Paper No. 8

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WHOOP, INC.

Petitioner,

v.

OMNI MEDSCI, INC.,
Patent Owner.

U.S. Patent No. 11,160,455

Case No. IPR2025-01585

PATENT OWNER'S PRELIMINARY RESPONSE

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Omni MedSci, Inc. ("Patent Owner") submits this Preliminary Response under 37 C.F.R. § 42.107 to the Petition for *Inter Partes* Review (Paper 1, "Petition" or "Pet.") of U.S. Patent No. 11,160,455 ("the '455 Patent"), filed by WHOOP, Inc. ("Petitioner").

I. INTRODUCTION

Patent Owner respectfully requests that the Director deny institution because Petitioner has not shown that any challenged claim of the '455 Patent is unpatentable in relation to any ground raised in the Petition.

Petitioner fails to show that the "driver" limitation in all independent claims is disclosed or rendered obvious by Lisogurski. Petitioner fails to clearly identify the alleged "driver" in Lisogurski to begin with, as Petitioner and its expert are inconsistent and unclear as to whether the claimed "driver" corresponds to Lisogurski's drive circuitry 120 alone or in combination with control circuitry 110. Additionally, to meet the "driver" limitation, Petitioner must show that Lisogurski would have been modified to relocate drive circuitry 120 into light source 130. But Petitioner argues to relocate the drive circuitry 120 into sensor 102, not light source 130. Petitioner's reliance on a prior Board decision (i.e., '533-FWD) is misplaced because it only addressed relocating drive circuitry 120 into sensor 102, not light source 130.

Petitioner also fails to show obviousness of the "arc" limitations included in

multiple claims. Petitioner asserts a two-step argument for the "arc" limitation by (1) first arguing a modification of Soller's reference detectors 610 to be reflectance detectors and (2) then arguing a modification of Lisogurski's detectors to be arranged based on Soller's arrangement of then-modified detectors 610. But Petitioner fails to establish that a POSITA would have modified Soller's reference detectors 610 as part of step 1. A POSITA would not have made this modification to reference detectors 610, including because of redundancy with Soller's existing reflectance detector 605 and because the modification would render detectors 610 incompatible and inoperable based on their positioning. Additionally, even if Soller's detectors 610 were modified as alleged, Petitioner nonetheless fails to show that a POSITA would have implemented Soller's arrangement of detectors in Lisogurski.

II. OVERVIEW OF THE '455 PATENT

The '455 Patent discloses systems for measuring physiological parameters and use with a smartphone or tablet. EX1001, Abstract, 8:29-31; EX2046, ¶55. For such systems, the '455 Patent discloses a wearable device that includes a light source comprising a driver and a plurality of semiconductor sources that generate an output light that is delivered to tissue. EX1001, Abstract, 8:29-36. The '455 Patent also discloses that the wearable device includes a detection system comprising a plurality

of detectors, and the detection system receives at least a portion of reflected light and generates an output signal. EX1001, Abstract, 8:39-47; EX2046, ¶55.

An exemplary physiological measurement system is depicted in Figure 24:

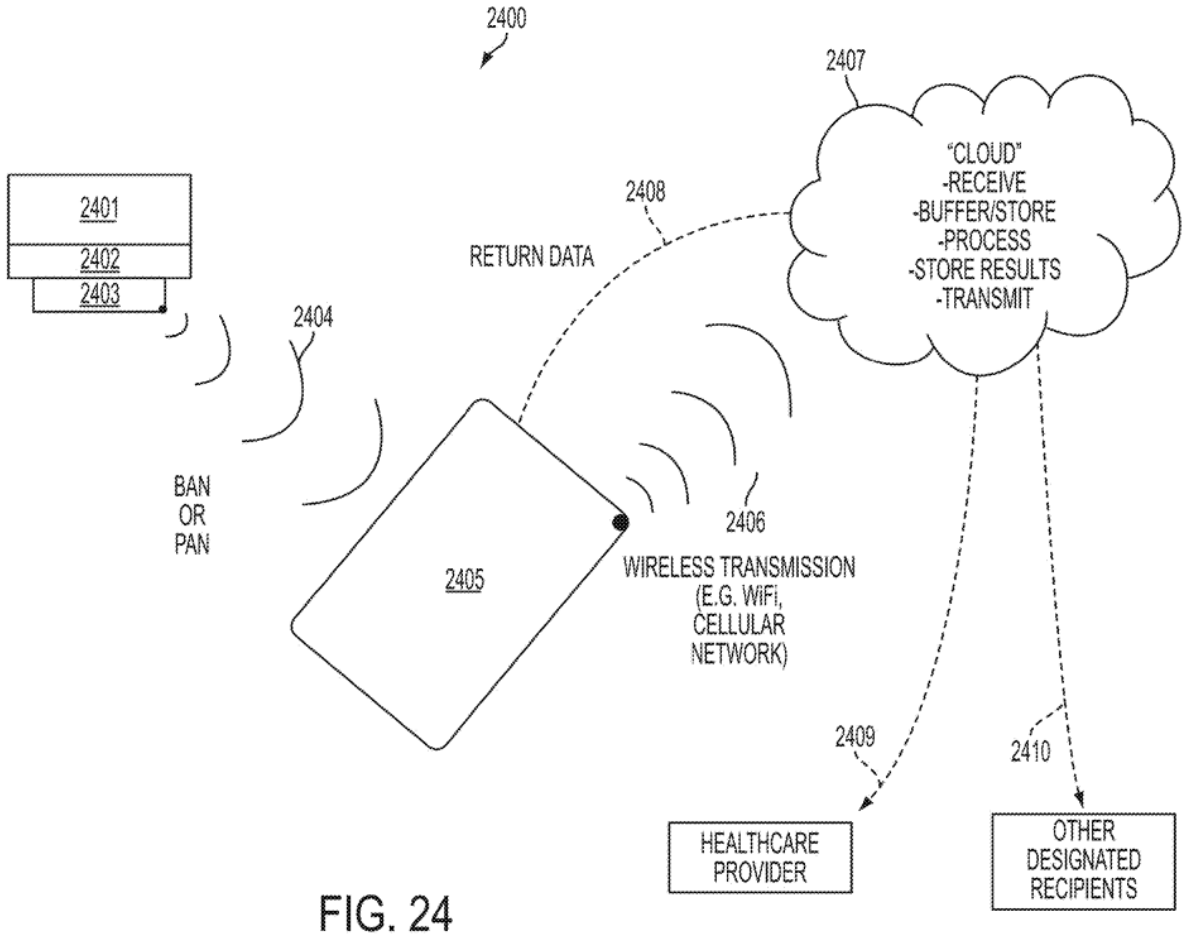

FIG. 24

EX1001, FIG. 24, 12:1-6; EX2046, ¶56. The system includes a measurement device 2401, a personal device 2405 such as a smartphone or tablet, and a cloud server 2407. EX1001, 36:18-56; EX2046, ¶56.

The '455 Patent discloses that the plurality of semiconductor sources and the plurality of detectors in the wearable device may be located on one or more arcs.

EX1001, Abstract, 9:47-50; EX2046, ¶57. The '455 Patent also discloses that the wearable device may include a reflective surface to receive and redirect at least some of the output optical light from the plurality of semiconductor sources. EX1001, 87:51-54, 88:64-67, 90:23-26; EX2046, ¶57. The wearable device may improve a signal-to-noise ratio via various techniques disclosed in the '455 Patent, resulting in improved accuracy of physiological measurements despite interference from spectral artifacts. EX1001, 59:4-25, 2:66-3:40; EX2046, ¶58.

III. LEVEL OF SKILL IN THE ART

Petitioner proposes the following definition for a person of ordinary skill in the art ("POSITA") in relation to the '455 Patent:

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

Pet., 13 (citations omitted). For purposes of this Preliminary Response, Patent Owner adopts Petitioner's proposed definition. EX2046, ¶¶51-54.

IV. SUMMARY OF REFERENCES IN THE PETITION

Petitioner challenges claims 1-20 of the '455 Patent as allegedly obvious in Grounds 1-4, which involve various combinations of the following references: Lisogurski, Carlson, Soller, Tran, and Valencell-093. Pet., 11.

A. Lisogurski (EX1027) (Grounds 1-4)

Lisogurski describes a non-invasive system for measuring parameters related to a subject's blood. EX1027, 3:61-4:5; EX2046, ¶85. The system is illustrated in Figures 3 and 1:

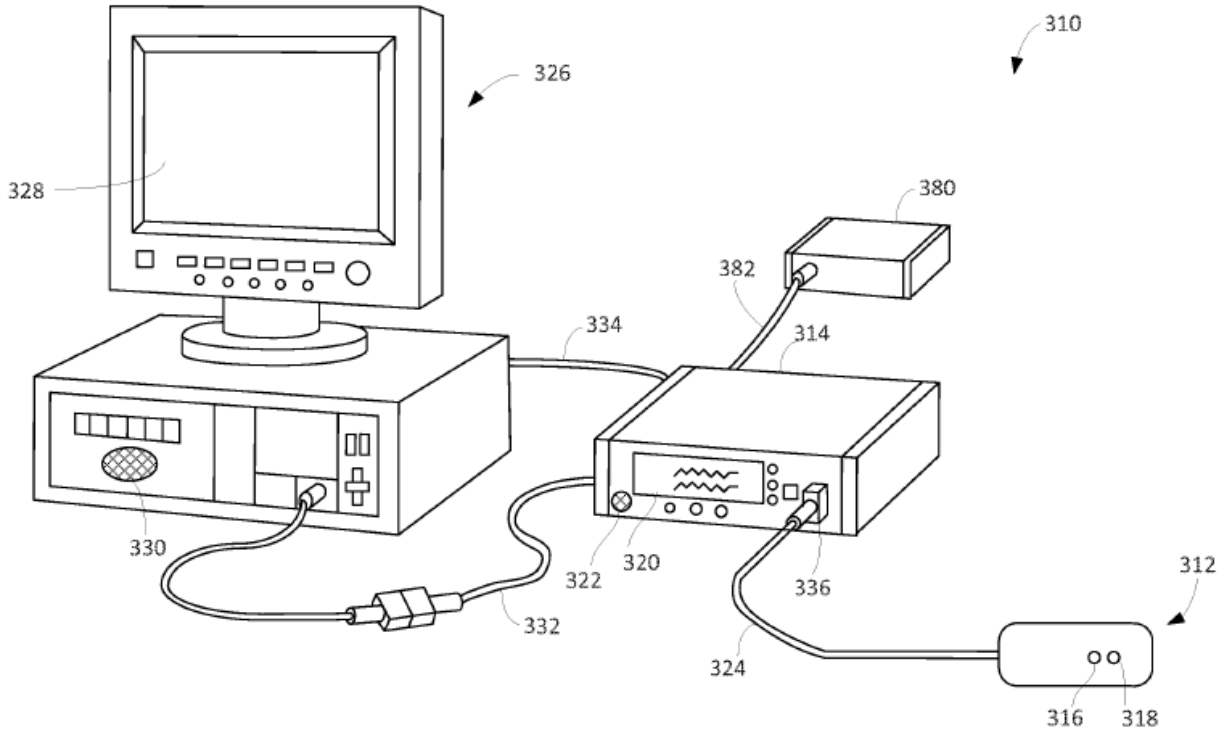

FIG. 3

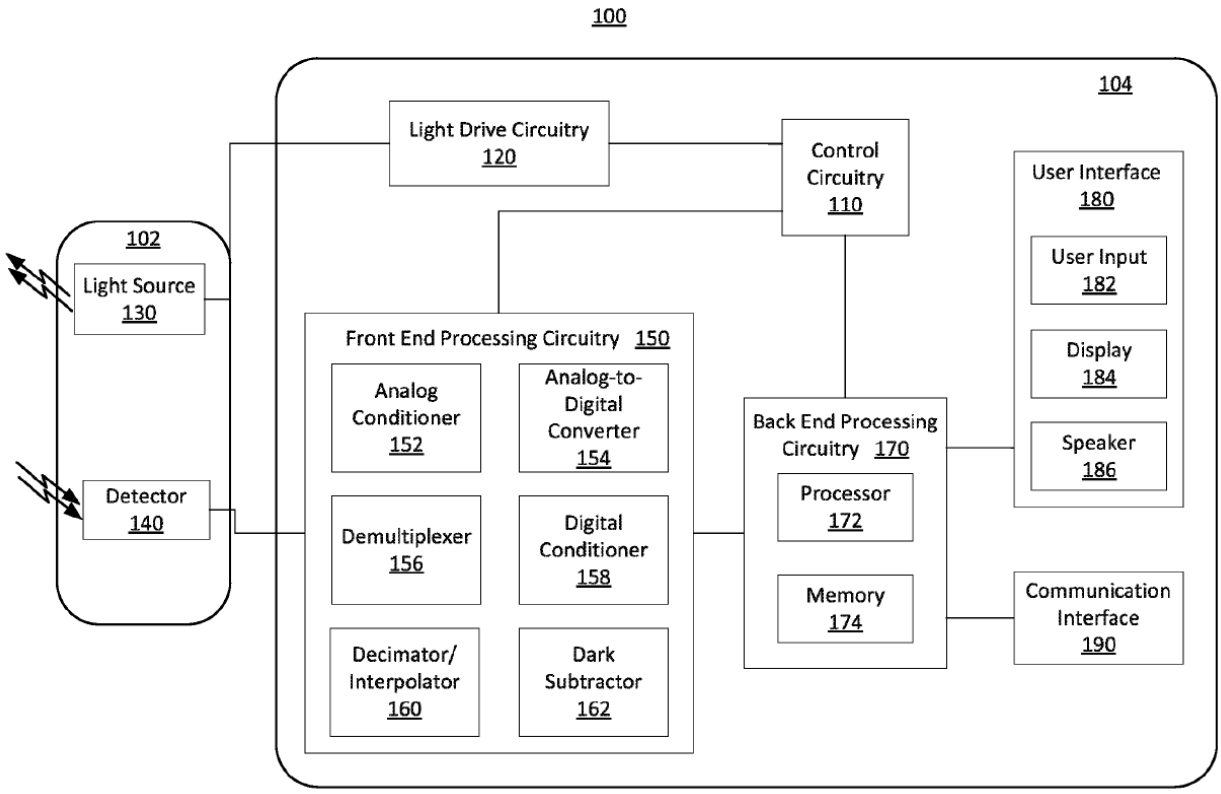

FIG. 1

EX1027, FIGS. 3, 1; EX2046, ¶85. A subject wears sensor unit 312, while the other components in the system are included for system calibration, data processing, and displaying information. EX1027, 17:54-18:15, 18:32-67; EX2046, ¶85. The sensor unit 312 includes light emitting diodes for directing light of different wavelengths to the subject's tissue and a detector that detects the light reflected from the tissue and converts it into an electrical signal. EX1027, 4:42-62, 10:48-64; EX2046, ¶85.

