex. 1036, 902:13–14 (Dr. Block’s trial testimony, confidential version); Ex. 2008, 938:21–23 (Dr. Waydo’s trial testimony); Ex. 2076, 963:19–21 (Mr. Land’s trial testimony); Ex. 2077, 996:25–997:5, 1012:12–25 (Dr. Mannheimer’s trial testimony); Ex. 2078, 923:1–25 (Dr. Waydo’s trial testimony); Ex. 2080, 173:9–16 (Dr. Mannheimer’s deposition testimony); Ex. 2081, 165:1–166:6 (Dr. Waydo’s deposition testimony); Ex. 2082, 108:2–14 (Dr. Shui’s deposition testimony). They were not asked to address the issue presented here, which is whether a person of ordinary skill in the art would have reasonably expected success in determining oxygen saturation at the wrist, using the light shape changing material disclosed by Iwamiya. Ex. 2035, 99–100 (emphasis omitted). Nonetheless, as Patent Owner correctly points out, even though Apple’s engineers were not testifying from the perspective of a POSA, they were “skilled artisans who were working on the same problem addressed by the ’743 Patent at the time of that patent.” PO Resp. 48. We find that the cited testimony of Apple’s engineers is relevant and that the weight of that testimony is only modestly diminished by the fact that their testimony was not framed from the perspective of the POSA considering the expectation of success in combining Iwamiya and Sarantos to measure oxygen saturation at the wrist.

With respect to Petitioner’s second point, Patent Owner argues that “Apple’s engineers were . . . aware of Li” because it was “in the possession of one of Apple’s engineers, Chinsan Han.” PO Resp. 53 (citing Ex. 2101). According to Patent Owner, Apple’s engineers were also aware of Cai, because [REDACTED]

[REDACTED] *Id.* (citing Ex. 2102, 9, 78). And Patent Owner argues that “Apple’s engineers were also aware of Maattala” because, in a related litigation, it was “produced . . . from the files of Ueyn Block, one of Apple’s engineers working on developing the oxygen saturation sensor.” *Id.* at 54 (citing Ex. 2103). Patent Owner does not direct us to evidence that *every* reference relied upon by Petitioner was known to Apple’s engineers. Petitioner, however, does represent that the techniques employed in many of its references were “well-known,” and these references may have supplied that knowledge. *See, e.g.*, Pet. 45 (asserting that “wrist-worn pulse oximetry sensors, such as that described in Sarantos, were well-known in the art”). Based on the foregoing, we find some support for Patent Owner’s argument that Apple’s engineers were “aware” of the references in question. The inability to develop a device in 2015, even after knowing about these references, would support that the POSA lacked a reasonable expectation of success. However, as Petitioner persuasively points out, the Apple engineers were tasked with developing a commercial Apple Watch product with requirements going well beyond the claimed devices here. Accordingly, the alleged inability to create a device in 2015, even with knowledge of these references, does not suggest that the POSA would have been unable to implement a basic device merely capable of meeting the broad requirements of claims 11 and 24. Pet. Reply 23–25.

For these reasons, we do not discount the testimony of Apple’s engineers on the basis that they were unaware of the prior art. To the contrary, we find the engineers’ awareness of the references aids, but only slightly, Patent Owner’s arguments as to reasonable expectation of success.

With respect to Petitioner’s third point, as discussed above, we are mindful that the correct inquiry centers on whether the POSA would have combined the art with a reasonable expectation of success in arriving at what is actually claimed. *Intelligent Bio-Systems*, 821 F.3d at 1367. Here, claims 11 and 24 merely refer to “determin[ing] a physiological parameter of a user responsive to the one or more signals” and recite “wherein the physiological parameter is oxygen saturation.” Ex. 1001, 15:31–62, 16:24–25, 17:28–18:18, 18:28–20. These requirements could have been satisfied by far more rudimentary functionality than Apple sought to implement in the Apple Watch.

With that in mind, we find that many of the challenges faced by the Apple engineers would have no application to designing a device that merely meets the base-level requirements of claims 11 and 24. For example, the testimonial evidence supports that design challenges relating to the Apple Watch included: fitting the pulse oximeter into a “tiny form factor” (*see, e.g.*, Ex. 2076, 958:19–24, 963:19–964:11 (testimony of Mr. Land); Ex. 2077, 999:5–11 (testimony of Dr. Mannheimer); Ex. 2035, 100 n.17 (opinion in IPR2022-01291 citing evidence)); designing a sensor with low power requirements (*see, e.g.*, Ex. 2076, 958:19–24 (testimony of Mr. Land); Ex. 2077, 999:5–11 (testimony of Dr. Mannheimer)), ensuring that the sensor would work for wide range of human physiology, a variety of skin tones, and across genders (*see, e.g.*, Ex. 2076, 958:19–24, 963:19–

964:11, 965:15–22 (testimony of Mr. Land); Ex. 2078, 925:6–12 (testimony of Dr. Waydo); Ex. 2081, 167:18–169:10 (testimony of Dr. Waydo); Ex. 2035, 101 n.18 (opinion in IPR2022-01291 citing evidence)); accounting for interference from transmitters [REDACTED]

[REDACTED] (*see, e.g.*, Ex. 2076, 970:12–972:5 (testimony of Mr. Land); Ex. 2082, 108:15–109:20. (testimony of Dr. Shui)); and [REDACTED]

[REDACTED] (*see, e.g.*, Ex. 2077, 1000:6–1001:1 (testimony of Dr. Mannheimer)). All of these challenges have only tangential connection to the rudimentary device recited in claims 11 and 24.

On the other hand, Apple’s engineers also testified that designing a sensor that measured blood oxygenation at the wrist was “unprecedented,” because the wrist [REDACTED]

[REDACTED] was “well known for its lack of signal.” Ex. 2076, 963:19–964:11 (testimony of Mr. Land); Ex. 2007, 998:15–999:11 (testimony of Dr. Mannheimer); Ex. 2082, 108:15–109:20 (testimony of Dr. Shui). The difficulty of measuring oxygen saturation at the wrist is confirmed by [REDACTED]

[REDACTED] Ex. 2085, 8–9. The challenge posed by measuring blood oxygenation at the wrist would apply even to the rudimentary device recited in claims 11 and 24.

