

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WHOOOP, INC.,

Petitioner,

v.

OMNI MEDSCI, INC.,

Patent Owner

U.S. Patent No. 9,651,533

Case No. IPR2025-01583

PATENT OWNER'S PRELIMINARY RESPONSE

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Exhibit No.	Description
2001-2030	Reserved
2031	First Amended Complaint, <i>Omni MedSci, Inc. v. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.) (May 5, 2025)
2032	Complaint, <i>Omni MedSci, Inc. v. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.) (Feb. 3, 2025)
2033	Defendant Whoop, Inc.'s Motion to Stay Pending Inter Partes and Post Grant Review, <i>Omni MedSci, Inc. v. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.) (October 22, 2025)
2034	Scheduling Order, <i>Omni MedSci, Inc. v. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.) (November 10, 2025)
2035	Transcript of Case Scheduling Hearing Conducted on October 24, 2025, <i>Omni MedSci, Inc. v. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.).
2036-2039	Reserved
2040	Complaint, <i>Cheetah Omni, LLC V. Whoop, Inc.</i> , 6:23-cv-478 (W.D. Tex.) (June 30, 2023)
2041	Reserved
2042	Plaintiff's Answering Brief in Opposition to Defendant's Motion To Stay Pending Inter Partes and Post Grant Review, <i>Omni Medsci, Inc. v. Whoop, Inc.</i> , No. 1:25-Cv-00140 (D. Del.) (November 5, 2025)
2043	Docket Navigator Statistics for United States Circuit Judge William C. Bryson, Pre-Institution Stay Requests
2044	Defendant's Answer to First Amended Complaint for Patent Infringement, <i>Omni Medsci, Inc. V. Whoop, Inc.</i> , No. 1:25-cv-00140 (D. Del.) (Sept. 29, 2025)
2045	Reserved
2046	Declaration of Prof. Igor Efimov, Ph.D.
2047	<i>Curriculum vitae</i> of Prof. Igor Efimov, Ph.D.

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2048	Reserved
2049	Joint Claim Construction and Prehearing Statement, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Nov. 21, 2025)
2050-2058	Reserved
2059	Declaration of Igor Efimov (Exhibit 2031), Samsung Elecs. Co. et al. v. Omni MedSci, Inc., IPR2025-01250 (PTAB Nov. 6, 2025)

Omni MedSci, Inc. ("Patent Owner") submits this Preliminary Response under 37 C.F.R. § 42.107 to the Petition for *Inter Partes* Review ("Petition") of U.S. Patent No. 9,651,533 ("the '533 Patent"), filed by Whoop, Inc. ("Petitioner").

I. INTRODUCTION

The Director should deny institution because the Petition fails to show a reasonable likelihood of prevailing on any challenged claim. In Ground 1, the Petition misplaces the "comparing signals at different optical wavelengths" operation in Lisogurski and conflates optical pre-detector filtering "in front of" detectors with post-detection electronic conditioning inside Lisogurski's front-end circuitry. In Ground 2, the Petition's reliance on Walker's transillumination design and optional "20–50 nm" statement does not disclose, let alone motivate, the narrower "20–40 nm" bandwidth in the reflectance-mode wearable that Lisogurski teaches. In Ground 3, Tam's own description shows that LED-only sources with tens-of-nanometers bandwidths cannot deliver accurate multi-species measurements without ratiometric calculations or tightly controlled optics; the Petition imports neither, so its proposed substitution would degrade performance in Lisogurski's device rather than predictably improve it. Petitioner's collateral estoppel narrative does not alter these outcomes because the prior proceedings did not adjudicate the distinct limitations of claims 11, 12, 14, and 18, nor did they decide where within Lisogurski's architecture the claim 12 comparison must occur to satisfy the

“generated in part by” language.

II. OVERVIEW OF THE '533 PATENT

The '533 Patent discloses systems for non-invasive physiological measurements. EX1001, 8:29-34, 3:66-4:32; EX2046, ¶¶56-59. The '533 Patent describes using spectroscopy to inspect a bodily sample “by comparing different features, such as wavelength (or frequency), spatial location, transmission, absorption, reflectivity, scattering, fluorescence, refractive index, or opacity.” EX1001, 8:29-34; EX2046, ¶¶56-59.

An exemplary physiological measurement system is depicted in Figure 24:

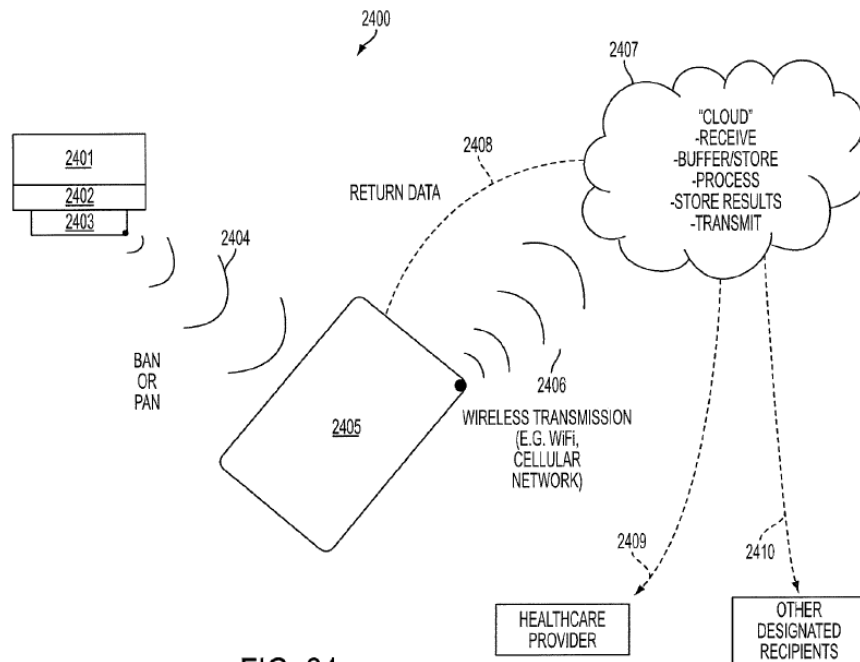


FIG. 24

EX1001, FIG. 24

EX2046, ¶¶56-59. The system includes a wearable measurement device 2401, a personal device 2405, and a cloud server 2407. EX1001, 26:49-27:20; EX2046, ¶¶56-59.

The wearable measurement device includes a light source which includes light emitting diodes (“LEDs”) that emit light of particular wavelengths and a detection system for detecting the light. EX1001, 19:23-30, 10:18-22; EX2046, ¶¶56-59. The specification teaches that there are at least two types of LEDs: (1) those that “emit a wavelength band that is ... between about 20 nm to 40 nm” and (2) “so-called super-luminescent LEDs that may even emit over a much wider wavelength range.” EX1001, 20:2-9; EX2046, ¶¶56-59.

Additionally, filters may be used in front of one or more detectors in the detection system to select the wavelengths of light to be detected. EX1001, 17:50-54; EX2046, ¶¶56-59. The detection system generates a signal in response to the detected light, which may be generated by comparing signals at different wavelengths of light. EX1001, 5:18-21, 8:29-34; EX2046, ¶¶56-59. The signal-to-noise ratio of the signal may be improved by the wearable measurement device via the various techniques disclosed in the '533 Patent. EX1001, 16:54-17:6; EX2046, ¶¶56-59. This results in an improvement of the accuracy of the physiological measurements, despite interference from spectral artifacts. EX1001, 3:59-4:32; EX2046, ¶¶56-59.