Front end processing circuitry 150 processes that signal. EX1027, 12:42-49; EX2046, ¶85. Then, "[p]rocessor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may

determine one or more physiological parameters based on the received physiological signals." EX1027, 14:60-64; EX2046, ¶85. The system compares the signals to determine parameters such as blood oxygen saturation. EX1027, 24:58-25:5; EX2046, ¶85.

B. Carlson (EX1028) (Grounds 1-4)

Carlson describes a non-invasive optical pulse oximeter. EX1028, ¶[0002]; EX2046, ¶86. The oximeter is designed to be clipped onto a user's ear. EX1028, ¶¶[0048]-[0049]; EX2046, ¶86. This is illustrated in Figures 1 and 2:

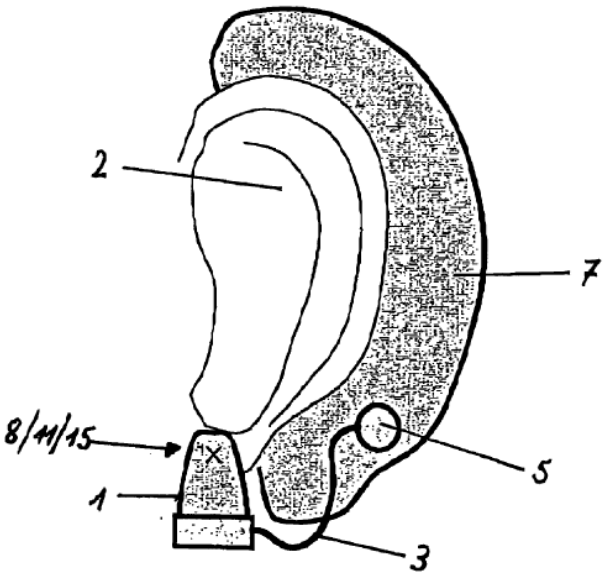

Figure 1

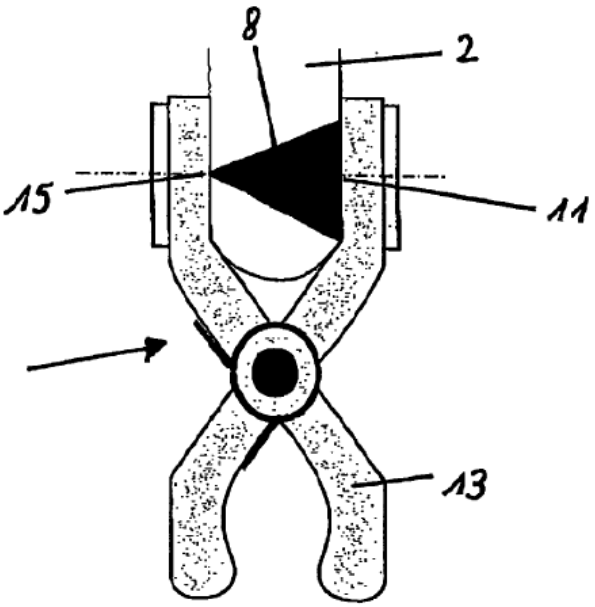

Figure 2

EX1028, FIGS. 1-2; EX2046, ¶86.

The oximeter relies on various techniques, including beam shaping optical elements, for improving the signal-to-noise ratio and signal-to-background ratio of

the signal generated by its photo detecting element when it detects light that has been reflected from bodily tissue. EX1028, ¶¶[0010], [0013]-[0014], [0062]; EX2046, ¶86. Carlson also relies on "optical wavelength filters" which filter the light detected by the photo detecting element to a particular range of wavelengths before it is detected by the photo detecting element. EX1028, ¶¶[0026], [0062]; EX2046, ¶86.

C. Soller (EX1030) (Grounds 1-4)

Soller describes a "measurement of blood hematocrit (Hct)" – "the volume percent of red blood cells in a blood sample." EX1030, 1:17-20; EX2046, ¶87. Soller explains that hematocrit is measured using a "non-invasive optical and mathematical method… with an accuracy of approximately 99%," and that this "accuracy results from the complete analysis provided by the new optical method, which measures blood hematocrit by quantifying a plurality of red blood cell constituents." EX1030, 1:49-52; EX2046, ¶87. According to Soller, hematocrit is determined by "processing the optical spectrum with a mathematical model" that relates "optical properties of the plurality of red blood cell constituents to known blood hematocrit." EX1030, 1:58-62; EX2046, ¶87. In one aspect, Soller "features a fiber optic device for determining blood hematocrit including an array of light sources…attached to a mount and a fiber optic cable …for delivering radiation to the sample." EX1030, 3:16-22; EX2046, ¶87. Additionally, Soller is directed to using both reflectance detectors and reference detectors, with the reference detectors used to measure and

account for variations in LED intensity. EX1030, 2:27-33, 2:58-63, 17:42-48; EX2046, ¶87.

D. Tran (EX1031) (Grounds 2-4)

Tran describes a patient heart monitoring system with wireless nodes forming a wireless mesh network. EX1031, Abstract, 3:3-13, 8:29-33; EX2046, ¶88. Tran's system also includes a wearable appliance adapted to communicate with the wireless nodes and a statistical analyzer to determine a heart attack or stroke attack. EX1031, Abstract, 3:3-13; EX2046, ¶88. The wearable appliance may include sensors and may non-invasively measure, for example, blood pressure. EX1031, 4:62-65, 9:23-30; EX2046, ¶88.

E. Valencell-093 (EX1032) (Grounds 3-4)

Valencell-093 discloses "apparatus and methods for attenuating environmental interference." EX1032, Abstract; EX2046, ¶89. Valencell-093 explains that "a medium (e.g., physiological material of a subject), having a region of interest, is monitored via a sensor module having at least one energy emitter for interrogating the medium with energy to generate an energy response associated with the medium." EX1032, ¶[0005]; EX2046, ¶89.

Valencell-093 further discloses that "[t]he sensor module includes an optical emitter, a detector, a motion/position sensor, a filter, and at least one processor that controls operations of the optical emitter, detector, and/or filter." EX1032, ¶[0012];

EX2046, ¶90. Valencell-093 additionally states that "[o]utput from the motion/position sensor is associated with the motion or position between the housing and ear of the subject." EX1032, ¶[0012]; EX2046, ¶90.

V. CLAIM CONSTRUCTION

Petitioner contends that the terms in the challenged claims of the '455 Patent do not require construction. Pet., 11-12.

Patent Owner notes that the Board construed two claim terms in prior IPRs involving related patents, although the Board need not construe those terms to deny institution. EX1008, 10-12; EX1011, 8-10; EX1013, 3; EX2046, ¶¶74-79. Patent Owner also notes that pursuant to the Scheduling Order in the Delaware Case, Invalidity Contentions are due on January 21, 2026; the parties will exchange their proposed claim constructions by February 4, 2026; and the opening claim construction briefs are due on April 13, 2026. EX2034, 2, 6. In other words, as of the date of this Preliminary Response, the parties have not formally proposed claim constructions in the Delaware Case.

Patent Owner submits that claim construction is not necessary at this time for the Board to find that Petitioner did not meet its burden for institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Patent Owner reserves the right to seek constructions in litigation or if institution is granted, and to further respond to any constructions that Petitioner

proposes. EX2046, ¶¶73-82.

VI. PETITIONER FAILED TO MEET ITS BURDEN

The Director should deny institution because Petitioner has not met its burden of showing a reasonable likelihood that any claim of the '455 Patent is unpatentable for any of the grounds in the Petition.

A. Collateral Estoppel Does Not Apply to the Arguments in This Preliminary Response

Collateral estoppel does not apply for the limitations addressed in Sections VI.B-E below (Grounds 1-4). The Petition argues broadly that collateral estoppel applies to *all* "limitations in the Challenged Claims," such that Patent Owner is entirely estopped from making any arguments. Pet., 20-21 (arguing that "[t]he Challenged Claims are materially similar (or identical) to those found unpatentable by the Board in the prior '533 and '484 IPRs"). Petitioner's collateral estoppel argument is based on two previous Board decisions—specifically, EX1008 ("'533-FWD") and EX1011 ("'484-FWD"), which involved U.S. Patent Nos. 9,651,533 (EX1004, "'533 Patent") (EX1004) and 10,517,484 (EX1005, "'484 Patent"), respectively. Pet., 20-21. But the claim limitations addressed below are not similar or identical to any limitations in the '533 Patent or '484 Patent and were therefore not addressed in the '533-FWD or '484-FWD. *Infra*, §§VI.B-E.

For example, the "driver" limitation that is recited in each independent claim

of the '455 Patent (and thus implicated in all challenged claims) is not included in the claims of the'533 Patent or '484 Patent and therefore not addressed in the '533-FWD or '484-FWD. EX1001, 86:46-48, 87:62-65, 89:8-11; *see* EX1004, 28:51-32:23; EX1005, 36:45-40:55; EX2046, ¶¶97-98. Similarly, the "arc" limitation that is recited in independent claim 15 and dependent claims 2 and 9 is not included in the claims of the'533 Patent or '484 Patent and therefore not addressed in the '533-FWD or '484-FWD. EX1001, 87:29-31, 88:40-42, 90:6-9; *see* EX1004, 28:51-32:23; EX1005, 36:45-40:55; EX2046, ¶¶165-66. Indeed, Petitioner's analysis for the "driver" and "arc" limitations does not identify any finding in the '533-FWD or '484-FWD regarding similar or identical limitations. Pet., 30-32, 56-61.

Collateral estoppel therefore does not apply to the arguments herein because "there are differences between the claim limitation[s] at issue … and the adjudicated claim limitations at issue in the prior IPRs." *Palo Alto Networks, Inc. v. Centripetal Networks, Inc.*, IPR2021-01153, Paper 10 at 18 (PTAB Jan. 24, 2022); *see also MaxLinear, Inc. v. CF CRESPE LLC*, 880 F.3d 1373, 1377-78 (Fed. Cir. 2018) (collateral estoppel does not apply to claims that "present materially different issues that alter the question of patentability"); *Dr. Reddy's Lab'ys., Ltd. v. Monosol RX, LLC*, IPR2016-01111, Paper 14 at 16-17 (PTAB Dec. 5, 2016).

Petitioner's argument that Patent Owner is collaterally estopped from arguing against any possible combination of Lisogurski, Carlson, and Soller also fails. Pet.,

26. Petitioner cites no authority for this assertion. *Id.* The fact that the Board previously found that a POSITA would combine Lisogurski and Carlson to arrive at the inventions in different claims in different patents does not mean that a POSITA would combine those two references, and also a new reference (Soller), to meet the different requirements of the challenged claims, which are materially different. For example, as explained above, the challenged claims include "driver" and "arc" limitations not present in the claims of the '533 Patent or '484 Patent in previous IPRs, and Petitioner offers no argument, let alone evidence, that these limitations are materially the same as any limitation previously adjudicated. *See* EX1001, 86:46-48, 87:62-65, 89:8-11; EX1004, 28:51-32:23; EX1005, 36:45-40:55; Pet., 30-32, 56-61; EX2046, ¶¶97-98, 165-66. Additionally, the Soller reference (EX1030) was not asserted in the previous IPRs. EX1008, 3; EX1011, 6-7.

Thus, Petitioner has not shown that collateral estoppel applies for any claim limitations or motivation-to-combine issues discussed herein, and it does not.

B. Ground 1: Alleged Obviousness Based on Lisogurski, Carlson, and Soller (Claims 1-4, 8-11, 15-16)

In Ground 1, Petitioner argues that claims 1-4, 8-11, and 15-16 of the '455 Patent are obvious over Lisogurski in view of Carlson and Soller. Pet., 11, 21-65. For at least the reasons discussed below, Petitioner fails to meet its burden. EX2046, ¶¶92-288.

1. Independent Claim 1: The Petition Violates the Board's Rules, and Also Lisogurski, Carlson, and Soller Do Not Disclose or Render Obvious the Driver Limitation

Limitation 1[a][1] recites "a light source ***comprising*** a driver" (hereinafter, the "driver limitation"). EX1001, 86:46-47.[2] Petitioner relies on Lisogurski's light source 130 as the claimed "light source" and relies on at least Lisogurski's light drive circuitry 120 as the claimed "driver." Pet., 30-32. However, the Petition is unclear whether it relies on Lisogurski's drive circuitry 120 alone or in combination with control circuitry 110 for the claimed "driver," which violates the Board's Rules. EX2046, ¶¶105-13. Regardless, Lisogurski does not discloses nor render obvious that the light source 130 ***comprises*** the light drive circuitry 120 as claimed. EX2046, ¶¶93-153; Pet., 30-32. Thus, Petitioner cannot meet its burden for the driver limitation. EX2046, ¶¶93-153.

a) Petitioner Violates the Board's Rules by Failing to Clearly Identify the Claimed "driver" in Lisogurski

For the claimed "driver," Petitioner fails to clearly specify whether it relies on Lisogurski's drive circuitry 120 alone or in combination with control circuitry 110.