Ultimately the task before us is to weigh the testimony and documents relating to the design of the Apple Watch and determine to what extent, if at

all, they detract from²⁸ any reasonable expectation of success the POSA might have had in detecting blood oxygen saturation at the wrist.²⁹ This task is complicated by the fact that the difficulties faced by Apple's engineers were the result of a multitude of interrelated factors, some of which are not commensurate with the scope of claims 11 and 24. Having considered all of the evidence and arguments of record on this topic, we find that the testimony and documents relating to the design of the Apple Watch evinces that measuring oxygen saturation at the wrist posed a significant challenge and that this evidence weighs against a reasonable expectation of success. This weight of this evidence, however, is diminished because Apple's design efforts were all in the context of designing a watch that had constraints well beyond what is required by the claims. Thus, the testimony and documents relating to the design of the Apple Watch are entitled to some weight in Patent Owner's favor and somewhat detract from the POSA's reasonable expectation of success.

²⁸ There is no argument that design efforts for the Apple Watch support a reasonable expectation of success.

²⁹ We recognize that claims 11 and 24 do not specify a location at which blood oxygen levels are determined. However, the combination proposed by Petitioner would have monitored oxygen levels at the wrist. *See, e.g.*, Pet. 45 ("The above-noted modification would have been routine and have a reasonable expectation of success at least because wrist-worn pulse oximetry sensors, such as that described in Sarantos, were well-known in the art."). Accordingly, in order to prevail, Petitioner must establish that the POSA would have reasonably expected success monitoring oxygen at the wrist.

(3) *Absence of commercial wrist-worn pulse oximeters*

Patent Owner argues that by “the relevant time in 2015, a [POSA] would not have reasonably expected measuring oxygen saturation at the wrist to succeed, because it had never been done before, in a commercial wrist-worn oximeter.” PO Resp. 39. Patent Owner points out that “Sarantos is a patent assigned to Fitbit” and that “Fitbit did not release a device that could measure oxygen saturation at the wrist until 2020, five years after the ’743 Patent.” *Id.* (citing Ex. 1005; Ex. 2100 ¶ 99; Ex. 2091; Ex. 2092; Ex. 2088, 4 (Washington Post article quoting Fitbit’s director of research as stating that measuring SpO₂ at the wrist was “a pretty hard technical problem”)). Patent Owner also points out that another medical device company, Withings, had a wrist-worn device that required the user “to remove the device from the wrist strap and place it on a finger to measure oxygen saturation,” a feature that at least one review found “seriously annoying.” *Id.* at 39–40; Ex. 2095, 3–5 (review of Withings device). According to Patent Owner, “[f]ar from being ‘well-known,’ Apple also recognized at the time of the ’743 Patent that measuring oxygen saturation at the wrist was speculative.” PO Resp. 40 (discussing testimony of Mr. Land (discussed above) that when Apple began developing an oxygen saturation sensor for the wrist in late 2014 “there were no commercially available products that did blood oxygen sensing at the wrist”).

We give this evidence limited weight. As Petitioner points out, “[t]he motivations and resources of researchers are not inherently aligned with market forces and companies having the available capital for bringing such a product to mass market.” Pet. Reply 20; *see also* PO Resp. 47 (arguing that

“[t]he approval of businesspeople has no bearing on the relevant inquiry, which is whether a [POSA] would have reasonably expected success in measuring oxygen saturation at the wrist in July 2015”). It may very well be, as Patent Owner suggests, that the absence of commercial products was attributable to difficulties in determining blood oxygen saturation at the wrist. *See* Ex. 2088, 4 (quoting Fitbit’s director of research as stating “[i]t’s a pretty hard technical problem to measure SpO₂ on the wrist”). It may also be that the other companies did not seek to develop or introduce products because of a perceived lack of interest. *See id.* (posing the question “what . . . are we supposed to use oxygen apps for?” as follows: “Fitness? You can’t use these sensors while you work out. . . . That leaves us with the industry’s term ‘wellness.’ So are we supposed to get together with friends over drinks and talk about O₂ stats? ‘Hey, bud, my hemoglobin works better than yours!’”); Ex. 2091, 2 (article from Forbes stating that “[b]lood oxygen saturation monitoring has gained prominence in 2020, in part because it can be a sign of a Covid-19 infection”). The record here does not allow us to do more than speculate as to the reasons for the absence of commercial products at the time of the invention.

Moreover, claims 11 and 24 do not require a commercial-grade product. As discussed above, these claims are met by a rudimentary blood oxygen detecting device. And the evidence reflects that such devices were, in fact, made and tested well before the critical date of the ’743 patent. *See, e.g.,* Ex. 1035, 1900 (Cai, disclosing: “This paper describes the system design of a wristband pulse oximetry and completes the prototype fabrication. This oximeter can obtain oxygen saturation and heart rate information continuously and non-invasively through a wearable reflection

sensor placed on the inner wrist.”); Ex. 1036, 1856, 1860 (Määttälä reporting on study where a “pulse oximeter device, which was built in the University of Oulu . . . was used in order to find the best place on human’s . . . wrist to provide the highest accuracy for pulse oximeter signal with lowest noise and disturbances” and concluding “this study proves that wireless integrated pulse oximeter implanted in a . . . wrist band is possible to achieve with many benefits and practical applications”); Ex. 1014, 1562, 1566 (Pang, describing a “genuine wrist pulse oximeter” and reporting that the oximeter “has been developed and calibrated, and the calibration curve [relating to oxygen saturation] was analyzed”).

For the reasons discussed above, we give little weight to the evidence supporting Patent Owner’s argument that the POSA would not have reasonably expected success because pulse oximetry had never been done before in a commercial wrist-worn oximeter.