III. LEVEL OF SKILL IN THE ART

Petitioner proposes the following definition for a POSITA in relation to the '533 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. EX1003 ¶ 25. The POSITA would have an undergraduate degree in engineering (electrical, mechanical, biomedical, or optical) or a related field of study, along with relevant experience studying or developing physiological monitoring devices (e.g., non-invasive optical biosensors) in industry or academia. *Id.* Lack of professional experience can be remedied by additional education, and vice versa. *Id.*”

Petition, 13. For purposes of this Preliminary Response, Patent Owner adopts Petitioner's proposed level of skill in the art. Patent Owner reserves the right to propose a differing level of skill should the Board institute an IPR.

IV. SUMMARY OF REFERENCES IN THE PETITION

Petitioner challenges claims 6, 11, 12, 14, and 18 of the '533 Patent as allegedly obvious in Grounds 1-3, which involve various combinations of the following references: Lisogurski, Carlson, Walker, and Tam. Petition, 11.

A. Lisogurski (EX1027) (Grounds 1, 2, and 3)

Lisogurski describes a non-invasive system for measuring parameters related to a subject's blood. EX1027, 3:61-4:5; EX2046, ¶¶84-85. The system is illustrated in Figures 3 and 1:

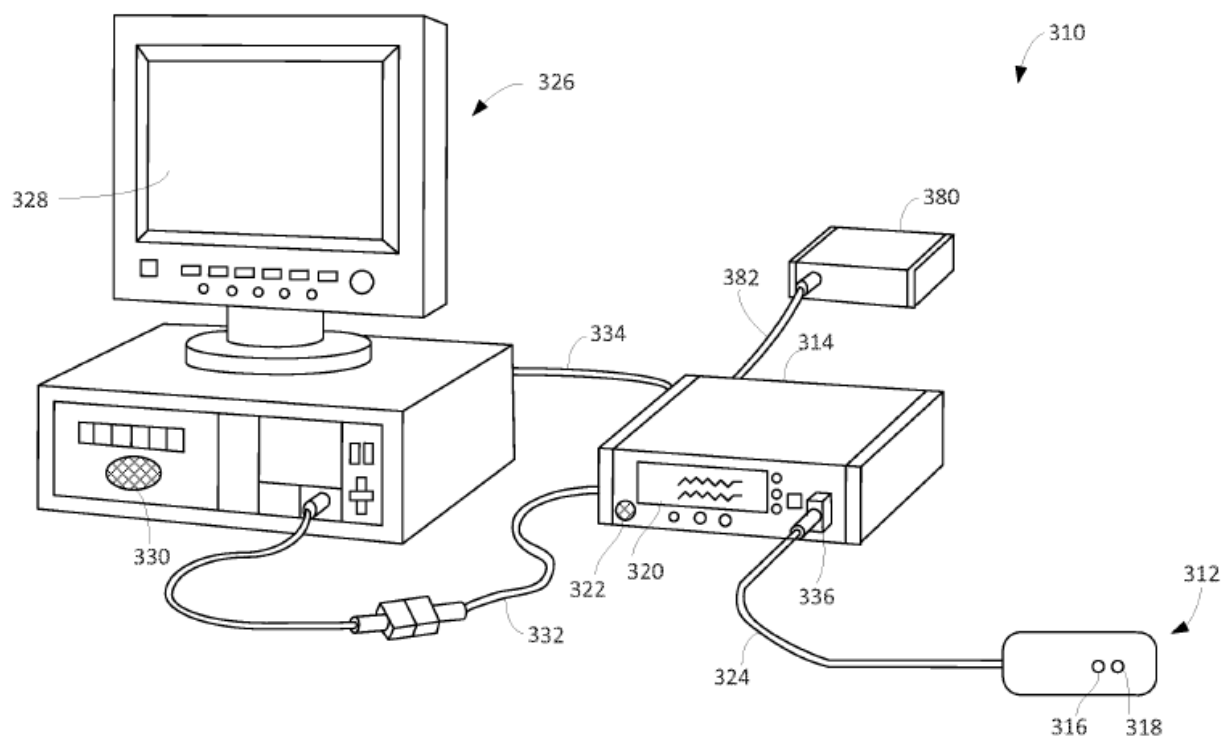


FIG. 3

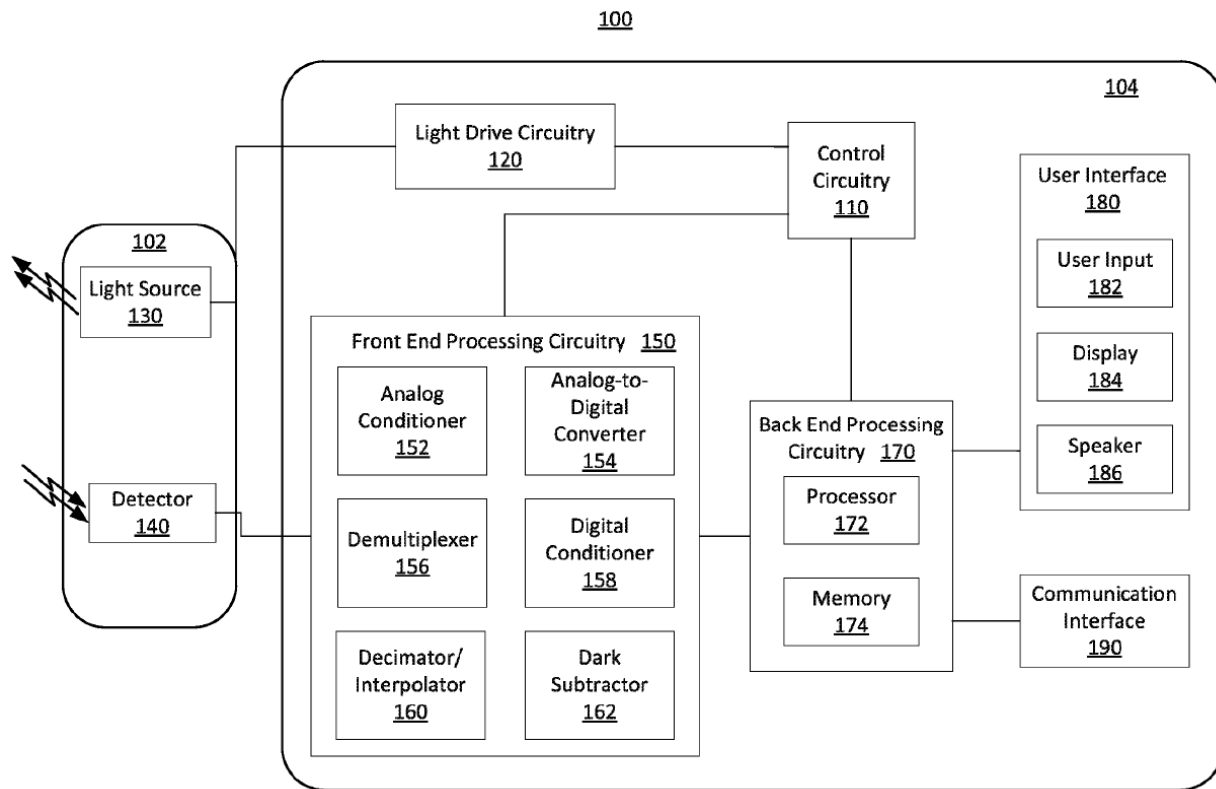


FIG. 1

EX1027, FIGS. 3, 1; EX2046, ¶¶84-85. 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, ¶¶84-85. 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, ¶¶84-85. Front end processing circuitry 150 processes that signal. EX1027, 12:42-49; EX2046, ¶¶84-85. 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, ¶¶84-85. The system compares the signals to determine parameters such as blood oxygen saturation. EX1027, 24:58-25:5; EX2046, ¶¶84-85.