[1] Claim limitations of the '455 Patent are identified herein using the same identifiers as the Petition. Pet., 84-90.

[2] All emphasis in case and evidence citations herein is added unless otherwise noted.

Pet., 30-32; EX2046, ¶¶107-13. Indeed, Petitioner only uses the word "driver" when quoting the challenged claims and never in connection with Lisogurski's teachings. *See* Pet., 30-32; EX2046, ¶108.

This lack of clarity is compounded by the Petition's inconsistencies. On one hand, the Petition's analysis suggests that ***only*** drive circuitry 120 constitutes the claimed "driver" as driver circuitry 120—but not control circuitry 110—is mentioned in the paragraph regarding "Lisogurski['s] disclos[ures]" and written in bold, and the next paragraph about modifying Lisogurski starts with a sentence about "[i]ntegrating the light drive circuitry 120 … with the light source 130," with no mention of control circuitry 110. Pet., 30-31; EX2046, ¶109.

On the other hand, however, the Petition's analysis of the driver limitation suggests that ***both*** drive circuitry 120 and control circuitry 110 constitute the claimed "driver," as it refers to "motivat[ion] to combine the control [circuitry] and light drive circuitry" and includes an annotated version of Lisogurski's Figure 1 that appears to depict an alleged modification involving both drive circuitry 120 and control circuitry 110, with both of these components in blue. Pet., 31-32; EX2046, ¶110.

Dr. Mercier's declaration is similarly inconsistent and unclear. EX2046, ¶¶111-12. Some aspects of Dr. Mercier's analysis of the driver limitation suggest that ***only*** drive circuitry 120 constitutes the claimed "driver." For example, he asserts

that "Lisogurski teaches a component ('light drive circuitry') … , which a POSITA would have understood to be the 'driver.'" EX1003, ¶125. He also states "[t]o the extent claim 1[a] requires the 'light drive circuitry 120' … to be part of the light source 130 … ," but makes no mention of the control circuitry 110 in this statement. EX1003, ¶126. Other aspects of Dr. Mercier's analysis of the driver limitation, however, suggest that ***both*** drive circuitry 120 and control circuitry 110 constitute the claimed "driver," as he refers four times to "combin[ing]" drive circuitry 120 and control circuitry 110, and he uses the color blue for the claim term "driver" and likewise to identify both drive circuitry 120 and control circuitry 110 in text and an annotated version of Lisogurski's Figure 1. EX1003, ¶¶123, 125-27.

Petitioner therefore fails to clearly identify which component(s) of Lisogurski allegedly constitute(s) the claimed "driver." EX2046, ¶¶107-13. This violates the Board's rules, which require that petitions include a "full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence," and that petitions "specify where each element of the claim is found in the prior art … relied upon" and "identify[] specific portions of the evidence that support the challenge." 37 C.F.R. §§ 42.22(a)(2), 42.104(b)(4)-(5). The Board routinely denies institution in similar situations. *Cherwell Software, LLC v. BMC Software, Inc.*, IPR2018-00980, Paper 9 at 16-17, 20-22 (PTAB Oct. 19, 2018) (denying institution where "[i]t [was] unclear from the [p]etition … what specific

component(s) in [the reference] [p]etitioner [was] relying on as allegedly teaching a [claim element]); *Advanced Lighting Concepts LLC v. Mate LLC*, IPR2023-01266, Paper 9 at 26-32 (PTAB Feb. 13, 2024) (denying institution because petitioner failed to "clearly identify where [the reference] discloses [the claimed] LED driver"); *Teradata Corp. v. SAP SE*, IPR2020-00942, Paper 10 at 20-22 (PTAB Nov. 24, 2020) (denying institution because the petition was "unacceptably unclear" and "fail[ed] to meet … clarity requirements," as it "obfuscate[d] the relationship between the [prior art] disclosures and the claim limitations").

For example, in *IMA S.p.A. et al. v. Indag Gesellschaft für Industriebedarf mbH & Co. Betriebs KG*, the Board denied institution because the petition "[was] unclear as to which portions of [the reference] [p]etitioners rel[ied] on as teaching each [claim] element," and also, "[b]eyond not expressly articulating which features … correspond to the [claim elements], the [p]etition[] … point[ed] in different directions as to how [p]etitioners map[ped] … disclosure[s] onto these elements," IPR2016-01153, Paper 11 at 15-18, 21-24 (PTAB Dec. 7, 2016) (finding that petitioners "d[id] not link each [claim] element … to a particular disclosure or structure in the reference" and, further, presented "inconsistent" positions). The same is true here. The Petition is unclear whether the claimed "driver" is the drive circuitry 120 by itself or in combination with control circuitry 110. Pet., 30-32; *see also* EX1003, ¶¶123, 125-27 (similarly unclear and inconsistent).

b) Lisogurski Does Not Disclose "a light source comprising a driver"

As discussed above, Petitioner relies on at least Lisogurski's drive circuitry 120 as the alleged "driver," but Lisogurski does not disclose that drive circuitry 120 is included in light source 130 (the alleged "light source") as required by the driver limitation. EX2046, ¶¶99-104. Rather, as depicted in the annotated version of Figure 1 below, drive circuitry 120 (blue) in monitor 104 (green) is separate and distinct from light source 130 (red) in sensor 102 (purple):

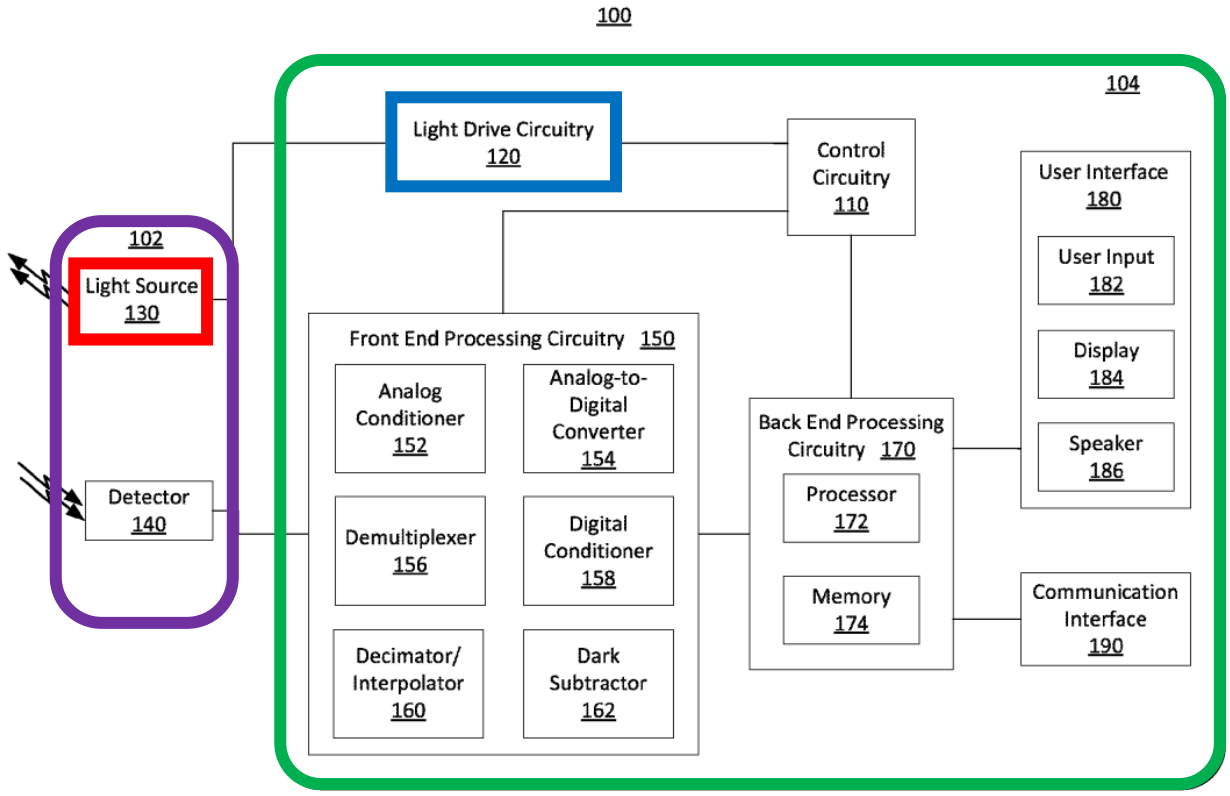

FIG. 1

EX1025, FIG. 1 (annotated), 10:42-49, 11:28-66; EX2046, ¶¶99-104.[3] Accordingly, Petitioner must show that a POSITA would have modified Lisogurski to include the claimed arrangement.

c) Petitioner Does Not Establish Motivation to Modify Lisogurski

Petitioner fails to establish that a POSITA would have modified Lisogurski to meet the driver limitation. EX2046, ¶¶105-47. As explained in Section VI.B.1.a above, Petitioner fails to clearly specify the alleged "driver" in Lisogurski and also does not show that a POSITA would have been motivated to modify Lisogurski to relocate the unspecified "driver" into light source 130 (the alleged "light source"). EX2046, ¶¶107-13. Additionally, as explained below, Petitioner fails to address relocating Lisogurski's drive circuitry 120 (hereinafter, the alleged "driver")[4] into light source 130 (the alleged "light source"). Additionally, Petitioner's motivation analysis constitutes only two conclusory sentences that refer, with no explanation,

[3] Control circuitry 110 is also separate and distinct from light source 130, as shown in annotated Figure 1.

[4] References herein to drive circuitry 120 as "the alleged 'driver'" reflects Petitioner's reliance on *at least* drive circuitry 120 for the "driver" and do not suggest that Petitioner's position regarding the "driver" is clear. *Supra*, §VI.B.1.a.

to Dr. Mercier's declaration, prior Board decisions, and ambiguous "disclosures in Lisogurski" and "market trends." Pet., 30-32; EX2046, ¶¶114-25. In fact, the Board's prior decisions and the alleged "disclosures in Lisogurski" or "market trends" do not address, much less support, relocating drive circuitry 120 into light source 130, and Dr. Mercier's declaration is similarly unsupported and inadequate. EX2046, ¶¶118-47.

(i) Petitioner's Proposed Lisogurski Modification is Deficient

To meet the driver limitation, which recites "a light source ***comprising*** a driver," Petitioner must establish motivation to modify Lisogurski to relocate drive circuitry 120 (the alleged "driver") into light source 130 (the alleged "light source"). EX2046, ¶¶114. Petitioner fails to address this. Instead, Petitioner merely argues that Lisogurski's drive circuitry 120 would have been relocated into sensor 102. Pet., 31; EX2046, ¶¶114-17.

The Petition's analysis of the driver limitation contains only two sentences purporting to describe the alleged modification of Lisogurski:

> Integrating the light drive circuitry 120 in Figure 1 of Lisogurski with the light source 130 would have been an obvious modification that a POSITA would have been motivated to make, as Dr. Mercier explains and as the Board previously found. … Specifically, a POSITA would have been motivated to combine the control and light drive circuitry …, which operate together, with the sensor unit/device with the light source, consistent with the disclosures in Lisogurski that multiple components can be combined and the market trends toward

miniaturized electronics.

Pet., 31 (citations omitted). The second sentence explains that the alleged "[i]ntegrat[ion]" mentioned in the first sentence means "***[s]pecifically***, … combin[ing] the control and light drive circuitry …, which operate together, with ***the sensor unit/device with the light source***," and this "sensor unit/device with the light source" is sensor 102. Pet., at 31; *see* EX1027, FIG. 1 (showing that sensor 102 is the device with light source 130); EX2046, ¶¶115, 119-20. That is, the Petition merely argues that drive circuitry 120 would have been combined with sensor 102 that contains light source 130—as opposed to ***within light source 130***. Similarly, Petitioner's annotated version of Lisogurski's Figure 1 does not clearly indicate that drive circuitry 120 would have been relocated within light source 130. Pet., 32. Regardless, the Petition does not describe this modification. Pet., 31-32; EX2046, ¶¶115-16.

The fact that the Petition only proposes relocating drive circuitry 120 into sensor 102, not into light source 130, is also evident from Petitioner's reliance on what "the Board previously found." Pet., 31 (citing EX1008, 22-23). As explained in Section VI.B.1.c.ii below, the cited '533-FWD only addressed relocating drive circuitry 120 into ***sensor 102***. EX1008, 22-23; EX2046, ¶¶127-30. Petitioner's reliance on the '533-FWD explains why the Petition only argues about relocating drive circuitry 120 only into sensor 102, not specifically into light source 130, or is

ambiguous at best. But importantly, this modification of relocating drive circuitry 120 only into sensor 102, as addressed in the '533-FWD, fails to meet the driver limitation here. EX2046, ¶¶94-95, 114, 119-20.

Dr. Mercier's declaration is similarly deficient in that he merely argues that drive circuitry 120 would have been relocated into sensor 102 containing light source 130, not relocated into light source 130. EX1003, ¶¶126-27 (arguing "motivat[ion] to combine the light drive circuitry 120 … into ***the same device as the light source 130*** [i.e., into sensor 102]"; "motivate[ion] to combine the light drive circuitry … with ***the same device as the light source*** [i.e., with sensor 102]"; "combining the light drive circuitry … with ***the device containing the light source*** [i.e., with sensor 102]"; "motivat[ion] to combine … light drive circuitry 120 … into ***the device containing the light source*** [i.e., into sensor 102]"); *see* EX1027, FIG. 1 (showing that sensor 102 is the device containing light source 130); EX2046, ¶¶117, 134, 138, 141, 145. Indeed, Dr. Mercier's modification argument alleges that "existing … sensors … combined the driver and light source … into a single … wearable device," which merely addresses locating the driver in the same wearable device, not locating the driver in the light source. EX1003, ¶126; EX2046, ¶¶117, 141.