(4) *Conclusion with respect to reasonable expectation of success*

We determine that the POSA would have reasonably expected success in “adapting Iwamiya’s sensor . . . by using LEDs that emit light in the red or infrared spectrum and modifying the optical filter 17 to let light of corresponding wavelengths pass to obtain oxygen saturation measurements.” Pet. 43–44. In reaching this conclusion, we acknowledge the difficulties faced by the engineers of the Apple Watch. However, we find that many of these difficulties are not commensurate with the scope of claims 11 and 24. We give weight to the evidence that one of the principal difficulties faced by the Apple Watch engineers was taking oxygen saturation measurements at the wrist. However, particularly when considering that the claims require

only a rudimentary device, we find that this evidence is outweighed by Määttälä, Cai, Li, and Pang—i.e., actual studies and experimental results that confirm the feasibility of determining oxygen saturation at the wrist.³⁰ All four studies, particularly when considered collectively, support that the POSA would have reasonably expected success. Although all four studies support a reasonable expectation of success, we find the disclosures of Määttälä and Cai particularly compelling. Ex. 1035, 1897 (Cai, reporting results of a study testing a wrist-band pulse oximeter and concluding that “the experimental results have confirmed the feasibility of this wrist-band oximeter”); Ex. 1036, 1860 (Määttälä, reporting study that used a pulse oximeter device built in the University of Oulu and concluding that, although there are still many problems to overcome, “this study proves that wireless integrated pulse oximeter implanted in a chest belt or wrist band is possible to achieve with many benefits and practical applications”). These studies support Petitioner’s argument that a POSA would have had a reasonable expectation of success in make a device that satisfies the limitations of claims 11 and 24, and outweigh the general skepticism shown in some of the testimony of the engineers working on the Apple Watch and the documents related to the research and development of the Apple Watch.

d) Conclusion with respect to claims 11 and 24

For the reasons discussed above, we determine that a preponderance of the evidence supports that Sarantos discloses measuring blood oxygen saturation, that the POSA would have been motivated to combine Iwamiya

³⁰ Pang is a subject of Patent Owner’s Motion to Strike. We note that our consideration of Pang is not necessary to our ultimate decision and that we would reach the same conclusion even without taking Pang into account.

and Sarantos, and that the POSA would reasonably have expected success in doing so. Accordingly, for the reasons discussed above, we find that Petitioner has established by a preponderance of the evidence that claims 11 and 24 would have been obvious over the combination of Iwamiya and Sarantos.

6. *Claim 13*

Claim 13 recites that “the opening defined in the dark-colored coating comprises a width and a length, . . . wherein the width is larger than the length.” *Id.* at 16:28–3. Petitioner contends that the Iwamiya/Sarantos combination discloses this claim requirement. According to Petitioner:

Sarantos discloses that the photodiodes have a “high-aspect ratio” (‘HAR’), such that “at least 90% of the photodetector element active area[. . .] has a maximum first dimension along a first axis that is at least twice as large as a maximum second dimension of the photodetector element along a second axis that is perpendicular or orthogonal to the first axis.”

Pet. 47–48 (alterations in original). Petitioner then argues that Sarantos teaches that “window regions 2226 through which the light reaches the HAR photodetector elements 2212 each overlap their respective HAR photodetector elements 2212” such that the “window regions 2226 are mutually coextensive with their respective HAR photodetector elements 2212.” *Id.* at 48. Therefore, Petitioner argues, “the window regions defined in the dark-colored coating each include a width and a length corresponding to the width and length of their respective HAR photodiodes, and the width is larger than the length.” *Id.* at 48–49.

Patent Owner argues that in its showing for claim 1, from which claim 13 depends, Petitioner “identified Iwamiya’s optical filter 17 as the “opening

defined in the dark-colored coating” and did not explain “how [Iwamiya’s] optical filter 17 comprises a different width and length.” PO Resp. 61–62. Therefore, Patent Owner argues, Petitioner’s reliance on Sarantos’s window regions 2226 in connection with claim 13 is at odds with its earlier mapping for claim 1 and its reference to HAR photodetectors is “nonsensical because the Iwamiya-Sarantos combination does not use Sarantos’s HAR photodetectors.” *Id.* at 62

We find that Patent Owner has the better position on this issue. Petitioner relies on an opening in Iwamiya’s frame, which includes Iwamiya’s optical filter 17, as the recited opening, and Iwamiya’s photodetectors 9 as the recited detectors. *See, e.g.*, Pet. 25–26 (citing only Iwamiya for the proposition that the Iwamiya/Sarantos combination’s device “includes plural light receiving units 9 (*‘a plurality of detectors’*) that are ‘composed of a silicon photo diode’” and that are “*‘configured to detect at least a portion of the light after passing through tissue’* and *‘to output at least one signal responsive to the detected light’*”); 31–32 (asserting that “Iwamiya describes that the “optical filter 17 is configured to transmit light of a specific wavelength band of 900 nm or more,” and thus “*is configured to allow at least a portion of light reflected from the tissue to pass through to the surface’*”); *see also id.* at 36–40 (relying only on Iwamiya’s disclosure of “plural light receiving units 9 preferably disposed on the same circumference” as meeting the requirements of claim 5). The Petition includes a lengthy discussion explaining, in detail, how and why the POSA would have implemented the Iwamiya/Sarantos combination. *Id.* at 11–17. But this discussion does not discuss modifying the shape of Iwamiya’s

optical filter 17 or implementing Iwamiya's photodetectors using Sarantos's HAR photodiodes. *Id.*

The Petition's mapping for claim 13 mentions that HAR photodiodes have a maximum first dimension that is at least twice as large as a maximum second dimension, and discusses that Sarantos's window regions overlap and are coextensive with the HAR photodiodes. *Id.* 47–49. But the Petition never articulates a reason why the POSA would include HAR photodiodes in the proposed combination or explains how HAR photodiodes would be implemented in the combination consistent with Petitioner's showing for claim 1. *Id.*; *see also* Ex. 1003 ¶¶ 95–97 (testimony of Dr. Anthony suffering from the same deficiency). At oral argument, counsel for Petitioner argued that “the citations for the portion of Sarantos that were in the Petition identify why those high aspect ratio photodiodes would've been desirable.” Tr. 25. Presumably, Petitioner's counsel was referring to the citation to column 9, line 48 – column 10, line 26 of Sarantos on page 48 of the Petition. This disclosure does describe benefits of using HAR photodetectors. But, particularly in the face of Petitioner's reliance on a different photodiode in connection with claim 1, it is too much to expect Patent Owner in its Response, and the Board in this Decision, to infer from this bare citation Petitioner's intent to rely on Sarantos's HAR photodetectors. 37 C.F.R. § 42.104(b). Petitioner's Reply quotes a portion of Sarantos's disclosure discussing the benefits of using HAR

photodetectors, but continues not to address the problem that the Petition does not propose to include them in the Iwamiya-Sarantos device.³¹

In sum, the Petition does not explain why Iwamiya's optical filter has a width that is larger than its length. The Petition does not rely on Sarantos's HAR photodetectors and, absent such reliance, Sarantos's disclosure of window regions that overlap and are coextensive with the HAR photodiodes does not speak to whether the "opening" in the Iwamiya/Sarantos device (i.e., the space filled by Iwamiya's optical filter) has a width that is larger than its length. For these reasons, Petitioner has not established, by a preponderance of the evidence, that claim 13 would have been obvious over the combination of Iwamiya and Sarantos.