B. Carlson (EX1028) (Grounds 1, 2, and 3)

Carlson describes a non-invasive optical pulse oximeter. EX1028, ¶[0002]; EX2046, ¶¶86-87. The oximeter is designed to be clipped onto a user's ear. EX1028, ¶¶[0048]-[0049]; EX2046, ¶¶86-87. This is illustrated in Figures 1 and 2:

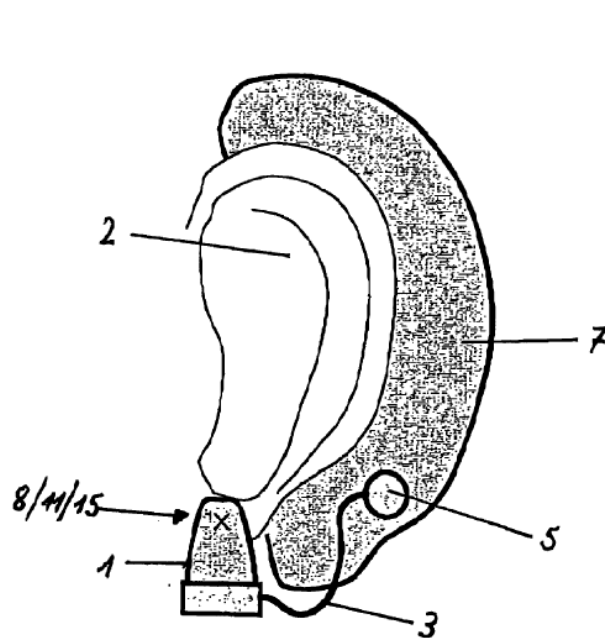


Figure 1

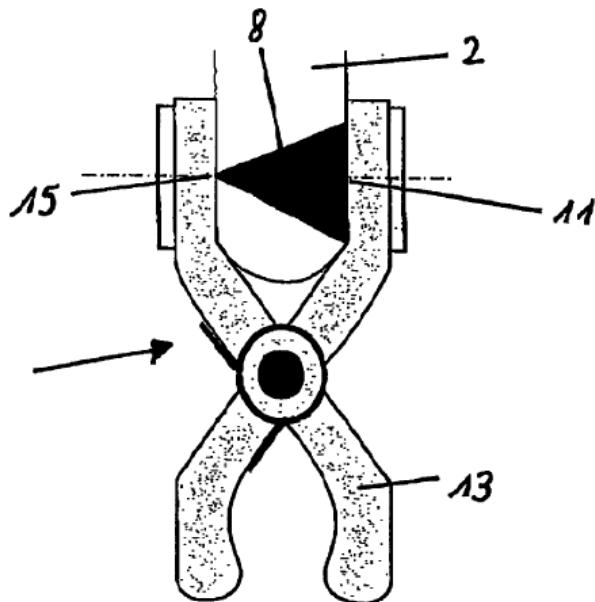


Figure 2

EX1028, FIGS. 1-2; EX2046, ¶¶86-87. 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, ¶¶86-87. 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, ¶¶86-87.

C. Walker (EX1044) (Ground 2)

Walker describes a pulse oximeter sensor assembly configured to fasten to a patient via a pierced or pierceable site—such as an earlobe, finger- or toe-webbing, or other tissue—using a self-piercing post and cooperating retention hardware, thereby enabling transillumination measurements at nontraditional locations. EX1044, 1:8-11; EX2046, ¶88.

Walker's assembly comprises a flexible sensor substrate carrying a light source and a detector, an earring-style post that can either create a new piercing or be inserted through an existing one, and a grommet that captures the post after passage through tissue to maintain alignment for optical transmission. EX1044, 2:8-15, EX2046, ¶88. Walker performs pulse oximetry in a transillumination mode by driving light through the pierced tissue and detecting the transmitted signal to assess arterial oxygen saturation. EX1044, 3:5-12, EX2046, ¶88.

D. Tam (EX1046) (Ground 3)

Tam describes a co-oximeter which includes LEDs emitting light directed to

a blood sample in order to measure and analyze its hemoglobin derivatives. EX1046, 1:48-65; EX2046, ¶89. The LEDs emit light with bandwidths between 7 to 100 nm. EX1046, 13:45-52; EX2046, ¶89. The light travels through the blood sample and is absorbed by photodetectors for analysis. EX1046, 13:2-5; EX2046, ¶89. The co-oximeter's processor then analyzes the detected light to determine information about the blood sample. EX1046, 11:22-41; EX2046, ¶89. Tam describes a portable device, "generally enabled to be portable by three design characteristics," including (1) using small optical components that do not require tight controls; (2) performing the measurement on whole blood; and (3) using ratiometric calculations." EX1046, 13:19-25.

V. CLAIM CONSTRUCTION

Petitioner contends that "[t]he only construction that is relevant to the Challenged Claims in this Petition is 'beam'" and "[t]o the extent the Board finds it necessary to reach the construction of beam to resolve the issues below, 'beam' should be construed to 'refer to photons or light transmitted to a particular location in space.'" Petition, 11; EX1003, ¶44. Patent Owner agrees 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 Petitioners propose.

A. Prior Constructions by the Board and in the Texas Case

As noted in the Petition, the Board construed the following terms in the prior IPR concerning the '533 Patent:

Term/Phrase	Board's Construction
personal device	a computer or microprocessor-based device having a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor, and a touch screen (EX1008, 10)
a light source comprising a plurality of semiconductor sources that are light emitting diodes ... configured to increase signal-to-noise ratio by ... increasing a pulse rate of at least one of the plurality of semiconductor sources	a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes is capable of having its pulse rate increased to increase a signal-to-noise ratio (EX1008, 10-12)

In the Texas case, the parties have proposed the following construction for the

term “one or more filters” in claim 11 of the '533 Patent (EX2049):

Patent Owner's Construction	Texas Case Defendants' Construction
Plain and ordinary meaning	“one or more physical components or coatings configured in the device to selectively pass light of a particular wavelength or range(s) of wavelengths”

The same term also appears in claim 18 of the '533 Patent, which is not asserted in the Texas Case. EX1001, 32:20-24; EX2049.

An agreed construction was proposed for the term “personal device” in claim 5 of the '533 Patent in the Texas Case which is the same as the construction of the Board in the prior IPR of the '533 Patent. EX2049. The same phrase also appears in claim 13 of the '533 Patent. EX1001, 30:46-31:20.

An agreed construction was proposed for the term “beam” in claim 12 of the '533 Patent in the Texas Case which is “photons or light transmitted to a particular location in space.” EX2049. The same phrase also appears in claims 5 and 13 of the '533 Patent. EX1001, 29:43-30:10; 30:46-31:20.

The Board does not need to resolve any claim construction disputes to deny institution. For claims 11 and 18, Petitioner fails under either construction of “one or more filters.” Under the plain and ordinary meaning, the claims require filters

positioned “in front of” detectors. EX1001, 30:38-41; 32:20-24. Lisogurski's digitizers, filters, decimators, and interpolators are electronic signal processing components, not optical filters that are placed in front of a detector. *See infra*, §VI.B.2. The same is true even under the construction proposed by the Defendants in the Texas Case, which requires “one or more physical components or coatings configured in the device to selectively pass light of a particular wavelength or range(s) of wavelengths.” For claims 6, 12, and 14, no terms require construction to deny institution. *See infra*, §§VI.B.1 (claim 12), VI.C (claims 6 and 14), VI.D (claims 6 and 14).

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 '533 Patent is unpatentable for any of the three grounds in the Petition.

A. Ground 1: Lisogurski and Carlson (Claims 11, 12, and 18)

In Ground 1, Petitioner argues that claims 11, 12, and 18 are obvious over Lisogurski and Carlson. *See* Petition, 27-45. Petitioner failed to meet its burden for Ground 1 for at least four reasons.

First, as detailed below, collateral estoppel does not apply to claim 12.