Because the Petition's proposed modification of Lisogurski does not address relocating Lisogurski's drive circuitry 120 into light source 130, it does not (and cannot) explain motivation for the modification. *See Micron Tech. Inc. v. Yangtze*

Memory Techs. Co., Ltd., IPR2025-00244, Paper 27 at 17-19, 22-23 (PTAB Aug. 8, 2025) (holding that the Board "will not consider any arguments not sufficiently set forth in the Petition," and denying institution because arguments were not "expressly assert[ed]" or "clearly articulated in the Petition"); *Apple Inc. v. Uniloc 2017 LLC*, IPR2019-00056, Paper 7 at 21 (PTAB Apr. 29, 2019) (denying institution because the asserted modification was "vague and require[d] speculation … and, therefore, [p]etitioner's arguments and evidence in this regard are not persuasive" (citing 37 C.F.R. §§ 42.22(a)(2), 42.104(b)(4) and additional authority)); EX2046, ¶¶119-20, 134, 138, 141, 145.

(ii) Petitioner Fails to Show Motivation to Relocate Lisogurski's Drive Circuitry 120 Into Light Source 130

Even if Petitioner had proposed modified Lisogurski to relocate the drive circuitry 120 into light source 130, Petitioner fails to show that a POSITA would have been motivated to make this modification. EX2046, ¶¶118-47.

The Petition contains only two relevant sentences arguably addressing motivation to modify Lisogurski for the driver limitation, the first of which asserts:

> Integrating the light drive circuitry 120 in Figure 1 of Lisogurski with the light source 130 would have been an obvious modification that a POSITA would have been motivated to make, as Dr. Mercier explains and as the Board previously found. EX1003 ¶126; EX1008, 22-23 (quoting EX1027, 16:2-9); EX1011, 24-45.

Pet., 31. Here, Petitioner does not identify any alleged motivation for modifying

Lisogurski and instead merely cites and refers to previous Board decisions and Dr. Mercier's declaration in conclusory fashion, with no explanation. Pet., 31; EX2046, ¶¶119-21, 127. Indeed, Petitioner does not explain what "the Board previously found." Pet., 31 (citing EX1008 ('533-FWD), 22-23; EX1011 ('484-FWD), 24-45). This is because those cited Board decisions do not address—much less find—motivation to relocate Lisogurski's drive circuitry 120 into light source 130. EX2046, ¶¶126-31.

The proposed modification to Lisogurski addressed in the '533-FWD involved relocating drive circuitry 120 to within sensor 102, ***not*** within light source 130. EX1008, 22-23 ("Petitioner's proposed combination relocates some components of Lisogurski's monitor 104/314 ***to sensor 102/312***"; "Petitioner's proposed combination … involves relocating … light drive circuitry 120 … ***to sensor 102***"; "Petitioner articulates sufficient reasoning … why a [POSITA] would have modified Lisogurski's ***sensor 102/312***"); EX2046, ¶¶126-29, 145-47.[5]

[5] The annotated version of Lisogurski's Figure 1 in the '533-FWD also does not indicate a finding about relocating drive circuitry 120 into light source 130 because the text clarifies that the illustrated proposal involves relocating drive circuitry 120 "to sensor 102." EX1008, 22-23; EX2046, ¶130.

Petitioner's cited portion of the '533-FWD does not even mention light source 130. EX1008, 22-23. The '533-FWD discusses drive circuitry 120 sending a drive signal ***to*** light source 130 in the modified version of Lisogurski, showing that the Board did not consider a modification where the light source 130 comprises the drive circuitry 120. EX1008, 27, 32-33; EX2046, ¶128. In fact, Dr. Mercier acknowledges that in the '533-FWD, "the Board … found … motivat[ion] to combine … light drive circuitry … into ***the device containing the light source***"—i.e., into sensor 102, not into light source 130 itself. EX1003, ¶127 (citing EX1008, 22-23); *see* EX1027, FIG. 1 (showing that sensor 102 is the device containing light source 130); EX2046, ¶129.

Petitioner also relies on the '533-FWD's citation to Lisogurski at 16:2-9. Pet., 31 (citing "EX1008, 22-23 (quoting EX1027, 16:2-9)"). The Petition, however, does not discuss this portion of Lisogurski, much less explain if or how this disclosure purportedly applies to any modification involving drive circuitry 120 and light source 130. Pet., 31; EX2046, ¶123. The '533-FWD only found that Lisogurski at 16:2-9 supported the modification of "relocating … light drive circuitry 120 … to sensor 102," not into light source 130. EX1008, 22-23 (quoting Lisogurski (here EX1027, there EX1011), 16:2-4, 16:7-9); EX2046, ¶¶124, 126-29. Petitioner does not explain why Lisogurski at 16:2-9 would have led a POSITA to further relocate drive circuitry 120 to within light source 130. Pet., 31; EX1008, 22-23; EX2046, ¶123.

Lisogurski does not suggest relocating drive circuitry 120 into light source 130. EX2046, ¶¶123, 136. Instead, it states that only "the functionality of ***some*** of the components may be combined in a single component" – it does not teach that it applies to the alleged combination of drive circuitry 120 and light source 130. EX1027, 15:66-16:16; EX2046, ¶¶123, 136. Petitioner does not explain why drive circuitry 120 and light source 130 together qualify as "***some*** of the components" referenced in Lisogurski. Pet., 31. Moreover, a POSITA would have understood that Lisogurski at 16:2-9 does not apply to relocating drive circuitry 120 into light source 120, as discussed below in Section VI.B.1.d. EX2046, ¶123 For example, Lisogurski teaches that drive circuitry 120 provides or sends a signal "***to***" light source 130, so a POSITA would not have relocated drive circuitry 120 into light source 130 because this would result in light source 130 effectively sending a signal to itself. EX1027, 11:28-12:6, FIG. 1; EX2046, ¶149; *see Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987) (a reference "must be considered in its entirety, … including portions that would lead away" from the claimed invention).

Like the '533-FWD, the '484-FWD also does not address relocating Lisogurski's drive circuitry 120 into light source 130. EX1011, 24-45; EX2046, ¶131. For example, the cited portion of the '484-FWD contains only a single mention of drive circuitry 120 and no discussion of it in connection with light source 130. EX1011, 24-45.

The second of the Petition's two relevant sentences on motivation asserts:

> Specifically, a POSITA would have been motivated to combine the control and light drive circuitry … , which operate together, with the sensor unit/device with the light source, consistent with the disclosures in Lisogurski that multiple components can be combined and the market trends toward miniaturized electronics. EX1003 ¶126.

Pet., 31. This fails to establish any motivation to modify Lisogurski because it contains no identification, citation, or explanation regarding the alleged "disclosures in Lisogurski" or "market trends," much less how these things would allegedly motivate relocating drive circuitry 120 into light source 130. Pet., 31; EX2046, ¶122. For example, Petitioner fails to explain why alleged "market trends toward miniaturized electronics" would have motivated the relocation of Lisogurski's drive circuitry 120 into light source 130. Pet., 31; EX1027, FIG. 1. In fact, such a modification would not have led "toward miniaturized electronics" because it would not change the footprint of Lisogurski's sensor 102 and monitor 104. EX2046, ¶122.

The Petition's citation to Dr. Mercier's declaration is unavailing because, to the extent it addresses the "disclosures in Lisogurski" and "market trends" (which it does not as discussed below), it amounts to improper incorporation by reference. Pet., 31 (citing EX1003, ¶126); EX2046, ¶¶132-47; *Cisco Sys., Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 at 9-10, 15 (PTAB Aug. 29, 2014) (informative) (denying institution where petition improperly cited declaration to support conclusory statements not otherwise argued or explained in the petition); 37

C.F.R. § 42.6(a)(3).

Dr. Mercier's analysis is also unsupported and inadequate. The only paragraph cited in the Petition quotes Lisogurski at 16:2-9 and simply asserts that "[a] POSITA would have been motivated … based on this suggestion in Lisogurski alone." Pet., 31 (citing EX1003, ¶126); EX1003, ¶126 (quoting EX1027, 16:2-9). This fails for the same reasons discussed above. *Supra*; *see also* EX2046, ¶¶133-37.

The cited paragraph also includes a conclusory assertion "based on … market trends … calling for increased portability for electronic medical monitoring systems." EX1003, ¶126. But Dr. Mercier provides no evidence or explanation of the alleged "market trends," much less how they would have purportedly motivated the specific requisite modification of Lisogurski. EX1003, ¶126. For example, Dr. Mercier does not explain how the alleged trend of "increased portability" would have purportedly motivated, or been achieved by, relocating drive circuitry 120 into light source 130. EX1003, ¶126; EX1027, FIG. 1. The reality is that such a modification would have no impact on the footprint of Lisogurski's sensor 102 and monitor 104. EX2046, ¶¶138-40. Dr. Mercier's only alleged support for his assertion about "market trends" is a cross-reference to "§ V.B" of his declaration, but that section contains no mention of Lisogurski, much less any explanation of how alleged "market trends" would have motivated modification of Lisogurski. EX1003, ¶¶126 (citing "§ V.B"), 52-62 (§ V.B); EX2046, ¶140.

Third, the cited paragraph asserts "obvious[ness] in view of existing wearable sensors (e.g., Nonin Onyx 9500 finger clip sensors) that combined the driver and light source … into a single finger-worn wearable device," but he cites zero evidence for this assertion. EX1003, ¶126; EX2046, ¶¶141-42. As for the only specific sensors identified in this assertion—i.e., "Nonin Onyx 9500 … sensors"—Dr. Mercier provides no citation anywhere in his declaration regarding such sensors and thus no evidence of their structure or prior art status. *See generally* EX1003. This assertion also fails because: it addresses merely "combin[ing] the driver and light source … into a … wearable device" (i.e., locating the driver in the same device as the light source), which does not meet the driver limitation of "a light source ***comprising*** a driver"; it argues "obvious[ness]" based on "modification [of Lisogurski] … in view of existing wearable sensors," but Ground 1 asserts Lisogurski only in view of Carlson and Soller, not those alleged "sensors"; it relies on the mere "***exist[ence]***" of other "wearable sensors" without arguing any alleged motivation for why Lisogurski would have been modified based on those other sensors or how. EX1003, ¶126; EX2046, ¶¶141-44; *Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-87 (Fed. Cir. 2024) (holding that "mere … exist[ence]" of possible arrangements in the prior art is insufficient for motivation).

Therefore, even if the Board were to consider improperly referenced opinion, they are conclusory and unsupported, and should be given little or no weight. *Xerox*

Corp. v. Bytemark, Inc., IPR2022-00624, Paper 9 at 15-17 (PTAB Aug. 24, 2022) (precedential) (denying institution because "declaration testimony is conclusory and unsupported, adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight");.*TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1361-63 (Fed. Cir. 2019) (reversing the Board's obviousness finding based on "unsupported and conclusory" expert testimony); 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight").

For at least these reasons, Petitioner fails to show that a POSITA would have been motivated to relocate Lisogurski's drive circuitry 120 (the alleged "driver") to within light source 130 (the alleged "light source") as required for the driver limitation.

d) A POSITA Would Not Have Been Motivated to Modify Lisogurski

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to relocate Lisogurski's drive circuitry 120 to within light source 130.

First, Lisogurski teaches that the purpose of drive circuitry 120 is to provide or send the light drive signal "***to***" light source 130. EX1027, 11:28-12:6, FIG. 1. A POSITA would not have relocated drive circuitry 120 to inside light source 130 because this modification would cause light source 130 to effectively send a signal

to itself, creating unnecessary redundancy and inefficiency. EX2046, ¶¶148-49; *see Panduit*, 810 F.2d at 1568 (a reference "must be considered in its entirety, … including portions that would lead away" from the claimed invention).

Second, a POSITA would not have been motivated to relocate drive circuitry 120 to within light source 130 because the heat generated by the light source 130 would potentially damage the driver circuitry 120. EX1027, 1:17-19, 3:58-60, 5:7-9; EX2056; EX2057, 10-11; EX2046, ¶¶150-52. Lisogurski recognizes this concern of heating effects for light emitters such as light source 130 and expresses a desire to reduce these heating effects. EX1027, 1:17-19 (describing desirability of "reduc[ing] heating effects of the emitters"), 3:58-60 (describing a "desir[e] to … reduce heating effects caused by an emitter"), 5:7-9 (describing desirability of "reduc[ing] the impact of heating effects caused by a light source"); EX2046, ¶150. A POSITA would have understood that relocating drive circuitry 120 into light source 130 would put drive circuitry 120 at risk of being compromised due to heat generated by light source 130, especially in this situation where Petitioner relies on embodiments in which the light source 130 emits infrared (IR) light for oximetry. Pet., 52-55; EX2046, ¶¶150-52.

Third, the proposed modification would have created unnecessary complications, costs, and design issues for a combined light-source-and-driver. EX2046, ¶153. Based on Lisogurski's teaching that light source 130 and drive

circuitry 120 are separate components, a POSITA would have understood them to be standard components that are designed and fabricated separately and that integration of drive circuitry 120 into light source 130 would require more specialized and complicated design and fabrication, including due to the heating concerns discussed above. EX1027, FIG. 1; 10:42-49, 11:28-32; EX2046, ¶153.

2. Dependent Claim 2: Lisogurski, Carlson, and Soller Do Not Render Obvious the Arc Limitation

Petitioner's analysis of claim 2, which depends from claim 1, does not address the deficiencies in Lisogurski, Carlson, and Soller with respect to claim 1. Pet., 56-61. Therefore, Lisogurski, Carlson, and Soller do not render obvious claim 2 for at least the same reasons as claim 1. *Supra*, §VI.B.1; EX2046, ¶¶154-56.