7. *Remaining claims (claims 2–4, 12, and 25)*

Petitioner contends that claims 2–4, 12, and 25 would have been obvious over the combination of Iwamiya and Sarantos.³² Patent Owner does not challenge Petitioner's showing with respect to any of the additional limitations recited in dependent claims 2–4, 12, and 25. *See generally* PO

³¹ We do not consider Petitioner's quotation of a passage discussing the benefits of HAR photodetectors in its Reply to propose that the Iwamiya/Sarantos device would include such photodetectors. To the extent Petitioner contends that its Reply makes that proposal, it is new argument that we decline to consider. *See* 37 C.F.R. § 42.23(b).

³² Petitioner challenges claim 22 in Ground 5 but challenges claim 25, which depends from claim 22, in Ground 1. We deem this a harmless error because the basis for Petitioner's challenge is clear. Petitioner contends that Iwamiya (which is included in Ground 1) by itself discloses or suggests all of the limitations of claim 22 (Pet. 69–70 (Petitioner, in Ground 5, asserting obviousness of claim 22 over Iwamiya alone)) and relies on Sarantos as helping to render the additional limitation recited in claim 25 obvious (*id.* at 49).

Resp. As to these unchallenged claim limitations, we have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that they are disclosed by the combination of Iwamiya and Sarantos for the reasons set forth in the Petition. Accordingly, we find that Petitioner has established, by a preponderance of the evidence, that claims 2–4, 12, and 25 would have been obvious over the combination of Iwamiya and Sarantos.

F. Ground 2: Obviousness Over Iwamiya, Sarantos, and Utter

Petitioner contends that claim 7 would have been obvious over the combination of Iwamiya, Sarantos, and Utter (“Ground 2”). Claim 7 depends from claim 1, and additionally recites that “the device is configured to wirelessly transmit physiological parameter data to a separate device.” Ex. 1001, 16:12–14. In the Petition, Petitioner relies on its showing for claim 1, adding Utter to address the additional limitation recited in dependent claim 7. Pet. 49–59. Patent Owner does not contest Petitioner’s proof for the limitation recited in claim 7, instead relying on its challenge to independent claim 1. *See generally* PO Resp. We have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that the combination of Iwamiya, Sarantos, and Utter would have rendered claim 7 obvious for the reasons set forth in the Petition.

G. Ground 3: Obviousness Over Iwamiya, Sarantos, and Han

Petitioner contends that claim 8 would have been obvious over the combination of Iwamiya, Sarantos, and Han (“Ground 3”). Claim 8 depends from claim 1, and additionally recites that the device comprises “a touch-

screen display configured to present information related to the determined physiological parameter.” Ex. 1001, 16:15–18. In the Petition, Petitioner relies on its showing for claim 1, adding Han to address the additional limitation recited in dependent claim 8. Pet. 59–64. Patent Owner does not contest Petitioner’s proof for the limitation recited in claim 8, instead relying on its challenge to independent claim 1. *See generally* PO Resp. We have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that the combination of Iwamiya, Sarantos, and Han would have rendered claim 8 obvious for the reasons set forth in the Petition.

H. Ground 4: Obviousness Over Iwamiya, Sarantos, Utter, and Han

Petitioner asserts that claims 14–21 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han. Pet. 64–70 (“Ground 4”). For the reasons discussed below, we find that Petitioner has established, by a preponderance of the evidence, that claims 14–19 and 21 would have been obvious over the combination of Iwamiya and Sarantos but that Petitioner has not established that claim 20 would have been obvious.

1. Claim 14

Petitioner asserts that claim 14 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han and sets forth an element-by-element comparison of the challenged claims to the asserted art. Claim 14 is an independent claim with limitations similar to those recited in claim 1. Ex. 1001, 16:32–17:3. Petitioner relies largely on its showing in connection with Ground 1 to address limitations of claim 14 that parallel

those in claim 1. Pet. 65–68. Petitioner adds Utter and Han to address limitations that differentiate claim 14 from claim 1. *Id.* In doing so, Petitioner applies Utter and Han as it did in connection with Grounds 2 and 3. *Id.* at 68. Patent Owner does not separately contest Petitioner’s proof for claim 14, instead relying on its challenge to independent claim 1. *See generally* PO Resp. We have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that the combination of Iwamiya, Sarantos, Utter and Han would have rendered claim 14 obvious for the reasons discussed *supra* §§ II.E–G and for the reasons set forth in the Petition.

2. *Claim 17*

Claim 17 depends from claim 14 and further requires that “the output light pattern comprises a width and a length, . . . wherein the width is different than the length.” Ex. 1001, 17:12–14. The limitation recited in claim 17 parallels that recited in claim 9, which depends from claim 1. *Id.* at 16:19–21. To address the limitation recited in claim 17, Petitioner relies on its showing from claim 9. Pet. 69. Patent Owner does not challenge Petitioner’s showing for claim 17. However, Petitioner still bears the burden to prove unpatentability. *Harmonic*, 815 F.3d at 1363. For the reasons discussed *supra* § II.E.3, we find that Petitioner has not established that claim 17 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han.

3. *Claim 18*

Claim 18 depends from claim 14 and further requires that the “physiological parameter is oxygen saturation.” Ex. 1001, 17:16–17.

Because it depends from claim 14, it also requires that such determination be made using “one or more optical sources . . . proximate a wrist of a user.” *Id.* at 16:33–35. Petitioner relies on entirely on its showing for claims 11 and 24 in connection with Ground 1 to address the additional limitation in claim 18. Unlike claims 11 and 24, for which Patent Owner did not rely on objective indicia to support nonobviousness, for claim 18, Patent Owner asserts that industry skepticism, failure of others, and long-felt-but-unmet need support nonobviousness. PO Resp. 56–61.