Second, as detailed below, Petitioner fails to show that the alleged output signal in Lisogurski is “generated in part by comparing signals at different optical

wavelengths” as required by claim 12. EX1001, 30:42-45. Petitioner maps the claimed “output signal” to the processed output from Lisogurski’s front-end processing circuitry 150. Petition, 42 (citing EX1027, 11:9-27, 11:41-46, 12:42-45, 17:39-42, Fig. 1, Fig. 3). Petitioner then separately maps the “comparing signals at different optical wavelengths” to Lisogurski’s “ratio-of-ratios” calculation. Petition, 42-43 (citing EX1027, 4:52-56). But these mappings are inconsistent. Lisogurski’s front-end processing circuitry 150 generates its output *before* back-end processing circuitry 170 performs the cross-wavelength comparison. EX1027, 12:42-45 (“[F]ront end processing circuitry 150 may receive a detection signal from detector 140 and provide one or more processed signals to back end processing circuitry 170.”). The front-end circuitry conditions, digitizes, demultiplexes, and decimates signals—none of which involves comparing signals at different wavelengths. EX1027, 12:42-14:55. Only later does back-end processor 172 perform the cross-wavelength comparison that Petitioner relies on. EX1027, 14:56-64. Petitioner did not meet its burden because the alleged “output signal” is generated before—not “by”—comparing signals at different optical wavelengths.

Third, as detailed below, Petitioner fails to meet its burden for claims 11 and 18 because Lisogurski does not teach optical filters in front of detectors. Claims 11 and 18 require “one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths.” EX1001, 30:38-41, 32:20-23.

Petitioner points to Lisogurski's disclosure that detected signals "may be processed by processing equipment including, for example, digitizers, **filters**, decimators, interpolators." Petition, 34-35 (citing EX1027 38:59-39:8). But these are electronic signal-processing filters, not optical filters positioned "in front of" detectors. EX1027, 38:59-39:8. Petitioner identifies no optical filter in Lisogurski, let alone one positioned in front of a detector.

Fourth, Petitioner does not provide motivation to combine Carlson's optical filter with Lisogurski, as detailed below. Petitioner offers no reason why a POSITA would incorporate Carlson's ear-clip sensor (Figure 6C), which uses a "double pass filter 33" in front of a photodetector, into Lisogurski's system. Petition, 35-39 (citing EX1028, ¶[0062], Fig. 6C). Lisogurski already addresses SNR (signal-to-noise ratio) and ambient light interference electronically—through source modulation, dark subtraction, and front-end conditioning. Petition, 27-33, 41-44; EX1027, 4:42-56; 6:7-31; 12:42-49; 13:13-20; 13:31-14:10; 14:46-55; 14:60-64; EX1028, ¶¶[0062]-[0063]; EX1003 ¶¶105-07, 118-25, 127-32; EX2046 ¶¶86-93, 112-16, 121-29.

1. Petitioner Failed to Meet its Burden for Claim 12

Independent claim 5 of the '533 Patent recites "a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal. EX1001, 29:59-62.

Claim 12 requires that “the output optical beam comprises a plurality of optical wavelengths” and that “the output signal is generated in part by comparing signals at different optical wavelengths.” EX1001, 30:43-45.

As set forth below, Petitioner failed to meet its burden because (1) collateral estoppel does not apply and (2) the alleged comparison of different optical wavelengths in Lisogurski occurs after the alleged generation of an output signal.

a) Collateral Estoppel Does Not Apply

Petitioner argues that Patent Owner “is collaterally estopped from challenging the unpatentability of claim 12 and motivation to combine Lisogurski and Carlson” because claim 12 “is essentially identical to the claims found unpatentable by the Board in the prior ‘533 IPR.” Petition, 25-26; *see also id.*, 41-42. Petitioner is incorrect: claim 12 is patentably distinct from the claims in the prior ‘533 IPR.

It is well-settled that collateral estoppel does not apply when “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) (explaining that whether collateral estoppel applies to dependent claims turns on whether they “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) (finding collateral estoppel inapplicable where an earlier decision did not address a different limitation from the challenged patent). Petitioner baldly asserts that “claim 12 consists of limitations the Board found unpatentable in the prior IPRs” without showing the alleged correspondence or explaining why there are no material differences. Petition, 26. Petitioner's argument should be rejected for this reason alone.

Petitioner's collateral estoppel arguments also repeatedly mischaracterize the Board's findings in the prior IPRs and ignore differences between the claims in the prior IPR and challenged claim 12.

With respect to claim 12's requirement that “the output optical beam comprises a plurality of optical wavelengths,” Petitioner argues that “the Board has already held ... that Lisogurski teaches an output optical beam with ‘one or more’ (i.e., a ‘plurality of’ optical wavelengths).” Petition, 41 (citing EX1008, 25 (referencing claim 13)). This is wrong. In the prior IPR, the Board addressed a claim that merely required “one or more optical wavelengths.” EX1008, 25. The portion of the prior FWD quoted in the Petition references claim 13's language of “one or more optical wavelengths.” Petition, 25 (citing EX1008, 25). The Board's finding that Lisogurski meets a different claim that only requires one optical wavelength is not a finding that Lisogurski discloses a plurality of optical wavelengths as required by claim 12.

Similarly, Petitioner's argument that "the Board has already held ... Lisogurski teaches 'a receiver configured to...generate an output signal'" (Petition, 42 (citing EX1008, 37-39)). The cited portion of the prior decision merely found that Lisogurski teaches "a receiver configured to...generate an output signal" and did not address the comparison recited in claim 12. EX1008, 37-39. The Petition ignores that in contrast to claim 13, the "output signal" in claim 12 is generated based on a different "optical beam" and by comparing at least two signals at different wavelengths. EX1001, 30:42-45 (claim 12: "wherein the ***output optical beam*** comprises a plurality of optical wavelengths, and the ***output signal*** is generated in part by *comparing signals at different optical wavelengths*"), 30:64-31:3 (claim 13).

And even if the Board had found that Lisogurski teaches an optical beam with two or more wavelengths, such a finding would have no collateral estoppel effect because it would not be essential to a judgment for a claim that did not require two or more wavelengths. *BioDelivery Sciences Int'l, Inc. v. Monosol RX, LLC*, IPR2015-00168, Paper 74 at 5-7 (PTAB Sep. 26, 2016) (finding issue preclusion did not apply because the earlier decision did not address language of the later-challenged claim and therefore "resolution of the issue central to this case was not essential to the final judgement in the [prior Board] decision"); *see also* Restatement (Second) of Judgments § 27, cmt. H ("If issues are determined but the judgment is not dependent upon the determinations, relitigation of those issues in a subsequent

action between the parties is not precluded. Such determinations have the characteristics of dicta ...”).

Petitioner also argues that “the Board has already held that Lisogurski teaches the receiver’s output signal is generated in part by comparing the first and second signals (which, as discussed above, are signals generated at different optical wavelengths).” Petition, 42 (citing EX1008, 46 (referencing claims 9 and 17)). But this ignores the differences in claim language. Claims 9 and 17, which were addressed in the prior IPR, required “the receiver’s output signal to be generated in part by comparing the first and second signals.” EX1001, 30:31-32, 32:18-19. Claims 8 and 16 specified that the first signal is from a first LED and the second signal is from a second LED. EX1001, 30:24-30, 32:10-17. By contrast, claim 12 recites that the optical beam has at least two different wavelengths and comparing signals at different optical wavelengths is not the same as comparing a first and second signal. EX1001, 30:42-45. Indeed, Petitioner makes alternative arguments that do not rely on the prior FWD in an attempt to address this requirement. Petition, 42-43.