Additionally, Lisogurski, Carlson, and Soller do not render obvious claim 2's requirement that "the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more ***arcs***" (hereinafter, the "arc limitation"). EX1001, 87:29-31; EX2046, ¶¶157-259. Petitioner relies on Lisogurski's sensor's multiple LEDs and detectors as the claimed "semiconductor sources" and "detectors," respectively. Pet., 57-58, 30, 32, 37-39, 42. Because Lisogurski does not disclose any arrangement of its LEDs or detectors, Petitioner relies on Soller's arrangement of LEDs 604 and reference detectors 610 in Figure 11A (referenced herein as Soller's "alleged arc arrangement") and proposes a two-

step modification to arrive at the claimed invention. Pet., 59-61; EX2046, ¶¶157-63.

Specifically, Petitioner argues, as the first step, that a POSITA would have "modif[ied] Soller's [***reference***] detectors [610] … to be ***reflectance*** detectors," like the reflectance detectors recited in the '455 claims (including the arc limitation) and those in Lisogurski. Pet., 59-61; *see also* EX1001, 86:45-64, 87:27-31 (reciting reflectance "detectors"); EX1027, 17:39-42 (teaching reflectance detectors); Pet., 19, 23, 37, 39-40, 42, 52 (recognizing that the claimed "detectors" and Lisogurski's relied-upon detectors are reflectance detectors). Petitioner alleges, as the second step, that, based on Soller's alleged arc arrangement of then-modified detectors 610 from the first step, a POSITA would have "modif[ied] Lisogurski to include LEDs and [reflectance] detectors configured in one or more arcs."[6] Pet., 61; EX2046, ¶¶158-62.

In proposing this two-step modification, Petitioner relies on the following annotated Figure 11A of Soller:

[6] Petitioner does not rely on Carlson for the arc limitation.

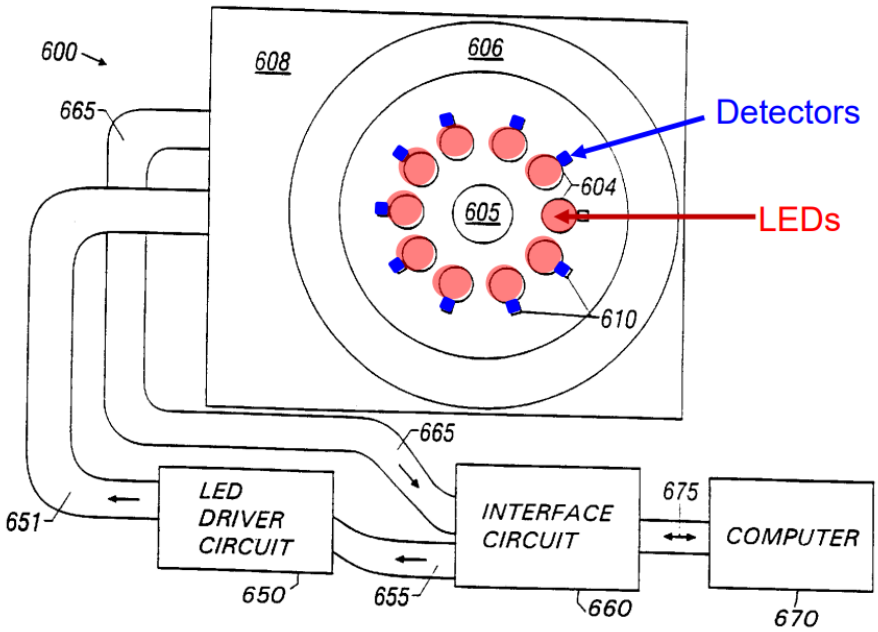

Figure 11A

Pet., 57-60 (annotating EX1030, FIG. 11A). Petitioner, however, failed to show (1) that a POSITA would have modified Soller's reference detectors 610 to be reflectance detectors, (2) that a POSITA would have modified Lisogurski's reflectance detectors without that first modification to Soller, or (3) that a POSITA would have implemented Soller's alleged arc arrangement in the Lisogurski/Carlson combination. EX2046, ¶¶164-259.

a) Soller Does Not Disclose the Arc Limitation

Claims 1-2 recite that the "detection system" comprising the "plurality of detectors" is "configured to receive at least a portion of the lens output light reflected from the tissue." EX1001, 86:45-64, 87:27-31. The claimed "detectors" are reflectance detectors that receive reflected light from the sample. EX2046, ¶¶162, 167-68. Petitioner recognizes this and relies on ***reflectance*** detectors in Lisogurski,

i.e., detectors that receive reflected light from the sample. Pet., 19, 23, 37, 39-40, 42, 52; EX1027, 17:39-42.

As discussed above, Petitioner relies on Soller's embodiment in Figure 11A for the arc limitation, but as depicted in the annotated version of Figure 11A below, the relied-upon embodiment teaches only a single, central ***reflectance*** detector 605 (annotated in green). Pet., 59-61.

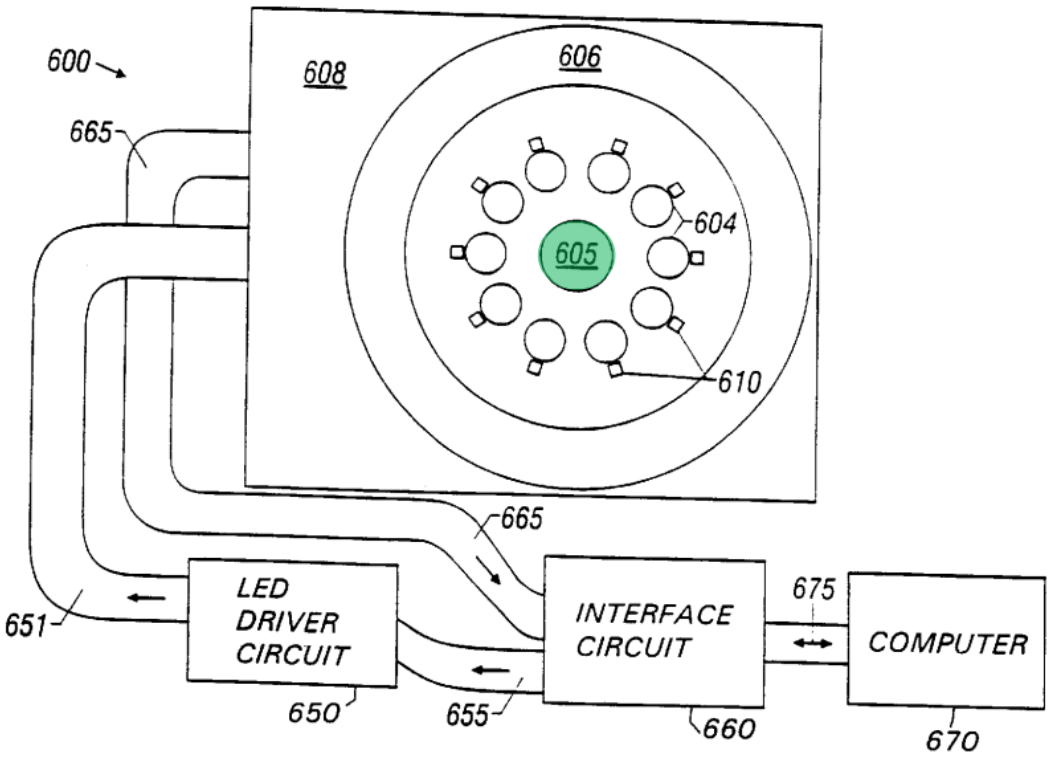

Figure 11A

EX1030, FIG. 11A (annotated), 17:36-60; EX2046, ¶¶169-77 (explaining that Soller's other embodiments teach single reflectance detectors). Soller does not disclose an arc arrangement of reflectance detectors as required by the arc limitation. EX2046, ¶176. Petitioner instead relies on Soller's arrangement of ***reference***

detectors 610 in Figure 11A in an attempt to show that Soller discloses an arc. Pet., 59-61. But these ***reference*** detectors measure light directly from LEDs 604 rather than light reflected from a sample. EX1030, 17:36-60, 2:27-33, 3:27-39; EX2046, ¶¶177-78.

Recognizing this shortcoming in Soller, Petitioner argues as a first step of its obviousness modification that a POSITA would have changed Soller's ***reference*** detectors 610, which are allegedly arranged in an arc, to be ***reflectance*** detectors. Pet., 59-61. As set forth below, Petitioner failed to show that a POSITA would do this.

b) Petitioner Does Not Establish Motivation to Modify Soller's *Reference* Detectors 610 to Be *Reflectance* Detectors

Petitioner fails to establish that a POSITA would have modified Soller's ***reference*** detectors 610 to be ***reflectance*** detectors. EX2046, ¶¶179-94. The Petition addresses this alleged modification of Soller's reference detectors 610 in only a single paragraph. Pet., 60-61.[7] This paragraph first asserts the following:

[7] The subsequent paragraph, which starts on page 61 ("Thus, …"), only addresses motivation to combine Soller and Lisogurski, not motivation to modify Soller to begin with (particularly its reference detectors 610). Pet., 61. Even if this subsequent paragraph was intended to address motivation to modify Soller's reference detectors

> The "detectors" in Fig. 11A are "reference detectors" "mounted on the side of each LED to measure and correct for variations in…intensity," EX1030, 17:36- 50, but are still conventional photodiodes that a POSITA would have understood could be configured to serve as "reflectance detectors" to measure light received from the sample. EX1003 ¶¶205-11; EX1030, 17:42-60.

Pet., 60. This assertion, however, merely argues that Soller's reference detectors 610 "***could be*** configured to serve as 'reflectance detectors,'" which does not support motivation. *PersonalWeb Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017) ("[O]bviousness concerns whether a [POSA] not only *could have made* but wo*uld have been motivated to make* the … modifications … ."") (emphasis in original) (citation omitted). Petitioner fails to explain ***why*** a POSITA would have been motivated to change Soller's reference detectors 610 into reflectance detectors, especially since Soller's Figure 11A embodiment already includes reflectance detector 605. Pet., 60-61; EX1030, FIG. 11A, 17:42-60; EX2046, ¶¶182-84. Moreover, the portion of Soller cited by Petitioner does not indicate that reference detectors 610 can instead serve as reflectance detectors, much less provide any motivation for such modification. EX1030, 17:36-50; EX2046, ¶182-84. Dr. Mercier's testimony is substantially similar and thus deficient for the same reasons.

610, it fails at least because it does not even mention those detectors 610, let alone explain how modification thereof would "increase accuracy." *Id.*

EX1003, ¶¶205-06 (asserting merely that "the 'reference detectors' … ***could*** serve as 'reflectance detector(s),'" without identifying ***why*** a POSITA would have made this modification); EX2046, ¶¶182-84.

The Petition next argues that changing Soller's reference detectors 610 to be reflectance detectors would have been a "routine design change":

> It would have been obvious to modify Soller's detectors depicted in Fig. 11A to be reflectance detectors and a POSITA would have been motivated to make this modification as a routine design change. EX1003 ¶¶205-11.

Pet., 60. But this argument is conclusory and unsupported, as the Petition argues this alleged "routine design change" in only a single sentence and provides no explanation. Pet., 60; EX2046, ¶185.

Regardless, Petitioner's alleged modification would not have been a mere "routine design change" because modifying Soller's reference detectors 610 to be reflectance detectors would result in functional and structural differences. EX2046, ¶¶186-87. For example, Soller's reference detectors 610 are "mounted on the side of each LED [604]" to directly light from LEDs 604 "and correct for variations in the LED intensity," but Petitioner's alleged modification would change the function of detectors 610 to instead measure light reflected from sample 505 and also require changing the mounting/location of detectors 610 such that they no longer receive light directly from LEDs 604. EX1030, 17:36-48, FIGS. 11A-B; EX2046, ¶¶186-

87. As another example, Soller teaches that LEDs 604 are mounted "at an angle" around an existing "centrally located" reflectance detector 605, but Petitioner's alleged modification would necessitate changes regarding the mounting angle of LEDs 604 and subsequent change to existing reflectance detector 605 (e.g., relocation or removal). EX1030, 17:36-60, FIGS. 11A-B; EX2046, ¶¶186-87. Petitioner's modification would leave the device 600 with no remaining reference detectors and thus necessitate the addition of new reference detectors, with appropriate location/mounting relative to LEDs 604. EX1030, 17:36-50, FIGS. 11A-C; EX2046, ¶187.

In similar situations, the Federal Circuit has held that such modifications—where structure and function differed—were not obvious design choices. *See In re Gal*, 980 F.2d 717, 719-720 (Fed. Cir. 1992) (finding of "obvious design choice" was precluded because the claimed structure and the function it performed were different from the prior art); *Ex parte Maeda*, Appeal No. 2010-009814, Decision on Appeal, at 6-7 (PTAB Oct. 23, 2012) (informative) (finding, by the Board, that the "proposed modification of Meserole is not an obvious design choice" because it "would result in a different function than that shown by Meserole"); *Cutsforth, Inc. v. MotivePower, Inc.*, 636 Fed. App'x 575, 578 (Fed. Cir. 2016) ("Merely stating that a particular placement of an element is a design choice does not make it obvious.").

The Petition next argues that "Soller … teaches modifying the arrangement of detectors":

> Soller itself directly teaches modifying the arrangement of detectors. EX1030, 17:42-49 ("Fig. 11C shows an alternate mounting position for reference detectors 610, which allows more light to reach reference detectors 610"); *see also id.*, 18:47-58 ("Hematocrit measuring device 700 can be modified").