We incorporate our analysis for claims 11 and 24 as it relates to Sarantos’s disclosure of measuring blood oxygen saturation, the motivation of the POSA to combine Iwamiya and Sarantos, and whether the POSA would have reasonably expected success in so combining Iwamiya and Sarantos. *See supra* §§ II.E.5.a–c. However, we reserve our ultimate conclusion on whether claim 18 would have been obvious until after fully considering the objective indicia evidence offered by Patent Owner, which we discuss further below.

a) Industry skepticism

Patent Owner contends that skepticism in the form of testimony from Apple’s engineers, and related documents, show that those in the industry thought that determining oxygen saturation at the wrist would not work. PO Resp. 56 (citing Ex. 2077, 993:17–994:25, 1012:12–25; Ex. 2080, 174:2–174:6; Ex. 2100 ¶ 123). Patent Owner relies on largely the same evidence as we addressed above in the context of the reasonable expectation of success dispute. *See id.* (referring back to the “testimony and documents” discussed in its previous argument as supporting its industry skepticism argument (citing *id.* at 39–50)). For industry skepticism, Patent Owner focuses on the

testimony of Dr. Mannheimer to the effect that his initial reaction to the project was “good luck with that” and “I don’t know if it can be done.” *Id.* (emphasis omitted) (citing Ex. 2077, 1012:12–25; Ex. 2080, 174:2–174:6).

Patent Owner asserts that the Board in IPR2022-01291 “erroneously disregarded the skepticism” of Apple’s engineers by taking “such a narrow view of skepticism.” *Id.* at 57 (citing cases). In Patent Owner’s view, the fact that Apple “continued developing their oxygen saturation feature beyond 2015 does not negate the real skepticism” expressed by Apple’s engineers in 2015. *Id.* at 57–58. Patent Owner also contends that this skepticism went beyond the context of developing a future Apple Watch and extended to “the feasibility in 2015 of measuring oxygen saturation at the wrist at all.” *Id.* at 58–59 (citing Ex. 2080, 173:9–174:1, 174:7–174:18; Ex. 2100 ¶ 124). Patent Owner also argues that Apple’s engineers expressed skepticism about “measuring oxygen saturation at the wrist . . . due to the physiology of the wrist.” *Id.* at 59–60 (citing Ex. 2081, 166:4–16; Ex. 2082, 108:13–21; Ex. 2085, 6, 12; Ex. 2089, 2; Ex. 2100 ¶ 125).

In its Reply, Petitioner does not specifically address Patent Owner’s objective indicia or industry skepticism by name, but Petitioner directly addresses the same evidence Patent Owner relies on for these arguments. *See id.* at 56 (referring back to the “testimony and documents” (citing PO Resp. 39–50)); Pet. Reply 22–25 (addressing Patent Owner’s reliance on Apple engineers’ testimony (citing PO Resp. 39–50)). Patent Owner argues in its Sur-reply that Petitioner’s Reply “fails to address” Patent Owner’s industry skepticism arguments. *See* PO Sur-reply 23.

As an initial matter, we disagree with Patent Owner’s argument that Petitioner’s Reply fails to address Patent Owner’s arguments as to industry

skepticism. Patent Owner expressly relied on its previous, extensive arguments regarding the testimony of Apple’s engineers, and cited to pages in its Response that include those extensive arguments. In its Reply, Petitioner cited, and responded to, those same specific arguments. *See* PO Resp. 56 (citing *id.* at 39–50); Pet. Reply 22–25 (citing PO Resp. 39–50). Accordingly, we do not view Petitioner’s Reply as failing to respond to the substance of Patent Owner’s industry skepticism arguments.

Turning to the merits, we note that neither party addresses the nexus requirement for objective indicia evidence. *See, e.g.,* PO Resp. 56–61. The Federal Circuit has made clear on numerous occasions that “the evidence of secondary considerations must have a ‘nexus’ to the claims, *i.e.*, there must be ‘a legally and factually sufficient connection’ between the evidence and the patented invention.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019) (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). Patent Owner bears the burden of establishing a nexus between the objective indicia and the claimed invention. *See Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (“[A] patentee is entitled to a rebuttable presumption of nexus between the asserted evidence of secondary considerations and a patent claim if the patentee shows that the asserted evidence is tied to a specific product and that the product ‘*is* the invention disclosed and claimed.’” (quoting *Demaco Corp.*, 851 F.2d at 1392)). Even absent a presumption of nexus, a nexus still exists between the objective indicia and the claimed invention when “the evidence of secondary considerations is the ‘direct result of the unique characteristics of the claimed invention.’” *Id.* at 1373–74.

Based on our review of the evidence and arguments, Patent Owner fails to meet its burden of establishing a nexus between claim 18 and its industry skepticism evidence. *See id.* at 1373. Not only did Patent Owner fail to even mention nexus, it did not perform the analysis required to establish a nexus, whether via a presumption of nexus or through evidence that would establish that the industry skepticism was tied to the unique characteristics of claim 18. *See id.* at 1373–74; PO Resp. 56–60. This failure to address the issue here is more glaring given that the parties dispute whether the testimony and documents at issue are directed to unclaimed features that are part of the Apple Watch. *See* Pet. Reply 22 (arguing that “the engineers’ testimony regarding their subjective experiences developing pulse oximetry for the Apple Watch does not bear on whether a [POSA] would have reasonably expected success in performing the claimed function of ‘determining’ an oxygen saturation parameter at the wrist (with no claimed degree of accuracy, time-frame for gathering signals, or exact location” (emphasis omitted) (citing Ex. 1079 ¶ 52)).

While it may be possible to piece together competing implicit nexus arguments from the parties’ briefing, we cannot introduce an issue for the first time and make findings in support of it in a Final Written Decision without depriving Petitioner of the opportunity to address the nexus issue. *See* Paper 13, 9 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.” (emphasis omitted)). Under these circumstances, we are not persuaded that Patent Owner has established the required nexus.

Even if we assume a nexus exists, we would find Patent Owner’s arguments only somewhat persuasive for the same reasons we provided

above when addressing much the same evidence in connection with reasonable expectation of success. We acknowledge that Apple’s engineers did express some degree of skepticism. *See, e.g.*, Ex. 2077, 1012:12–25 (testimony of Dr. Mannheimer that his initial reaction to being assigned to prove the feasibility of measuring oxygen saturation at the wrist was, “good luck with that” and “I don’t know if it can be done”). And as discussed *supra* § II.E.5.c.2, the evidence supports that Apple’s engineers considered measuring at the wrist to pose a significant challenge. As also discussed *supra* § II.E.5.c.2, the skepticism expressed by the Apple engineers was in the context of their development of the Apple Watch, not whether they could develop a rudimentary detector device as recited in claim 18. Although the engineers did express skepticism, it must be viewed in that context. Accordingly, even if we assume a nexus exists, the evidence of record shows only a moderate amount of industry skepticism directed toward the device of claim 18.