As another example, Petitioner argues that “the Board has already held that Lisogurski teaches the receiver’s output signal is generated in part by comparing the first and second signals (which, as discussed above, are signals generated at different optical wavelengths).” Petition, 42 (citing EX1008, 46). Once again, Petitioner

ignores the differences between claim 17, which was at issue in the prior IPR, and claim 12. Claim 17 depends from claim 16, which recites “a first signal from the first light emitting diode and a second signal from the second light emitting diode.” EX1001, 32:18-20. Unlike claim 12, claims 16 and 17 do not specify that the first and second signals are different optical wavelengths. EX1001, 32:10-20. Indeed, claim 13, from which claims 16-17 depend, merely requires “one or more wavelengths.” EX1001, 30:46-31:20. Accordingly, even if the Board found that Lisogurski compares signals at different wavelengths, such a finding was not “essential” to the prior FWD because the claims at issue in the FWD did not require comparing at least two different wavelengths. *See BioDelivery*, IPR2015-00168, Paper 74 at 5-7 (finding collateral estoppel did not apply based on differences in claim scope).

The differences in claim language between claim 12 and the previously addressed claims presents a new issue that was not litigated in the prior IPR. Because claim 12 expressly requires that output signal is generated in part “by comparing signals at different optical wavelengths,” Petitioner relies on Lisogurski’s description of comparing wavelengths of two different intensities. Petition, 41-43 (citing EX1027, 4:42-56). This is inconsistent with Petitioner’s reliance on the signal generated by front-end processing circuitry as the claimed “output signal” since the alleged comparison in Lisogurski happens *after* the alleged output signal is

generated. *Infra*, §VI.B.1.b. In other words, Petitioner's theory for how Lisogurski meets the narrower requirements of claim 12 presents a new issue regarding timing that was not litigated in the prior IPR such that collateral estoppel does not apply. *See Ohio Willow*, 735 F.3d at 1342 (explaining it is "the identity of the issues that were litigated that determines whether collateral estoppel should apply").

Petitioner's reliance on *Samsung Elecs. Co., Ltd. v. Netlist, Inc.*, IPR2025-00002, Paper 17 (PTAB May 17, 2025) is misplaced because in that case, the Board preliminarily found that the patent owner was collaterally estopped from challenging the grounds in the Petition because the claims were not patentably distinct from claims that were found unpatentable in a related patent. Petition, 26. This case is distinguishable because even if Petitioner's contentions regarding collateral estoppel were correct (they are not), collateral estoppel is not case dispositive for the '533 Patent because Petitioner limits its argument to claim 12. Petition, 26, 41 (only arguing that Patent Owner is estopped as to claim 12). Further, in *Netlist*, the petitioner mapped the limitations in the challenged claims to limitations in the invalidated claims and cited the FWDs addressing those limitations. *Netlist*, IPR2025-00002, Paper 17 at 23. As discussed above, Petitioner failed to do this for claim 12.

Petitioner's other cited cases are distinguishable. *See* Petition, 26-27. In *Google LLC v. Hammond Dev. Int'l, Inc.*, collateral estoppel applied because "[t]he

only difference between the claims [in the two patents] is the language describing the number of application servers.” 54 F.4th 1377, 1381 (Fed. Cir. 2022). In *Ohio Willow Wood Co. v. Alps S., LLC*, collateral estoppel applied because the claims “use slightly different language ... to describe substantially the same invention.” 735 F.3d 1333, 1342 (Fed. Cir. 2013). In *Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt., LLC*, collateral estoppel applied because “the additional limitation” in the challenged claim did “not materially alter the question of the validity.” 778 F.3d 1311, 1319 (Fed. Cir. 2015).

Petitioner also argues that Patent Owner “is collaterally estopped from challenging ... motivation to combine Lisogurski and Carlson.” Petition, 26, 30 (citing FWDs in prior '533 IPR and '484 IPR). Petitioner cites no authority for this assertion. *Id.* The fact that the Board found that a POSITA would combine Lisogurski and Carlson to arrive at the inventions in different claims does not mean that a POSITA would combine them to meet the requirements of these challenged claims, which as discussed above, have material differences relative to the prior claims.

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

b) Lisogurski Alleged Signal Comparison Occurs After the Alleged Output Signal is Generated

Petitioner's arguments on the merits fail. In the prior IPR, the Board stated that "[t]he receiver [of Lisogurski] generates an output signal because front end processing circuitry 150 'receive[s] a detection signal from detector 140 and provide[s] one or more processed signals to back end processing circuitry 170.'" EX1008, 39. The Board identified the alleged "output signal" on a modified version of FIG. 1:

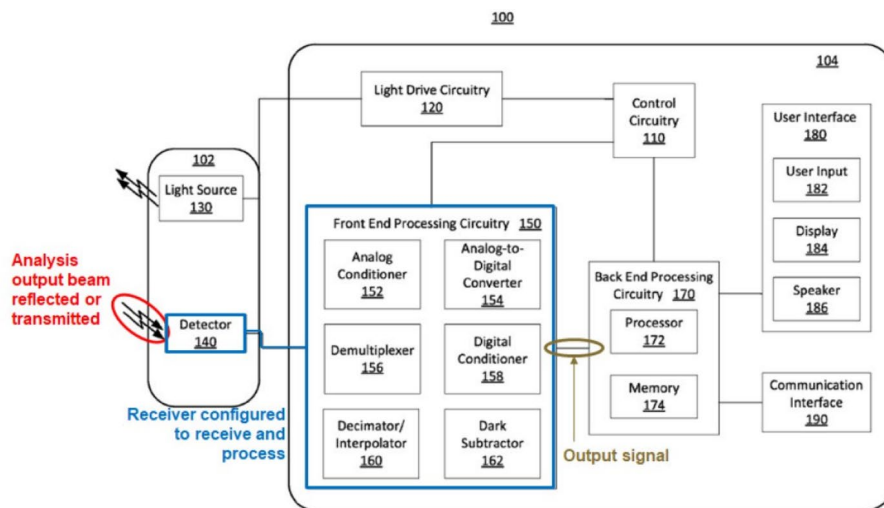


FIG. 1

EX1008, 38 (annotating EX1027, FIG. 1)

The alleged "output signal" in Lisogurski, as identified by the Board in the prior IPR, is generated by front end processing circuitry 150 and sent to the back end processing circuitry 170." EX1008, 38-39.

To address claim 12's requirement that the output signal is generated in part by comparing signals at different wavelengths, Petitioner relies on Lisogurski's

description of “comparing the intensities of two wavelengths at different points in the pulse cycle ... to estimate” saturation. Petition, 41-43; EX1027, 4:42-56. But Petitioner omits that this comparison in Lisogurski occurs within back-end processing 170 *after* front-end processing has produced the “processed” output that the Board relied on as the “output signal” in the prior IPR. EX1027, 12:42-49; 14:60-64.