Pet., 60-61. Even if true this modification of the "***arrangement*** of detectors" does not mean modifying the ***type*** of detector, like Petitioner's proposed modification of changing ***reference*** detectors 610 to be ***reflectance*** detectors. Pet., 60-61; EX2046, ¶188. Petitioner does not argue that Soller teaches modifying the ***type*** of detector, and Soller does not teach such modification. Pet., 60-61; EX1030, 17:42-43. Indeed, neither of the two portions of Soller cited by Petitioner teach or support changing detectors 610's type from reference to reflectance. Pet., 60-61 (citing EX1030, 17:42-49, 18:47-58); EX2046, ¶¶189-90.

Petitioner argues Soller teaches that "FIG. 11C shows an alternate mounting position for reference detectors 610 which allows more light to reach reference detectors 610," but this does not teach that reference detectors 610 can be modified to be reflectance detectors. EX1030, 17:42-49; Pet., 60-61. In fact, this disclosure relates to positioning detectors 610 to receive more light directly from LEDs 604 (as shown in Figure 11C below) to improve the performance of detectors 610 ***in their capacity as reference detectors*****:**

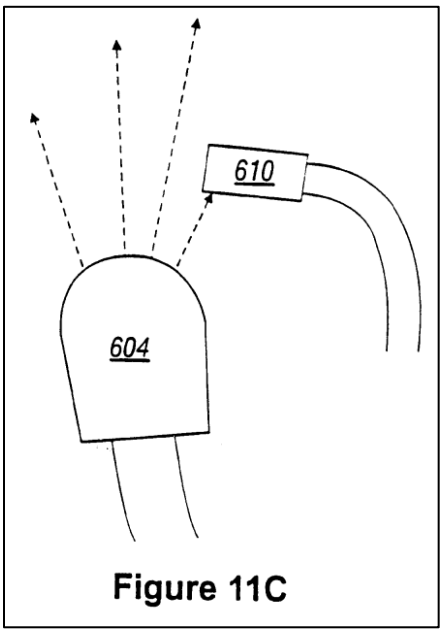

Figure 11C

EX1030, FIG. 11C, 17:42-50; EX2046, ¶189. Additionally, a POSITA would have understood that reference detector 610 shown in Figure 11C (above) ***cannot*** serve as a reflectance detector, since it receives light directly from LED 604. EX1030, FIG. 11C; EX2046, ¶189.

Petitioner also cites Soller's teaching that "Hematocrit measuring device 700 can be modified." EX1030, 18:47-58; Pet., 60-61. But this teaching does not relate to the relied-upon embodiment of device 600 in Figure 11A or mention any detector or modification, much less teach or support a proposed modification of reference detectors 610 in device 600. *Compare* EX1030, 18:18-19, 18:47-58, FIGS. 12A-B *with* EX1030, 17:36-43, FIGS. 11A-B; *see* EX2046, ¶190.

As discussed above, Petitioner fails to establish ***why*** a POSITA would have modified Soller's reference detectors 610 to be reflectance detectors. Petitioner also

fails to explain specifically ***how*** this change would be implemented in device 600 as required for motivation for obviousness. Pet., 59-61; EX2046, ¶¶191-92; *PersonalWeb*, 848 F.3d at 993-94 (finding the Board failed to explain "*how* the [modified prior art] was supposed to work" (emphasis in original)); *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012) (finding obviousness analysis insufficient for failure to explain specifically how the prior art would be modified); *In re NuVasive, Inc.*, 842 F.3d 1376, 1381-82 (Fed. Cir. 2016) (emphasizing "need for specificity" in "findings on motivation"). That is, Petitioner merely suggests "modify[ing] Soller's [reference] detectors [610] … to be reflectance detectors" without explaining how a POSITA would have changed other relevant aspects of device 600 to account for such modification. Pet., 59-61. For example, Petitioner's proposed modification to detectors 610 would have affected and necessitated changes to several other relevant aspects of device 600, such as: the relative location, mounting, and angling of detectors 610 (as modified), LEDs 604, and reflectance detector 605; the redundancy of detectors 610 (as modified) and existing reflectance detector 605 resulting from Petitioner's proposed modification; and the lack of any remaining reference detectors as a result of Petitioner's proposed modification. EX1030, 17:36-60, FIGS. 11A-B; EX2046, ¶¶191-92. Petitioner fails to address these issues. Pet., 59-61; EX2046, ¶¶191-92.

c) A POSITA Would Not Have Been Motivated to Modify Soller's *Reference* Detectors 610 to Be *Reflectance* Detectors

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to modify Soller's ***reference*** detectors 610 to be ***reflectance*** detectors as Petitioner proposes. EX2046, ¶¶195-210.

First, a POSITA would not have modified Soller's reference detectors 610 in device 600 to be ***reflectance*** detectors because device 600 already includes an existing ***reflectance*** detector 605, and the modified detectors 610 would perform the same function as existing reflectance detector 605. EX1030, 17:42-60, FIGS. 11A-B, 2:30-31; Pet., 60 (arguing that detectors 610 would be modified to serve as "'reflectance detectors' to measure light received from the sample"); EX1003, ¶205 (recognizing that Soller already teaches "'reflectance detector [605]' for receiving light … from the sample"); EX2046, ¶¶195-97. Thus, modifying detectors 610 to be reflectance detectors would be redundant and unnecessary given Soller's existing reflectance detector 605. EX2046, ¶¶195-97; *South-Tek Systems, LLC v. Engineered Corrosion Solutions, LLC*, 748 Fed. App'x 1003, 1006 (Fed. Cir. 2018) (finding no motivation "[g]iven the redundant functions" of primary and secondary reference elements); *In re Anova Hearing Labs, Inc.*, 809 Fed. App'x 840, 843 (Fed. Cir. 2020) (finding the Board "d[id] not explain why a [POSA] would be motivated to modify Brown, which already includes vents"); *see also Kinetic Concepts, Inc. v. Smith &*

Nephew, Inc., 688 F.3d 1342, 1369 (Fed. Cir. 2012). Neither Petitioner's nor Dr. Mercier's arguments about modifying detectors 610 discuss Soller's existing reflectance detector 605, much less address that the modified detectors 610 would have been redundant of reflectance detector 605. *See* Pet., 60-61; EX1003, ¶¶205-08; EX2046, ¶197.

Second, Petitioner's proposed modification is inconsistent with Soller's alleged invention and goals. Soller is directed to hematocrit measuring devices that contain ***both*** (1) **reflectance detectors** to measure light reflected from a sample ***and*** (2) **reference detectors** to measure light from the LEDs. EX1030, 2:27-33, 3:27-32, 13:50-14:13, FIGS. 5-6, 16:8-32, FIG. 7, 16:61-17:5, 17:42-48, FIGS. 11A-B, 18:24-25, FIGS. 12A-B, 18:66-67, 19:17-27, FIGS. 13A-B, 23:14-36; EX2046, ¶198. Soller's alleged invention includes reference detectors for measuring and accounting for variations in LED intensity when calculating reflected light. EX1030, 2:58-63, 7:26-29, 14:7-13, 17:1-5, 17:45-48, 19:4-7; EX2046, ¶199. For example, in Soller's Figure 11A embodiment, device 600 includes reference detectors 610 in addition to reflectance detector 605, with reference detectors 610 intended to "measure and correct for variations in the LED intensity due to temperature, gaining, or electrical power source drifts." EX1030, 17:42-48; EX2046, ¶199.

However, Petitioner's proposed modification of Soller would have changed reference detectors 610 (which are the only reference detectors in device 600) into

reflectance detectors, leaving device 600 with ***no remaining reference detectors***. Pet., 59-61; EX1030, 17:36-18:17 (disclosing no reference detectors other than detectors 610 for device 600); EX2046, ¶200. This is contrary to Soller's teaching to include both reflectance and reference detectors and also detracts from Soller's goal of using the reference detectors to account for variation in LED intensity to more accurately calculate reflected light from a sample. EX2046, ¶¶198-203. A POSITA would not have made this modification to Soller. EX2046, ¶¶198-203. Moreover, the Petition does not address that its proposed modification would result in device 600 containing no reference detectors, much less provide reasoning or support to square this result with Soller's contrary teachings and objective. *See* Pet., 60-61; EX2046, ¶¶201-02.

Third, Petitioner's proposed modification would result in incompatibilities and inoperability in Soller's device 600. Soller teaches that reference detectors 610 are positioned relative to LEDs 604 to receive light directly from LEDs 604. EX1030, FIGS. 11A-C, 17:42-50; EX2046, ¶204. With this positioning, a POSITA would have understood that detectors 610 ***cannot*** serve as ***reflectance*** detectors for measuring light reflected from sample 505 because such measurement of reflected light would be contaminated by light that detectors 610 receive directly from LEDs 604; EX2046, ¶¶204-05. If reference detectors 610 were modified to be reflectance detectors as Petitioner proposes, then those modified detectors 610 would be

incompatible with their positioning in device 600. EX2046, ¶¶204-05; *Grit Energy Sols., LLC v. Oren Techs., LLC*, 957 F.3d 1309, 1323 (Fed. Cir. 2020) (finding technological incompatibility telling of nonobviousness); *3Shape Medical A/S v. Sirona Dental Sys. GMBH*, IPR2016-00481, Paper 40 at 30 (PTAB June 21, 2017) (finding no motivation because of "incompatibilities").

Also, because the positioning of detectors 610 precludes them from functioning as reflectance detectors, Petitioner's proposed modification of those detectors 610 to be reflectance detectors would thus render device 600 inoperable for its intended purpose of measuring reflected light from sample 505. EX2046, ¶¶204-06; *In re Gordon,* 733 F.2d 900, 902 (Fed. Cir. 1984) (reversing obviousness rejection where the proposed modification would result in the reference being "rendered inoperable for its intended purpose").

Petitioner's proposed modification of Soller's reference detectors 604 does not address these issues of incompatibility and inoperability nor argue that a POSITA would have modified the positioning of detectors 610. *See* Pet., 60-61; EX1003, ¶¶205-08; EX2046, ¶207. Although Dr. Mercier's declaration contains an assertion (not included in the Petition) that "the reflectance detector(s) could also be arranged in a different position, including to be further away from the LEDs," it lacks any cited support or explanation, is unclear as to what "reflectance detector(s)" it is referring to, and merely asserts what "could" be done, not that a POSITA *would*

have made any such change. EX1003, ¶207; EX2046, ¶208; *see PersonalWeb*, 848 F.3d at 993-94 ("[O]bviousness concerns whether a [POSA] not only *could have made* but wo*uld have been motivated to make* the … modifications … ."") (emphasis in original) (citation omitted).

d) Without Modification of Soller's *Reference* Detectors 610, There Is No Motivation to Modify Lisogurski's *Reflectance* Detectors Based on Soller's Arrangement

Because there is no motivation to modify Soller's ***reference*** detectors 610 to be ***reflectance*** detectors, there is no motivation to arrange Lisogurski's reflectance detectors based on Soller's arrangement of those detectors 610. EX2046, ¶¶193-94, 209-10.

As discussed above, Petitioner makes a two-part argument for modifying Lisogurski's ***reflectance*** detectors to be arranged according to Soller's alleged arc arrangement of ***reference*** detectors 610 in Figure 11A: that (1) Soller would have been modified to change ***reference*** detectors 610 into ***reflectance*** detectors and (2) then Lisogurski would have been modified to arrange its ***reflectance*** detectors based on Soller's alleged arc arrangement of then-modified detectors 610. Pet., 59-61. Part one fails because there is no motivation to modify Soller's ***reference*** detectors 610 to be ***reflectance*** detectors. *Supra*, §§VI.B.2.b-c. Part two also fails.

First, Petitioner fails to show that a POSITA would have made the modification in part (2) without first making the modification in part (1). EX2046,

¶¶193-94. Petitioner's two-part argument recognizes that the proposed modification of Lisogurski's arrangement of ***reflectance*** detectors based on Soller's alleged arc arrangement of detectors 610 in part (2) is predicated on first modifying Soller's ***reference*** detectors 610 to be ***reflectance*** detectors in part (1). Pet., 59-61. Indeed, Petitioner does not argue part (2) without part (1)—i.e., does not argue that Lisogurski's ***reflectance*** detectors would have been arranged based on Soller's arrangement of unmodified ***reference*** detectors 610. Pet., 59-61.

Second, a POSITA would not have been motivated to make the modification in part (2) without first making the modification in part (1)—i.e., would not have arranged Lisogurski's ***reflectance*** detectors based on Soller's arrangement of (unmodified) ***reference*** detectors 610. EX2046, ¶210.

e) Petitioner Does Not Establish Motivation to Implement Soller's Alleged Arc Arrangement in Lisogurski

As explained below, Petitioner's motivation-to-combine argument fails to specifically explain, with supporting evidence, either why or how Soller's alleged arc arrangement of LEDs and detectors would have been implemented in Lisogurski's sensor's LEDs and detectors. *PersonalWeb*, 848 F.3d at 993-94 (finding the Board failed to explain "*how* the combination of the two references was supposed to work" (emphasis in original)); EX2046, ¶¶211-53.

Petitioner asserts that "Lisogurski, combined with Carlson and Soller, renders

… obvious" the claimed arc limitation. Pet., 56-61; EX1003, ¶¶202-12. Petitioner's discussion largely restates Soller and then asserts that the same arrangement could be applied to Lisogurski, without identifying any teaching in Lisogurski suggesting a need for such an arrangement or any recognized design problem in Lisogurski that Soller uniquely solves. Pet., 56-61; EX1003, ¶¶202-12; EX2046, ¶¶211-12; *see Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1359 (Fed. Cir. 2014) (patent challenger "failed to prove … why the … references would have worked together" (cleaned up)); *see also NuVasive*, 842 F.3d at 1381-82 (emphasizing "need for specificity" in "findings on motivation" to combine).