b) Failure of others

Patent Owner argues that “the evidence discussed above demonstrates the failure of others, including Apple, Fitbit, and Withings to achieve a device that determines oxygen saturation from the wrist and a long-felt-but-unmet need for such a device.” PO Resp. 60 (citing *id.* at 39–55; Ex. 2100 ¶ 126). Patent Owner asserts that Petitioner’s “own engineers tried and failed in 2015 to determine oxygen saturation at the wrist.” *Id.* (citing Ex. 2085, 7–13; Ex. 2094, 28:3–29:19; Ex. 2100 ¶ 126). Patent Owner also contends that “Fitbit was unable to release a device that measured oxygen saturation from the wrist until 2020” and that “Withings . . . released a device in 2014 that was mounted on a wrist strap, yet needed to be removed and placed on

the finger in order to measure oxygen saturation.” *Id.* (emphasis omitted) (citing Ex. 2091; Ex. 2092; Ex. 2095, 3–5; Ex. 2100 ¶ 127). Patent Owner further asserts that Petitioner failed to address these arguments in its Reply. PO Sur-reply 23.

Our analysis of the failure of others as objective indicia that the claimed invention would have been nonobvious generally tracks our analysis of industry skepticism above. First, we disagree with Patent Owner’s argument that Petitioner ignored this issue. Patent Owner expressly relies on its earlier arguments addressing the testimony of Apple’s engineers and related documents, and Petitioner directly addresses those arguments in its Reply. *See* PO Resp. 60 (citing *id.* at 39–55); Pet. Reply 20 (addressing “Fitbit and other companies mentioned” in Patent Owner’s Response), 22–25 (citing PO Resp. 39–50). Second, Patent Owner again never mentions nexus in its analysis, and for the same reasons noted above in our analysis of industry skepticism, we find that Patent Owner fails to meet its burden of showing a nexus to the alleged failure of others.³³ Finally, even if we assume a nexus exists, the absence of commercial products from Fitbit and Withings does not support nonobviousness for the reasons discussed *supra* § II.E.5.c.3. As discussed above, we can only speculate on the reasons behind

³³ *See* PO Resp. 60; *Purdue Pharma L.P. v. Accord Healthcare, Inc.*, No. 2023-1953, 2024 WL 5244764, at *10 (Fed. Cir. Dec. 30, 2024) (affirming finding of no nexus between alleged failure of others and claimed invention); *Oscar Mayer Foods Corp. v. ConAgra, Inc.*, 45 F.3d 443 (Fed. Cir. 1994) (“[O]bjective indicia of nonobviousness are helpful only where there exists a nexus between the indicia and the patented invention. For example, the failure of others is probative only if they sought to overcome the problem the applicant claims to have solved.”).

the absence of commercial products and, the efforts of Apple and other companies to make a commercially successful watch that measures oxygen saturation at the wrist are far more complicated than making a rudimentary device that satisfies claim 18. As a result, any “failure” in the short term in making commercial devices bears little relationship to claim 18.

Accordingly, we give little weight to Patent Owner’s evidence relating to the alleged failure of others.

c) Long-felt-but-unmet need

Patent Owner contends that the references Petitioner “cited to support its reasonable expectation of success argument demonstrate that there was a long-felt-but-unmet need in the industry for a device that could determine oxygen saturation at the wrist.” PO Resp. 61 (citing Ex. 2100 ¶ 128).

According to Patent Owner, the fact that “multiple research groups over the years were investigating the same problem, and yet no such devices were available in 2015 confirms a long-felt-but-unmet need.” *Id.* Patent Owner also relies on the statement in an Apple status update that “there were still [REDACTED] in 2015 impeding development of such a sensor.” *Id.* (citing Ex. 2085, 13). Patent Owner again asserts that Petitioner failed to address these arguments in its Reply. PO Sur-reply 23.

Our analysis here also tracks our analysis of industry skepticism above. First, we disagree with Patent Owner’s argument that Petitioner ignored this issue. Patent Owner’s argument hinges on its assumption that “no such devices were available in 2015,” and Petitioner responds to this position by arguing that at least some devices showed that oxygen saturation could be measured at the wrist in 2015, even if no commercial devices were available. *See* Pet. Reply 15–19. Accordingly, the substance of this dispute

was addressed by Petitioner in the context of reasonable expectation of success. Second, Patent Owner again never mentions nexus in its analysis, and for the same reasons noted above, we find that Patent Owner fails to meet its burden of showing a nexus to the alleged long-felt-but-unmet need. *See* PO Resp. 61. Finally, even if we assume a nexus exists, the record here fails to show a long-felt-but-unmet need for the device at issue in claim 18. Patent Owner cites to its expert for support, but neither Patent Owner's Response nor the cited testimony provide any time period where the industry allegedly desired but lacked the claimed device, and therefore no context from which we can conclude that any unmet need was "long felt." *See* Ex. 2100 ¶ 128; PO Resp. 61. The cited testimony cites to several references without identifying a specific time frame where the industry desired but lacked the claimed device. And, as discussed *supra* § II.E.5.c.3, non-commercial devices for testing blood oxygen levels at the wrist had been assembled and tested well before 2015. *See* Ex. 1035 (discussed *supra* § II.E.5.c.3); Ex. 1036 (discussed *supra* § II.E.5.c.3); Ex. 1014 (discussed *supra* § II.E.5.c.3). At best, even if we were to agree with Patent Owner that no device existed in 2015 that met the requirements of claim 18, and multiple groups sought to make such a device, Patent Owner does not provide persuasive evidence that the need for such a device was "long felt."

d) Conclusion claim 18

For the reasons discussed above, we find Petitioner's following arguments persuasive: (1) the combination of Iwamiya and Sarantos discloses all of the limitations of claim 18; (2) a POSA would have been motivated to combine the references for the reasons provided by Petitioner; and (3) a POSA would have had a reasonable expectation of success when

making the combination. We also find Patent Owner's objective indicia of nonobviousness arguments unpersuasive because Patent Owner fails to meet its burden to show a nexus between claim 18 and its arguments and evidence. In addition, if we assume a nexus, the evidence of industry skepticism would be entitled to moderate weight, and the evidence of failure of others and long-felt-but-unmet need would be entitled to little weight. Considering the evidence adduced by Petitioner that claim 18 would have been obvious, and giving moderate weight to Patent Owner's evidence of industry skepticism and little weight to Patent Owner's evidence of failure of others and long-felt-but-unmet need, we determine that the preponderance of the evidence supports that claim 18 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han, even had Patent Owner established a nexus.