In Lisogurski, the processor 172 receives the “processed signal” (alleged output signal) *after* it has already been generated by the detector 140 and front end processing circuitry 150. EX1027, 12:42-49; 14:60-64. This is depicted in the modified version of Figure 1 from Lisogurski, which has been annotated (green) to show the direction the “processed signal” travels to reach the processor 172:

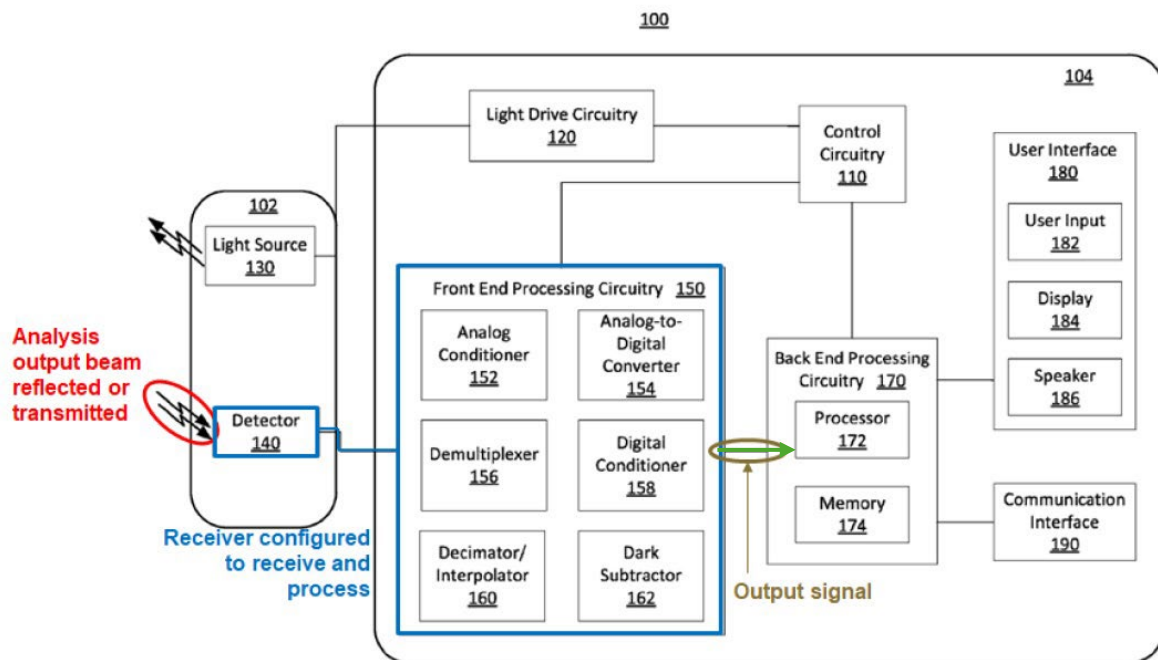


FIG. 1

EX1008, 38 (annotating EX1027, FIG. 1)

Lisogurski then “compar[es] the intensities of two wavelengths” in the back end processing circuitry 170 (which includes the processor 172). EX1027, 4:48-51. The “[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. One such physiological parameter is “blood oxygen saturation.” EX1027, 1:22-25. Thus, the processor 172 receives output signals and then compares them to determine blood oxygen saturation. EX1027, FIG. 1, 1:22-25, 14:60-64.

By contrast, claim 12 requires that the “processed signal” of Lisogurski be “generated in part by comparing signals at different optical wavelengths.” EX1001, cl. 12, EX2046 ¶¶67, 94-99. In other words, in the claim, the comparing occurs as part of generating the output signal. Lisogurski’s “processed signals” (alleged “output signals”), on the other hand, are not “generated in part by comparing signals at different optical wavelengths” because that comparison occurs after the alleged “processed signal” is already generated. EX2046, ¶¶92-103. Accordingly, Petitioner has not shown how Lisogurski’s alleged “processed signal” is generated by comparing signals at different optical wavelengths as required in claim 12. *3shape a/s v. Align Tech., Inc.*, IPR2021-01241, Paper 16 at 15-16 (PTAB Jan. 26, 2022) (finding Petitioner did not show that reference disclosed claim element where the

temporal relationship identified in the reference was the reverse of that required by the claim).

2. Petitioner Failed to Meet its Burden for Claims 11 and 18

a) Collateral Estoppel Does Not Apply

Petitioner does not argue that collateral estoppel applies to claims 11 and 18, which were not addressed in the prior '533 IPR or '484 IPR. Petitioner does not cite the previous FWD (EX1008) for claim 11 and claim 18's "one or more filters ... to select a fraction of the one or more optical wavelengths" element (Petition, 32-40; Petition, 43-45). These dependent-claim limitations were not adjudicated in the prior '533 IPR or '484 IPR.

Petitioner has not shown collateral estoppel should apply to the motivation to combine Lisogurski and Carlson with respect to claims 11 and 18 and collateral estoppel should not be applied. *See supra*, §VI.A.1.a.

Accordingly, collateral estoppel does not apply to claims 11 and 18.

b) A POSITA would not have combined Lisogurski and Carlson

Claims 11 and 18 require optical "filters in front of...detectors," *i.e.*, optical elements physically positioned before the detector to spectrally select incoming light. EX1001, 30:38-41; 32:20-23; EX2046, ¶57. Petitioner points to "filters" in Lisogurski's front-end processing, but those filters are electronic conditioning blocks that act on the detector's electrical signal and do not meet "in front of"

requirement in claims 11 and 18. Petition, 34-35. To fill that gap, Petitioner imports Carlson's ear-clip double-pass wavelength filter and packaging (Fig. 6C) but, as set forth below, does not show how, or why, that optical assembly would be implemented "in front of" the detector in Lisogurski's compact reflectance receiver.

Petitioner first points to Lisogurski's description of "filters" in its processing chain, but those passages concern post-detection electronic filtering of the detector's electrical output, not pre-detector optical filtration as the claims require (the cited passage lists "digitizers, filters, decimators, [and] interpolators" as processing equipment acting on the detected electrical signal). Petition, 32-35; EX1027, 38:59-39:8; EX2046, ¶¶112-13. A POSITA would understand that these "filters" are signal-processing blocks within front-end circuitry 150 rather than physical optical elements placed before detector 140 within the mapped receiver path. EX1027, 11:9-27; 12:42-49; 13:13-20; 13:31-14:10; 14:46-55; EX2046, ¶¶112-16.

Given this deficiency in Lisogurski, Petitioner turns to Carlson. Petition, 35-40. Petitioner relies on Carlson's "preferred embodiment" ear-clip geometry, which places a double-pass wavelength filter ahead of a photodetector and combines it with baffles and lenses. Petition, 39-40 (citing EX1028, [0062]-[0063], Figure 6C). But Carlson's Figure 6C depicts a fully integrated optical assembly with two LEDs 15, beam-shaping lenses 21, a double-pass filter 33 transmitting only approximately 660 nm and 890 nm, circumferential baffles 37 that trap stray light, and a photodetecting

element 35 downstream. *Id.* Petitioner does not show where or how this optical assembly would be implemented “in front of” Lisogurski’s detector without redesigning Lisogurski’s compact reflectance receiver. EX2046, ¶¶104-22.

Petitioner has not shown motivation to combine. Petitioner argues a POSITA would have been motivated to add Carlson’s optical filter assembly to Lisogurski because Carlson teaches this configuration can increase SNR “by a factor of 50 to 1000.” Petition, 39-40 (citing EX1028, ¶¶[0062]-[0063]). This argument ignores that Lisogurski already addresses ambient/background interference and noise through multiple, device-specific solutions at the circuit level: synchronized drive-cycle modulation with dark-period subtraction; LED brightness adjustments; optional constant-output mode; and passive/active analog/digital conditioning in the front-end chain. EX1027, 6:7-31; 9:46-60; 12:42-49; 13:13-20; 13:31-14:10; 14:46-55; EX2046, ¶¶104-22. Given this architecture, adding Carlson’s pre-detector optical filter would be a redundant relocation of functionality that supplies no identified, non-hindsight benefit in reflectance-mode operation. EX2046, ¶111. Petitioner does not articulate any architecture-specific performance gain from physically moving spectral selection “in front of” the detector where Lisogurski already neutralizes ambient/background electronically. EX2046, ¶110.

Predictable results are not shown where Lisogurski already neutralizes ambient/background interference and noise; stacking Carlson’s pre-detector optics

does not present a reasoned path to improved SNR in this device and therefore fails to provide predictable results. Dr. Mercier's assertions that this relocation would have been "routine," yielded "predictable results," or reflected a "natural design process" are *ipse dixit* that do not engage Lisogurski's on-point electronic mitigations that already address ambient/background and SNR without pre-detector optics. EX1003, ¶¶103-07. The record instead shows synchronized drive-cycle modulation, dark-period subtraction, LED brightness control, and front-end conditioning as the reasoned solutions in the architecture of Lisogurski, leaving no benefit to stack Carlson's optical filter "in front of" the detector. EX1027, 6:7-31; 9:46-60; 12:42-49; 13:13-20; 13:31-14:10; 14:46-55; EX2046, ¶¶104-22.