(i) Soller and Lisogurski Are Directed to Fundamentally Different Measurement Problems and Systems

Soller is directed to hematocrit measurement, not oximetry: "[h]ematocrit is the volume percent of red blood cells in a blood sample." EX1030, Abstract, 1:19-20; EX2046, ¶¶214-16. Soller teaches that "[t]he invention provides an optical and mathematical method to measure hematocrit with increased accuracy relative to other methods, e.g., impedance and oximetric methods." EX1030, 5:42-45. It distinguishes its invention from conventional oximetry methods: "[a]ll of the reported optical techniques are variations on oximetric methods where hematocrit is measured using only the concentrations of oxygenated and deoxygenated hemoglobin," typically "using 2 to 4 wavelengths of light in the near-infrared region

of the hemoglobin spectrum." EX1030, 1:36-44; EX2046, ¶215.

Soller emphasizes "a new optical method, which measures blood hematocrit by quantifying a plurality of red blood cell constituents." EX1030, 1:49-51. It relies on "irradiating blood with optical radiation having a selected range of optical wavelengths to produce an optical spectrum" and "processing the optical spectrum with a mathematical model" that explicitly accounts for multiple hemoglobin species and other cellular components. EX1030, 1:52-62, 5:33-42; EX2046, ¶216. Soller teaches "using a larger set of wavelengths for analysis," e.g., "7 or more wavelengths, to record optical spectra of blood," with LEDs that "uniformly span the 500-1100 nm range." EX1030, 5:48-63, 17:31-33; *see also* 6:33-41; EX2046, ¶¶216, 219-220. Soller's mathematical model likewise departs from oximetry's ratio-of-ratios and uses multivariate calibration (e.g., PLS) to relate spectral data across many wavelengths to hematocrit as a single scalar output. EX1030, 6:42-59; 7:18-25; 11:5-8; EX2046, ¶¶218, 221.

Lisogurski, in contrast, describes a conventional pulse oximeter that estimates oxygen saturation by exploiting the absorption differences between oxyhemoglobin and deoxyhemoglobin at two wavelengths: "[r]ed and infrared (IR) wavelengths may be used because it has been observed that highly oxygenated blood will absorb relatively less red light and more IR light than blood with a lower oxygen saturation." EX1027, 4:42-48, 24:58-25:5. Lisogurski explains that "[b]y comparing the

intensities of two wavelengths at different points in the pulse cycle, it is possible to estimate the blood oxygen saturation of hemoglobin in arterial blood," using "two wavelengths of light and a ratio-of-ratios calculation," a conventional, dual-channel approach. EX1027, 4:48-56; 45:6-21; EX2046, ¶¶217-18.

A POSITA would recognize that Soller's multi-wavelength, spectral-modeling hematocrit system is not a modular enhancement to Lisogurski's two-wavelength, ratio-of-ratios oximetry architecture. Rather, the two systems embody different measurement objectives and processing paradigms that are not interchangeable. EX1027, 4:42-56, 45:6-21; EX1030, 5:33-63; EX2046, ¶¶219-22.

Petitioner does not identify any design problem in Lisogurski that would motivate adopting Soller's alleged arc arrangement of LEDs and detectors. Nor does Petitioner show that Soller's alleged geometry solves any limitation or deficiency in the two-wavelength ratio-of-ratios oximetry model. Pet., 56-61; EX1003, ¶¶202-12. Because Lisogurski is purpose-built to compute oxygen saturation from two channels, importing Soller's broader spectral framework and detector layout would require a substantial redesign, including reengineering Lisogurski's light source array with optic cables, significantly increasing the count of the light sources and detectors, and replacing its two-channel ratio-of-ratios processing with a multi-wavelength spectral calibration model to acquire and analyze a much larger dataset. EX2046, ¶¶222-23. The resulting system would no longer measure blood oxygen

saturation using Lisogurski's two-channel ratio-of-ratios approach and would therefore undermine the very principle Lisogurski implements. EX2046, ¶¶222-23; *see Application of Ratti,* 270 F.2d 810, 813 (C.C.P.A. 1959) (holding the suggested combination of references was not obvious because it "would require a substantial reconstruction and redesign of the elements shown in [a prior art reference] as well as a change in the basic principles under which [that prior art reference's] construction was designed to operate").

Contrary to Petitioner's suggestion, combining Soller with Lisogurski would not "improve[]" Lisogurski's dual-wavelength oximetry; it would shift Lisogurski toward an entirely different multi-wavelength spectral-modeling paradigm and would fail to deliver the intended outputs of either system. Pet., 61; EX1027, 4:42-56, 45:6-21; EX1030, 5:33-63, 11:5-8; EX2046, ¶¶222-23; *see In re Fritch*, 972 F.2d 1260, 1265 n.12 (Fed. Cir. 1992) ("A proposed modification [is] inappropriate for an obviousness inquiry when the modification render[s] the prior art reference inoperable for its intended purpose."). Applying Soller's mathematical model and system would not produce the oxygen-saturation output Lisogurski is designed to generate because Soller is calibrated to estimate hematocrit from a broad, multi-wavelength spectrum reflecting multiple blood constituents, not to compute blood oxygen level from the red/IR pulsatile absorption relationship captured by two channels. EX1027, 4:42-56, 45:6-21; EX1030, 5:33-63, 11:5-8. EX2046, ¶¶214-23.

Conversely, applying Lisogurski's ratio-of-ratios calculation would not produce Soller's predicted hematocrit result because the ratio-of-ratios algorithm assumes only two wavelengths selected for oxy- and deoxyhemoglobin discrimination, whereas Soller's hematocrit prediction requires multi-wavelength spectral data calibration across multiple constituents. EX1027, 4:42-56, 45:6-21; EX1030, 5:33-63, 11:5-8; EX2046, ¶¶214-23.

(ii) Petitioner Fails to Show That Soller's Alleged Arc Arrangement Applies to Lisogurski

Petitioner asserts that "a POSITA would have been motivated to modify Lisogurski to include LEDs and detectors configured in one or more arcs, consistent with Soller's teachings that its device is designed to be … 'portable, hand-held, and easily manipulated' with improved accuracy, similar to Lisogurski's goal of increased portability," and that "[b]oth systems are also designed to increase accuracy." Pet., 61, 25-28; EX1003, ¶¶209-10. However, Petitioner's showing is deficient because it does not connect its generalized motivation to the *specific* Soller configuration it seeks to combine, nor does it explain how that configuration would operate in Lisogurski's wearable oximetry system with a reasonable expectation of success. Pet., 61, 25-28; EX2046, ¶¶224-46.

First, Petitioner's assertions of "increased portability" and "increase[d] accuracy" are conclusory and untethered to Soller's actual relied-upon disclosure.

Pet., 61, 25-28. Indeed, the portions of Soller that Petitioner and Dr. Mercier cite for these assertions of motivation do not relate to the Figure 11A embodiment that the Petition relies upon for the arc limitation. Pet., 61 (citing EX1030, 15:50-56, 13:40-49, 15:31-40, 16:33-39), 27 (similar); EX1003, ¶¶209-10 (citing the same); EX2046, ¶¶224-26.

Additionally, some aspects of Soller that the Petition and Dr. Mercier rely on involve fiber optic coupling that is absent from Lisogurski. Pet., 61 (citing EX1030, 16:33-39 for "Soller teaching a 'radial, symmetric pattern' increases 'coupling efficiency' and thereby improves accuracy"); EX1003, ¶¶210 (similar), 202-04 (relying on embodiments specific to fiber optics such as EX1030, 16:6-48 (FIGS. 7-9), 18:18-46 (FIGS. 12A-B) and mentions of "ring-like" and "ring" therein); EX2046, ¶¶227-28. Soller's alleged "ring-like" arrangement solves a fiber optic coupling problem that Lisogurski does not have and is incompatible with Lisogurski's direct-illumination wearable architecture. EX2046, ¶¶228-33; *see Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008) ("knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method").

Soller's fiber optic systems involve LEDs that do not illuminate the sample directly. EX2046, ¶228; EX1030, 3:19-22 ("A fiber optic cable is attached to each

light source" and includes "a delivery fiber for delivering radiation [from the light source] to the sample."); 12:30-31 ("radiation is delivered via an optical delivery cable 80 to a probe 82 positioned in close proximity to the skin 73"), FIG. 9. In the Figure 9 embodiment that Dr. Mercier relies upon, "radiation 122, 122' from the LEDs 104, 104' is focus[ed] by a lens 150 into a fiber optic cable 152," with "an annular fiber housing 156 disposed radially around the fiber optic cable 152." EX1030, 15:57-63, 16:39-48; EX1003, ¶¶202, 204. Thus, the alleged "ring-like" LED arrangement is expressly disclosed as part of a fiber optic coupling architecture in a hematocrit analysis system. EX1030, 15:57-63, 16:39-48. EX2046, ¶¶228-30.

Soller confirms that this geometry maximizes coupling into the fiber: "[t]he component of the light from each LED that is collimated will be focused by the lens into a small spot at the entrance end of cable [152], thereby maximizing the amount of radiation coupled into the fiber optic cable." EX1030, 16:44-48, 15:60-63 ("annular fiber housing…disposed radially around the fiber"); EX2046, ¶230. A POSITA would understand that such LED geometry is inseparable from its fiber delivery scheme and is not a general-purpose illumination geometry for a compact wearable sensor. EX1030, 15:57-63, 16:39-48; EX2046, ¶230; *Panduit*, 810 F.2d at 1568 (reference "must be considered in its entirety, … including portions that would lead away" from the claimed invention).

Soller's fiber pathway likewise defines the illumination "dimension" and

angular distribution at the sample through the fiber geometry, rather than through the LED package itself. EX2046, ¶231. As Soller explains, "radiation … from the LEDs … is focus[ed] by the lens … into a fiber optic cable," making the fiber the effective optical output aperture. EX1030, 15:57-63, 16:39-48. Consistent with this configuration, Soller discloses fiber diameters and spacing that determine the resulting illumination geometry. *See* EX1030, 13:10-12; EX2046, ¶¶231, 238.

Lisogurski, by contrast, discloses a compact wearable pulse oximeter that uses direct illumination and local detection, not fiber delivery. EX2046, ¶234; EX1027, 4:6-11, 4:21-22, FIG. 1, 10:42-11:20. Thus, when the "red and IR light emitters" are driven, "they emit pulses of light at their respective wavelengths into the tissue of a subject," and the detector senses the intensity "after passing through the subject's tissue." EX1027, 12:11-16; 11:9-14; EX2046, ¶235. The only "cable" disclosed in Lisogurski is a communication cable to the monitor, not an optical fiber. EX1027, 18:58-62, 18:16-23; EX2046, ¶236.

Because fiber delivery reduces the illumination aperture to the fiber output and imposes specific angular and spatial distributions, aspects of Soller's coupling physics and geometry are fundamentally different from—and incompatible with—Lisogurski's direct-illumination architecture. EX2046, ¶237. Soller requires focusing into the fiber entrance and mechanical structures "disposed radially around the fiber optic cable." EX1030, 15:57-63, 16:8-21, 16:39-48. Lisogurski's LEDs, on

the other hand, directly "emit pulses of light … into the tissue," with no suggestion of fiber routing or bifurcation. EX1027, Fig. 1, 4:6-11, 10:42-11:20, 12:11-16. A POSITA would recognize that these different illumination paradigms are not interchangeable because they define different optical footprints, coupling efficiencies, and spatial distributions at the tissue. EX1027, 4:6-11, 4:21-22, 12:11-16; EX1030, 15:57-63, 16:39-48; EX2046, ¶237.

Soller explains that "[p]robe fibers … are combined into a single fiber bundle … [and] [l]ight from [the] fiber bundle … illuminates sample," and further specifies that "[t]he spacing between the … illuminating fiber bundle and the outer fiber ring … is preferably 2–4 mm" for a 5 mm probe tip. EX1030, 18:43-46; EX2046, ¶238. This fiber spacing is selected to ensure sampling of blood-rich tissue and to manage noise: a "separation of 1–5 mm … facilitates obtaining adequate depth penetration," while spacing that "is too small" causes most reflected light to originate at the "air/tissue interface," such that "the geometry of the fiber optic probe is likely to be a limiting factor in the noise level." EX1030, 21:20-34 (referencing FIGS. 14A-B); EX2046, ¶239.

Pulse oximetry, by contrast, isolates the pulsatile arterial component mathematically using a conventional dual-wavelength ratio-of-ratios approach and does not depend on fiber-defined sampling geometry. EX1027, 4:42-56, 45:6-21; EX2052, 5; EX2046, ¶240.

Petitioner and Dr. Mercier also rely on aspects of Soller that involve porthole delivery system and coupling. Pet., 61 (citing EX1030, 13:40-49); EX1003, ¶¶202-12 (citing EX1030, 13:13-18, 13:35-63). For this, a mounting plate includes "a series of portholes … positioned above each LED" so that radiation passes through the plate and onto the sample. EX1030, 13:35-49. As with Soller's fiber optic aspects, this arrangement of LEDs is specifically tied to Soller's portholes for hematocrit analysis, in contrast to Lisogurski's use of direct illumination for oximetry. EX1030, 13:13-63; EX2046, ¶¶228, 231-41.

Additionally, Petitioner fails to explain why a POSITA would have chosen an arc arrangement from amongst the wide array of non-arc arrangement options (e.g., linear), let alone the alleged arc arrangement in Soller's FIG. 11A. Pet., 59-61; EX2046, ¶¶242-43; *Virtek Vision*, 97 F.4th at 886-87 (the "mere … exist[ence]" of "possible arrangements" does not mean that a POSITA would have been motivated to use them). For example, Carlson discloses a possible linear two-LED configuration (FIG. 4) and single-detector configuration (FIG. 2). EX1028, ¶¶[0049], [0054]; EX2046, ¶¶242-43. Indeed, Petitioner acknowledges in an IPR for a related patent that "Lisogurski … does not require the LEDs and detectors to be arranged in a particular configuration." EX2060, 70; EX2046, ¶244.