4. *Claim 20*

Claim 20 depends from claim 14 and further recites that "the opening defined in the dark-colored coating comprises a width and a length, wherein the width is larger than the length." Ex. 1001, 17:20–23. The limitation recited in claim 20 parallels that recited in claim 13, which we addressed *supra* § II.E.6. *Id.* at 16:28–31. To address the limitation recited in claim 20, Petitioner relies on its showing from claim 13. Pet. 69. For the reasons discussed *supra* § II.E.6, we find Petitioner's showing deficient. Accordingly, we find that Petitioner has not established, by a preponderance of the evidence, that claim 20 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han.

5. *Claim 21*

Claim 21 depends from claim 14 and further recites that “the plurality of detectors are arranged in an array having a spatial configuration corresponding to a shape of a portion of the tissue measurement site bounded by the light block.” Ex. 1001, 17:24–28. The limitation recited in claim 21 parallels that recited in claim 5, which we addressed *supra* § II.E.2. *Id.* at 16:5–9. To address the limitation recited in claim 21, Petitioner relies on its showing from claim 5. Pet. 69. Patent Owner argues claim 21 together with claims 5 and 22. PO Resp. 62–68. We do not find Patent Owner’s arguments persuasive for the reasons discussed *supra* § II.E.2. For the reasons discussed *supra* §§ II.E.2 (addressing claim 5) and II.H.1 (addressing claim 14, from which claim 21 depends), we find that Petitioner has established, by a preponderance of the evidence, that claim 21 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han.

6. *Claims 15, 16, and 19*

Petitioner contends that claims 15, 16, and 19 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han. Patent Owner does not challenge Petitioner’s showing with respect to any of the additional limitations recited in dependent claims 15, 16, and 19. *See generally* PO Resp. As to these unchallenged claim limitations, we have reviewed the evidence and arguments of record and find that Petitioner has shown, by a preponderance of the evidence, that they are disclosed by the combination of Iwamiya, Sarantos, Utter, and Han for the reasons set forth in the Petition. Accordingly, we find that Petitioner has established, by a

preponderance of the evidence, that claims 15, 16, and 19 would have been obvious over the combination of Iwamiya, Sarantos, Utter, and Han.

I. Obviousness Over Iwamiya

Petitioner asserts that claims 22 and 23 would have been obvious over Iwamiya (“Ground 5”). For the reasons discussed below, we find that Petitioner has established, by a preponderance of the evidence, that claims 22 and 23 would have been obvious over Iwamiya.

1. Claim 22

Petitioner relies upon its showing for claim 1 and its showing for claim 5 to address the limitations recited in claim 22. Pet. 69–70. Patent Owner argues claim 22 together with claims 5 and 21. PO Resp. 62–68. We do not find Patent Owner’s arguments persuasive for the reasons discussed *supra* § II.E.2. For the reasons discussed *supra* §§ II.E.2 (addressing claim 5) and II.E.1 (addressing claim 1), we find that Petitioner has established, by a preponderance of the evidence, that claim 22 would have been obvious over Iwamiya.

2. Claim 23

Claim 23 depends from claim 22 and imposes additional limitations on the light pattern emitted and on the diffuser. Ex. 1001, 18:18–28. Petitioner relies upon its showing for claim 1 and its showing for claim 22 to address the limitations recited in claim 23. Pet. 70. Patent Owner does not challenge Petitioner’s showing for claim 23. *See generally* PO Resp. We find that Petitioner has established, by a preponderance of the evidence, that claim 23 would have been obvious over Iwamiya.

III. MOTION TO STRIKE

Patent Owner's Motion to Strike relates to three categories of documents and arguments. PO MTS 1–7. The first category includes Exhibits 1014, 1028, 1038, 1042, 1044–1048, 1088, and 1092 and arguments related to them in Petitioner's Reply. *Id.* at 1, 3–6. These documents and arguments relate to the parties' dispute over reasonable expectation of success in determining oxygen saturation at the wrist, which relates to dependent claims 11, 18, and 24. *See id.*; PO Resp. 51–55. The second category relates to arguments in Petitioner's Reply that allegedly fail to respond to any argument in the Patent Owner Response and introduce “new motivations to combine” and “new combinations of references.” PO MTS 6–9. The third category of information Patent Owner seeks to strike relates to Petitioner's reliance on Patent Owner's expert testimony in the -1291 IPR from Dr. Duckworth. *Id.* at 1, 8–9. Petitioner cited to Dr. Duckworth's testimony from the -1291 IPR, which Patent Owner alleges it “cannot adequately respond to in its sur-replies without Duckworth's direct testimony.” *See id.*

In its Motion, Patent Owner notes that it “originally requested the Board allow [Patent Owner] to file this motion or, alternatively, allow [Patent Owner] to submit rebuttal evidence” such as Dr. Duckworth's Declarations. *Id.* at 9–10 (citing Ex. 3003). After the hearing, we granted Patent Owner's request to file specifically-identified rebuttal evidence as well as a post-hearing Supplemental Brief. *See* Exs. 3005, 3007.

We need not reach the merits of Patent Owner's Motion to Strike for two independent reasons. First, after the hearing, we granted Patent Owner's alternative request to file certain evidence in lieu of striking the

material at issue in the Motion, which obviates the need to strike any of the material in question. *See* Exs. 3003 (Patent Owner seeking authorization to file a motion to strike, or “[a]lternatively,” to permit Patent Owner to file evidence with its Sur-reply), 3005 (listing evidence Patent Owner sought to introduce), 3007 (granting Patent Owner’s request to submit evidence); PO Supp. Br. 1–3, PO MTS 9–10. Second, we would have reached the same conclusions in this case even if we granted Patent Owner’s Motion to Strike, and deciding the Motion would have no impact on the outcome of any issues in this proceeding.³⁴ Based on the foregoing, we dismiss Patent Owner’s Motion to Strike as moot.