Petitioner conflates and oversimplifies the two different problems described in Lisogurski and Carlson—the problems described in Lisogurski would not be addressed by Carlson's filter teachings. Petition, 27-30, *see also id.* 50-52; EX2046, ¶121. As a result, a POSITA would not have been motivated to combine Lisogurski and Carlson. *Nichia Corp. v. Everlight Americas, Inc.*, 855 F.3d 1328, 1339 (Fed. Cir. 2017) (finding "no motivation to modify Nitta in light of Waitl...[because] the references disclose different structures, resolve dissimilar problems, and propose dissimilar solutions"). With respect to Carlson, a POSITA would have understood that it describes a desire to *limit* the light received by a detector *to a particular range of wavelengths*, which Carlson accomplishes with a "[wavelength] filter[]." EX1028,

¶¶[0059], [0062], [0063] (explaining that a wavelength filter only transmits “light in the range of approximately 660 nm and in the range of approximately 890 nm”); *see also id.* ¶[0038], FIG. 5C; EX2046, ¶119.

With respect to Lisogurski, however, a POSITA would have understood that it describes a desire to *remove background noise* (e.g., based on ambient light) from the detection signal *across a range of wavelengths*, with no discussion regarding limiting the received light to a particular range of wavelengths to begin with, as in Carlson. EX1027, 6:7-31 (“The system may measure the ambient light detected by the detector during the ‘dark’ period and then subtract this ambient contribution from the signals received during the ... ‘on’ periods”—i.e., as further explained at 13:60-14:10, “determine a subtraction amount from the dark signal portion of the detection signal and subtract it from the peak portion of the detection signal ... to reduce the effect of the dark signal on the peak” and “generate adjusted Red and IR signals”), 14:46-55 (reducing the effect of ambient light on the detection signal), 12:42-49, 11:9-27; EX2046, ¶120.

As depicted in the annotated figures below, a POSITA would have understood that Carlson addresses excluding light (blue) outside of a *particular range of wavelengths* (red), whereas Lisogurski addresses adjusting the detected signal *across a range of wavelengths* (red) by removing a portion of the detected signal

attributable to background/ambient noise (green). EX1027, 6:7-31; EX1028, ¶[0062]; EX2046, ¶113.

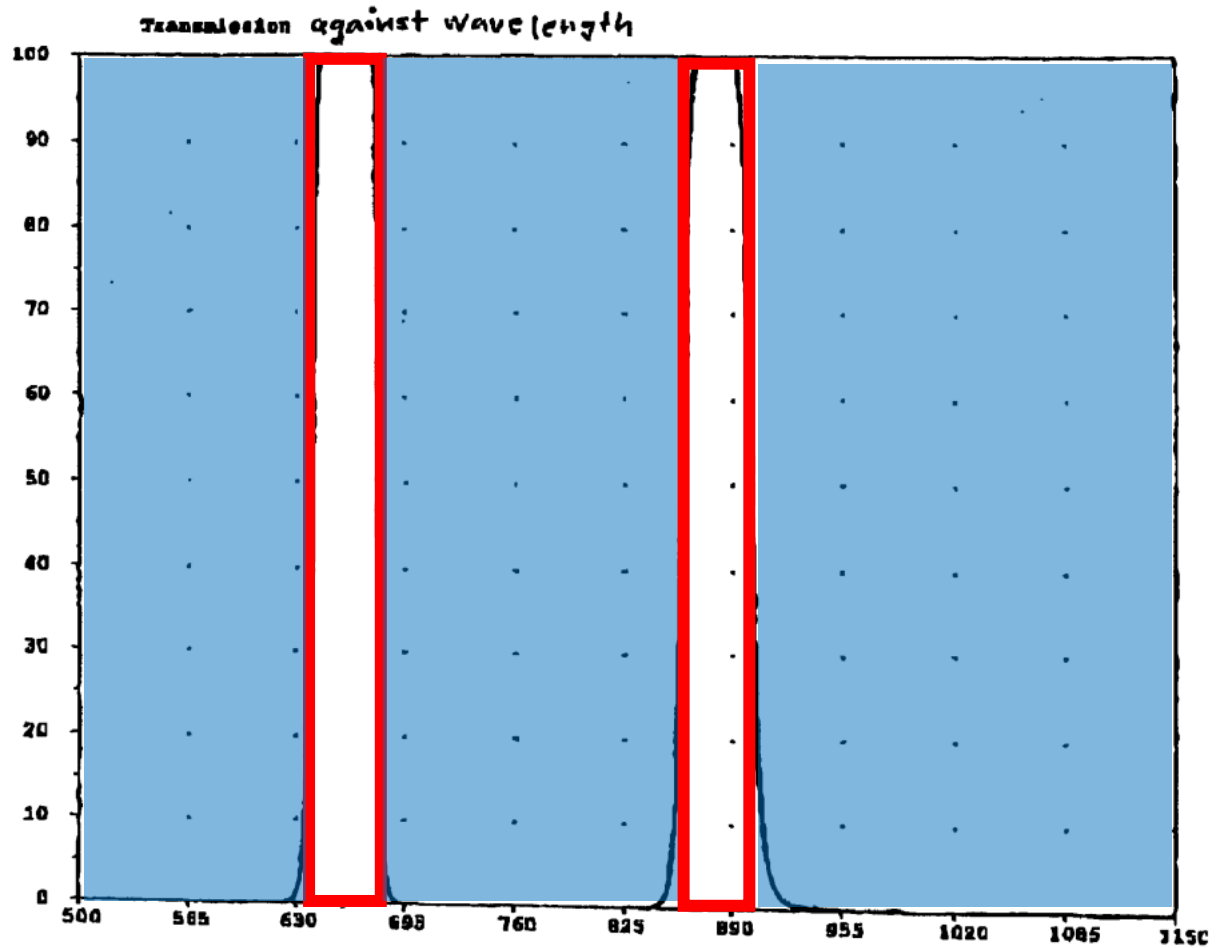


Figure 5c

EX1028, FIG. 5C (annotated); *see also id.*, ¶¶[0038], [0056].

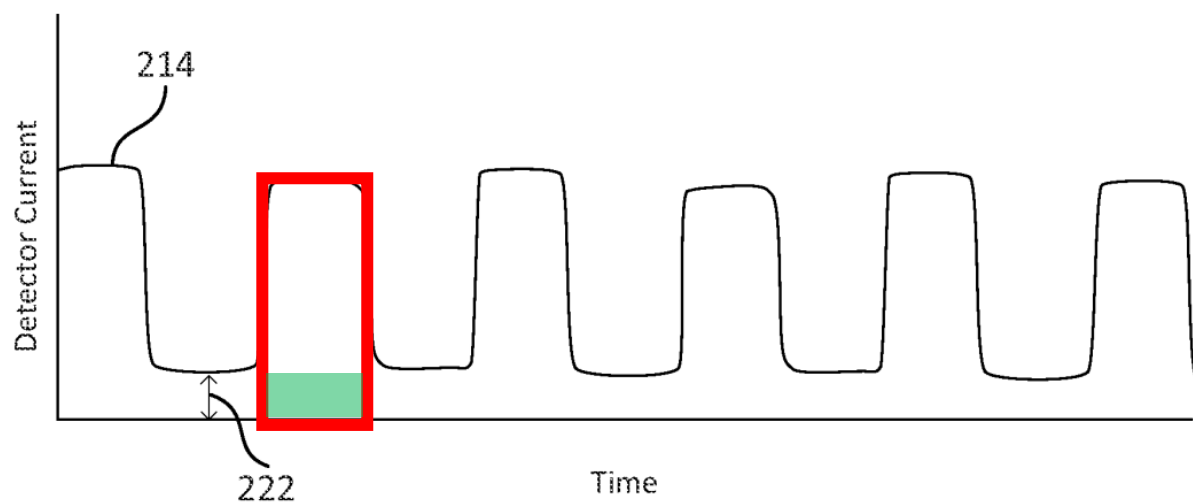


FIG. 2B

EX1027, FIG. 2B (annotated); *see also id.*, 2:17-19, 12:42-13:6, 13:60-14:10.