Second, Petitioner argues at a high level that all three references involve optical measurement systems and that Lisogurski's goal of improving SNR would

have motivated a POSITA to look to Soller for accuracy improvements, including "[i]mplementing Soller's … arrangement and number of LEDs and detectors into Lisogurski." Pet., 25-28. But this, at most, supports a general desire to improve performance—not a reasoned basis to adopt Soller's *particular* arc/ring-like configuration (and multi-LED/multi-detector structure) in Lisogurski's specific sensor. Pet., 25-28, 57-61; EX2046, ¶245. Petitioner does not identify any deficiency to be solved in Lisogurski or explain why Soller's solution—for multi-wavelength hematocrit spectral analysis—would improve Lisogurski's dual-wavelength ratio-of-ratios oximeter. Pet., 25-28, 59-61; EX2046, ¶245. Petitioner's motivation is too generalized and amounts to improper hindsight.

Third, Petitioner never explains the implementation details necessary to support a reasonable expectation of success. Pet., 28, 59-61. Petitioner argues the modification "would have been routine" and "not require significant time or cost-intensive changes," but Petitioner does not address what redesign would be required, for example, to (i) add Soller's many-wavelength LED array to Lisogurski's two-wavelength oximetry sensor, (ii) incorporate Soller's multiple detector scheme (including reference detectors), or (iii) reconcile Soller's correction and calibration framework with Lisogurski's time-varying, two-channel oximetry processing. Pet., 25-28, 59-61; EX2046, ¶246. Without this, Petitioner has not shown the modification is routine.

(iii) Petitioner Fails to Show That Soller's Alleged Detectors Would Be Used in Lisogurski

Petitioner relies on Soller—not Lisogurski—to supply the "one or more arcs" required by claim 2, pointing only to the arrangement of "reference" detectors 610 in Figure 11A. Pet., 59-61. Those detectors, however, serve a reference calibration function rather than capture light reflected from the sample as required by the claims as discussed in Sections VI.B.2.a-b above. EX2046, ¶¶247-53.

Soller's reference detectors (which Soller also calls "interior" detectors) do not perform reflectance detection. EX2046, ¶¶248-49. Instead, Soller's reference/interior detectors receive light from the LEDs to measure and account for variations in LED intensity. EX1030, 17:1-5, 17:45-48; EX2046, ¶¶248-49. By contrast, the '455 Patent's independent claim 1 (and thus claim 2 that depends therefrom) requires that the "detection system" comprising the claimed "plurality of detectors" is "configured to receive at least a portion of the lens output light reflected from the tissue." EX1001, 86:54-64, 87:27-31.

Lisogurski contains no separate reference detector and no disclosure of using a spatially arranged reference detector to correct LED intensity variation. EX1027, 10:48-11:27; EX2046, ¶250. Instead, the same detector receives light "after passing through the subject's tissue," with intensity tied to tissue absorbance/reflectance at the measurement wavelengths. EX1027, 11:9-20. Petitioner and Dr. Mercier do not

explain how or why a POSITA would use Soller's reference detector architecture—designed to generate a reference spectrum for hematocrit spectral calibration—in Lisogurski's two wavelength pulse oximetry system, which neither requires nor contemplates such detectors. EX2046, ¶¶251-53.

f) Petitioner Similarly Does Not Show that a POSITA Would Have Been Motivated to Implement's Soller's Alleged Arc Arrangement in Carlson to Meet the Arc Limitation

Petitioner argues that "[a] POSITA would have considered … Lisogurski, Carlson, and Soller together; they are analogous optical measurement systems with common applications and utility," and that "all three describe techniques for improving the performance of wearable, optical devices … used to remotely monitor physiological parameters, including blood oxygen saturation." Pet., 25-26. For the same reasons discussed with respect to Lisogurski, Petitioner and Dr. Mercier do not show that a POSITA would have been motivated to combine Soller's alleged arc arrangement into Carlson. Pet., 25-28; EX1003, ¶¶98-103, 202-12; EX2046, ¶¶254-59.

Carlson is directed to optical pulse oximetry—measurement of pulsation and oxygen saturation using conventional dual wavelength principles that distinguish oxygenated from deoxygenated hemoglobin. EX1028, ¶¶[0002]-[0003]. Soller, by contrast, addresses hematocrit using multi wavelength spectral acquisition and

mathematical modeling of red blood cell constituents. EX1030, Abstract, 1:49-62. A POSITA would recognize that Soller's multi-wavelength spectral-modeling framework is fundamentally different from—and incompatible with—Carlson's dual-wavelength, time-varying oximetry architecture, which mirrors the system implemented in Lisogurski. EX2046, ¶¶255-56. As explained in Section VI.B.2.e.i, the two systems address different measurement objectives and rely on different input data and processing paradigms.

Moreover, as explained in Section VI.B.2.e.ii, aspects of Soller's physical LED arrangement are driven by a fiber optic delivery constraint—focusing collimated LED light into a fiber entrance and organizing components around annular fiber housings—which Carlson does not disclose or require. EX1030, 3:19-22, 12:30-31, 16:44-48; EX2046, ¶257. Carlson teaches compact sensors in which LEDs directly illuminate tissue, with detector placement optimized for ambient light rejection, not fiber coupling. EX1028, ¶¶[0048]-[0052], [0073], FIGS. 1, 2, 10a, 10b. Because Carlson lacks the fiber optic coupling problem, a POSITA would have no reason to import Soller's geometry into Carlson's sensor. EX2046, ¶257.

Finally, Petitioner's reliance on Soller's "reference" (or "interior") detectors to supply an alleged detector arc is misplaced. Those detectors serve a calibration function—monitoring LED output to generate a reference spectrum and correct for LED intensity variation—that Carlson neither discloses nor needs. EX1030, 17:1-5,

17:45-48; EX1028, ¶[0025]; EX2046, ¶258. Petitioner offers no reasoned explanation for including Soller's reference detector architecture in Carlson's pulse oximetry design. Pet., 25-28.

Accordingly, Lisogurski, Carlson, and Soller do not render obvious the arc limitation of claim 2.

3. Dependent Claims 3-4

Claims 3-4 depend from claim 2 and indirectly from independent claim 1. Petitioner's analysis of claims 3-4 does not address the deficiencies discussed above regarding claims 1 or 2. Pet., 61-64. Therefore, Lisogurski, Carlson, and Soller do not render obvious claims 3-4 for at least the same reasons as claims 1 and 2. *Supra*, §§VI.B.1, VI.B.2; EX2046, ¶¶260-62.

4. Independent Claim 8: Lisogurski, Carlson, and Soller Do Not Disclose or Render Obvious the Driver Limitation

Limitation 8[a] of independent claim 8 includes the same driver limitation as limitation 1[a] (i.e., "a light source comprising a driver"); Petitioner relies on its analysis of limitation 1[a] for limitation 8[a], without more. EX1001, 87:62-65, 86:45-49; Pet., 86, 84, 29-33. Therefore, Lisogurski, Carlson, and Soller do not disclose or render obvious limitation 8[a] for at least the same reasons as limitation 1[a]. *Supra*, §VI.B.1; EX2046, ¶¶263-66.

5. Dependent Claim 9: Lisogurski, Carlson, and Soller Do Not Render Obvious the Arc Limitation

Claim 9 depends from independent claim 8. Petitioner's analysis of claim 9 (which relies on Petitioner's analysis of claim 2) does not address the deficiencies discussed above regarding claim 8. Pet., 56-61. Therefore, Lisogurski, Carlson, and Soller do not render obvious claim 9 for at least the same reasons as claim 8. *Supra*, §VI.B.4; EX2046, ¶¶267-69.

Additionally, claim 9 includes the same arc limitation as claim 2 (i.e., "wherein the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs"), and Petitioner relies on its analysis of claim 2 for claim 9. EX1001, 88:40-42, 87:29-31; Pet., 87, 85, 56-61. Therefore, Lisogurski, Carlson, and Soller also do not render obvious claim 9 for at least the same reasons as claim 2. *Supra*, §VI.B.2; EX2046, ¶¶270-72.

6. Dependent Claims 10-11

Claim 10 depends from claim 9 and indirectly from independent claim 8, and Claim 11 depends from independent claim 8. Petitioner's analysis of claims 10 and 11 does not address the deficiencies discussed above regarding claims 8 or 9. Pet., 54-56, 65, 61-64. Therefore, Lisogurski, Carlson, and Soller do not render obvious claims 10 or 11. *Supra*, §§VI.B.4, VI.B.5; EX2046, ¶¶273-78.

7. Independent Claim 15: Lisogurski, Carlson, and Soller Do Not Disclose or Render Obvious the Driver Limitation or Arc Limitation

Limitation 15[a] of independent claim 15 includes the same driver limitation as limitation 1[a] (i.e., "a light source comprising a driver"); Petitioner relies on its analysis of limitation 1[a] for limitation 15[a], without more. EX1001, 89:8-11, 86:45-49; Pet., 88, 84, 29-33. Therefore, Lisogurski, Carlson, and Soller do not disclose or render obvious limitation 15[a] for at least the same reasons as limitation 1[a]. *Supra*, §VI.B.1; EX2046, ¶¶279-82.

Additionally, limitation 15[k] includes the same arc limitation as claim 2 (i.e., "wherein the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs"), and Petitioner relies upon its analysis of claim 2 for limitation 15[k]. EX1001, 90:6-9, 87:29-31; Pet., 89, 85, 56-61. Therefore, Lisogurski, Carlson, and Soller also do not render obvious limitation 15[k] for at least the same reasons as claim 2. *Supra*, §VI.B.2; EX2046, ¶¶283-85.

8. Dependent Claim 16

Claim 16 depends from independent claim 15. Petitioner's analysis of claim 16 (which relies on Petitioner's analysis of claims 1[k]/10 and 4) does not address the deficiencies discussed above regarding claim 15. Pet., 65, 54-56, 63-64. Therefore, Lisogurski, Carlson, and Soller do not render obvious claim 16 for at least the same reasons as claim 15. *Supra*, §VI.B.8; EX2046, ¶¶286-88.

C. Ground 2: Alleged Obviousness Based on Lisogurski, Carlson, Soller, and Tran (Claims 5, 12)

In Ground 2, Petitioner argues that claims 5 and 12 are obvious over Lisogurski in view of Carlson, Soller, and Tran. Pet., 11, 65-71. Claim 5 depends indirectly from claim 2 and independent claim 1, and claim 12 depends indirectly from independent claim 8. Petitioner's analysis of claims 5 and 12 does not address the deficiencies discussed above regarding claims 1-2 or 8 in Ground 1 and does not rely upon Tran to cure those deficiencies. Pet., 68-71. Therefore, Lisogurski, Carlson, Soller, and Tran do not render obvious claims 5 and 12 for at least the same reasons as claims 1-2 and 8, respectively. *Supra*, §§VI.B.1, VI.B.2, VI.B.4; EX2046, ¶¶289-95.

D. Ground 3: Alleged Obviousness Based on Lisogurski, Carlson, Soller, and Valencell-093 (Claim 17)

In Ground 3, Petitioner argues that claim 17 is obvious over Lisogurski in view of Carlson, Soller, and Valencell-093. Pet., 11, 71-76. Claim 17 depends indirectly from independent claim 15. Petitioner's analysis of claim 17 does not address the deficiencies discussed above regarding claim 15 in Ground 1 and does not rely upon Valencell-093 to cure those deficiencies. Pet., 73-76. Therefore, Lisogurski, Carlson, Soller, and Valencell-093 do not render obvious claim 17 for at least the same reasons as claim 15. *Supra*, §VI.B.8; EX2046, ¶¶296-99.

E. Ground 4: Alleged Obviousness Based on Lisogurski, Carlson, Soller, Tran, and Valencell-093 (Claims 6-7, 13-14, 18-20)

In Ground 4, Petitioners argue that claims 6-7, 13-14, and 18-20 are obvious over Lisogurski in view of Carlson, Soller, Tran, and Valencell-093. Pet., 11, 76-82. Claims 6-7 depend indirectly from claim 2 and independent claim 1; claims 13-14 depend indirectly from independent claim 8; and claims 18-20 depend indirectly from independent claim 15. Petitioner's analysis of claims 6-7, 13-14, and 18-20 does not address the deficiencies discussed above regarding claims 1-2, 8, or 15 in Ground 1 and does not rely upon Tran or Valencell-093 to cure those deficiencies. Pet., 77-82. Therefore, Lisogurski, Carlson, Soller, Tran, and Valencell-093 do not render obvious claims 6-7, 13-14, and 18-20 for at least the same reasons as claims 1-2, 8, and 15, respectively. *Supra*, §§VI.B.1, VI.B.2, VI.B.4, VI.B.8; EX2046, ¶¶300-15.

VII. CONCLUSION

For at least the foregoing reasons, the Petition should be denied as to each of the requested grounds. For brevity, Patent Owner may not have addressed all characterizations of the applied references and challenged claims and reserves the right to do so should institution be granted. The absence of a response by Patent Owner to any of positions presented in the Petition or associated expert declaration is not a concession to those positions. The fact that Patent Owner's Preliminary

Response has focused on particular arguments is not a concession that there are no other arguments for patentability of the challenged claims.

Respectfully submitted,

Dated: January 5, 2026 By: /s/ *Jennifer Hayes*

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CERTIFICATION OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing Patent Owner's Preliminary Response is produced using a 14-point Times New Roman font and contains approximately 13,734 words, which is less than the 14,000 total words permitted by the U.S. Patent Trial and Appeal Board rules. Counsel relies on the word count of the computer program used to prepare the response on January 5, 2026.

By: /s/ *Jennifer Hayes*
Lead Counsel for Patent Owner

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing **Patent Owner's Preliminary Response** was served on January 5, 2026, by email:

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