IV. MOTION TO EXCLUDE

Petitioner “moves to exclude Exhibits 2076–2078, 2080–2086, 2089, 2094, and portions of Exhibit 2100.” Pet. MTE 1. Petitioner argues that Patent Owner’s Response “does not establish the relevance of Exhibits 2076–2078, 2080–2086, and 2094 to the issues in the present proceeding.” *Id.* at 2. Petitioner also argues that these exhibits should be excluded as hearsay. *Id.* at 8–11. The exhibits at issue generally relate to ITC testimony from Petitioner’s employees and the patentability of dependent claims requiring determination of oxygen saturation at the wrist. *See id.* at 2–6. The portions of Exhibit 2100 that Petitioner seeks to exclude relate to Dr. Madisetti’s opinions discussing or relying upon the exhibits it seeks to

³⁴ Our discussion above, including summaries of the parties’ arguments, refers to some of the material Patent Owner sought to strike, but none of the disputed material is necessary to the findings in this Decision.

exclude. *See id.* at 11–13; *see also* PO Resp. 35–54 (relying in part on disputed exhibits when addressing claims 11, 18, and 24).

We need not reach the merits of Petitioner’s Motion to Exclude because we find Petitioner’s challenges to the claims in this proceeding persuasive even considering the evidence Petitioner seeks to exclude. More particularly, the evidence Petitioner seeks to exclude relates to claims 11, 18, and 24, and we find that Petitioner met its burden as to those claims even if we consider the evidence Petitioner seeks to exclude. And the disputed evidence had no bearing on our consideration of claims 9, 10, 13, 17, and 20, where Petitioner failed to meet its burden of proving unpatentability. We, therefore, would reach the same conclusions even if we did not consider the evidence Petitioner seeks to exclude. Accordingly, we dismiss Petitioner’s Motion to Exclude as moot.

V. MOTIONS TO SEAL

Petitioner filed five unopposed Motions to Seal. *See* Papers 24, 28, 43, 45, 48. Although the Motions seek to seal distinct information in the papers and exhibits, they rely on common arguments and themes. *See id.* We refer to the arguments made in Petitioner’s first Motion to Seal (Paper 24) as representative.

In its various Motions to Seal, Petitioner seeks to seal certain information it deems confidential business information (“CBI”). *See* Paper 24, 1. According to Petitioner, this information includes “sensitive information regarding Apple’s Watch products, including proprietary research and development (R&D) information, trade secrets, proprietary processes, and confidential business operations information.” *Id.* The

produced documents generally originate from related proceedings in the ITC and the Board, including the -1291 IPR and -1465 IPR. *See id.* at 2.

Petitioner contends that some documents should be sealed in their entirety, while others may be sealed in part, with the public and redacted versions of these documents striking the correct balance between the public's interest in providing a complete and understandable record the parties' interest in protecting sensitive information. *See id.* at 2–4. In some cases, the material in question was already sealed in previous proceedings before the Board. *See id.* at 3 n.2.

In an *inter partes* review, the moving party bears the burden of showing that the relief requested should be granted. 37 C.F.R. § 42.20(c). A party moving to seal must show “good cause” for the relief requested. *Id.* § 42.54(a). The “good cause” standard for granting a motion to seal reflects the strong public policy for making all information in Board proceedings open to the public. *See Argentum Pharms. LLC v. Alcon Rsch., Ltd.*, IPR2017-01053, Paper 27 at 3 (PTAB Jan. 19, 2018) (informative). When assessing if the good cause standard has been met, we may consider whether (1) the information at issue is confidential, (2) harm would result upon public disclosure, (3) there exists a genuine need to rely in the trial on the specific information sought to be sealed, and (4) the interest in maintaining confidentiality as to the information outweighs the strong public interest in an open record. *Id.* at 4.

In the Motions, Petitioner identifies the documents and information it seeks to seal with particularity, and identifies the CBI it contends supports sealing the information. *See* Paper 24, 3–4. Petitioner also addresses each of the factors set forth in *Argentum* and contends that they support sealing

the information in question. *See id.* at 4–12. Petitioner also notes that Patent Owner does not oppose the Motions, although the parties dispute the extent of redactions necessary to protect Petitioner’s CBI. *See id.* at 13–15.

Based on our review of the material in the papers and exhibits Petitioner seeks to seal, and based on Petitioner’s representations concerning such material, we agree that the documents contain confidential, potentially sensitive information, that Petitioner would be harmed by not sealing the information, and that the interest in maintaining the information as confidential outweighs the public interest in having the information unsealed. We have also reviewed Petitioner’s redactions, which appear to be consistent with our rules and practices, and allow the public to ascertain the nature of the arguments and evidence at issue. *See, e.g.*, Paper 23 (public version of Patent Owner’s Response with redactions), Paper 32 (public version of Petitioner’s Reply with redactions), 46 (public version of Patent Owner’s Sur-reply with redactions). Accordingly, we conclude that good cause exists to seal the information as set forth in Petitioner’s Motions to Seal. *See* Papers 23, 28, 43, 45, 48.

VI. CONCLUSION³⁵

In summary, we determine that Petitioner shown by a preponderance of the evidence that claims 1–8, 11, 12, 14–16, 18, 19, and 21–25 of the ’743

³⁵ Should Patent Owner wish to pursue amendment of the Challenged Claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding, 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent

patent are unpatentable for the reasons discussed above. We further determine that Petitioner has not established by a preponderance of the evidence that claims 9, 10, 13, 17, and 20 are unpatentable for the reasons discussed above. These determinations are shown in the following table. In addition, we dismiss Patent Owner's Motion to Strike as moot, we dismiss Petitioner's Motion to Exclude as moot, and we grant the Petitioner's Motions to Seal.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–6, 9– 13, 24, 25	102(b)	Iwamiya, Sarantos	1–6, 11, 12, 24, 25	9, 10, 13,
7	103	Iwamiya, Sarantos, Utter	7	
8	103	Iwamiya, Sarantos, Han	8	
14–21	103	Iwamiya, Sarantos, Utter, Han	14–16, 18, 19, 21	17, 20
22, 23	103	Iwamiya	22, 23	
Overall Outcome			1–8, 11, 12, 14–16, 18, 19, 21–25	9, 10, 13, 17, 20

Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. §§ 42.8(a)(3), (b)(2).

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has proved by a preponderance of the evidence that claims 1–8, 11, 12, 14–6, 18, 19, and 21–25 of the '743 patent are unpatentable;

FURTHER ORDERED that, Petitioner has not established, by a preponderance of the evidence, that claims 9, 10, 13, 17, and 20 of the '743 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Strike is dismissed as moot;

FURTHER ORDERED that Petitioner's Motion to Exclude is dismissed as moot;

FURTHER ORDERED that Petitioner's Motions to Seal (Papers 24, 28, 43, 45, 48) are granted; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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