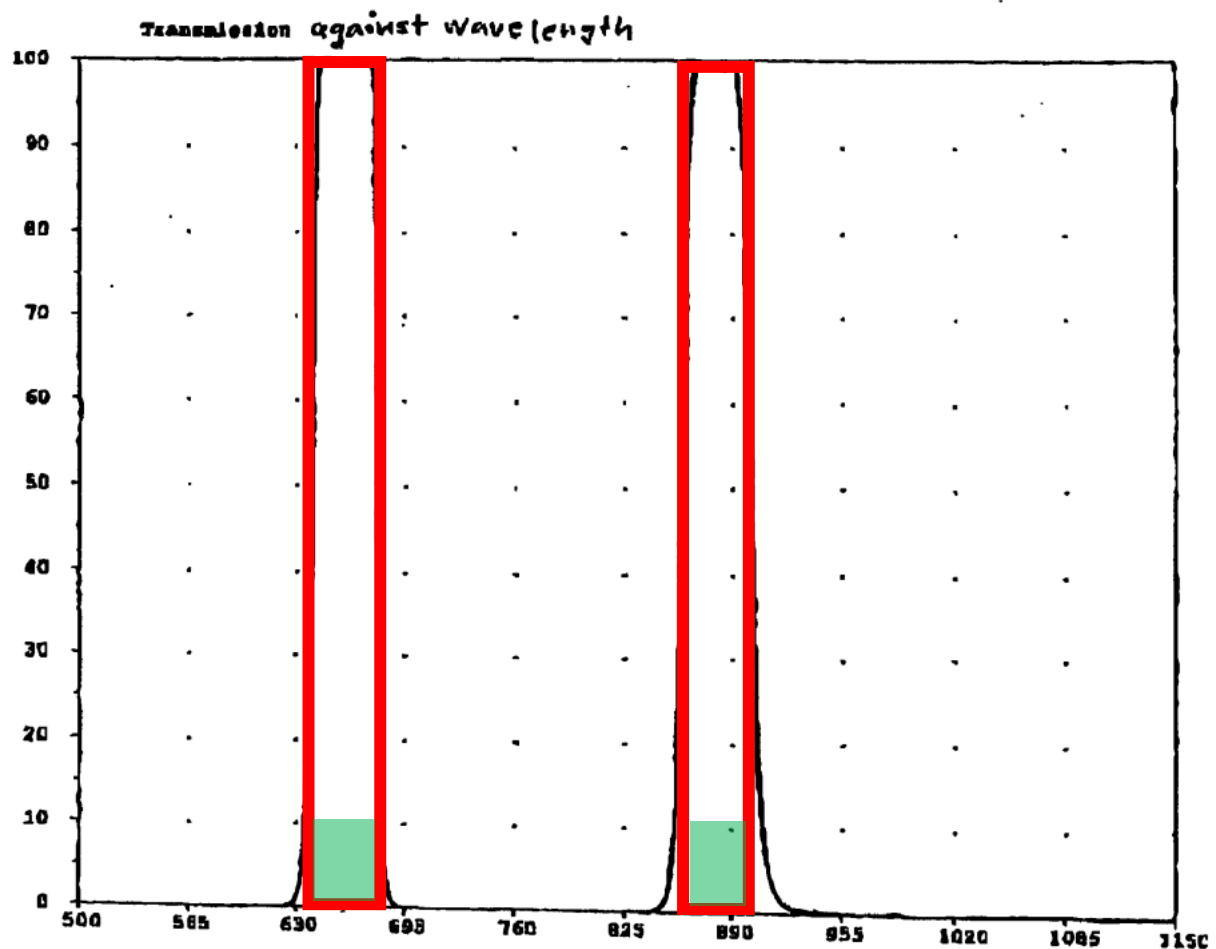


Figure 5c

EX1028, FIG. 5C (annotated).

A POSITA would have understood that Carlson's optical wavelength filter would not address the problem described in Lisogurski because Carlson's filter can only limit the detected light to a particular range of wavelengths and cannot remove the background noise detected across that range of wavelengths. EX1028, ¶¶[0026], [0062]; EX1027, 6:7-31; EX2046, ¶¶121-22. Thus, a POSITA reviewing Lisogurski would have recognized that Carlson's optical wavelength filter would be redundant

and unnecessary and therefore would have no motivation to combine Lisogurski and Carlson. EX2046, ¶¶121-22; *South-Tek Sys., LLC v. Engineered Corrosion Sols., LLC*, 748 F. 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 F. App'x 840, 843 (Fed. Cir. 2020) (finding the Board “d[id] not explain why a [POSITA] 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) (“Because each device independently operates effectively, a [POSITA], who was merely seeking to create a better device ..., would have no reason to combine the features of both devices into a single device”).

Instead, a POSITA would have relied on Lisogurski's electronic signal processing techniques for removing such background noise. *See* EX1027, 6:7-31 (disclosing “a technique to remove ambient and background signals,” i.e., Lisogurski's dark subtraction process), 14:46-55 (disclosing that “filtering or signal modification techniques may be employed to reduce the effect of ambient light,” referring to Lisogurski's teachings of filtering or signal modification, for example, by components 152, 156, 158, 160, and 162 disclosed at 13:13-20, 13:31-14:10), 12:42-49 (disclosing that Lisogurski's “[f]ront end processing circuitry 150 may perform various analog and digital processing of the detector signal”); EX2046, ¶¶104-22. Lisogurski discloses a “drive cycle modulation technique” (EX1027, 6:7-

31) with a dark subtractor (*id.*, 13:60-14:10), increasing the LED brightness (*id.*, 9:46-57), changing to a “constant light output” (*id.*, 9:57-60), and “passive or active filtering or signal modification techniques” (*id.*, 14:46-55).

With the “drive cycle modulation technique,” the system “may measure the ambient light detected by the detector during the ‘dark’ period and then subtract this ambient contribution from the signals received during the first and second ‘on’ periods.” EX1027, 11:16-19. The dark subtractor “determine[s] a subtraction amount from the dark signal portion of the detection signal and subtract[s] it from the peak portion of the detection signal in order to reduce the effect of the dark signal on the peak.” EX1027, 13:63-65; FIG. 2A. As another example, Lisogurski teaches that increasing the LED brightness reduces noise because “the system may require increased signal amplitudes to differentiate between fiducial and other points of interest related to physiological parameters and those related to noise or motion.” EX1027, 9:50-57.

Lisogurski's system can “change from a modulated light output to a constant light output in response to noise, patient motion, or ambient light.” EX1027, 9:57-60. In addition, “passive or active filtering or signal modification techniques may be employed to reduce the effect of ambient light on the detection signal that is applied to analog-to-digital converter 154, and thereby reduce the contribution of the noise component to the converted digital signal.” EX1027, 14:51-55.

A POSITA would have understood that these techniques would be used together—*i.e.*, (1) measuring the detected light when the LEDs are “on,” including the red or infrared light emitted from the LEDs as well as any light outside of the red and infrared ranges of wavelengths, (2) measuring the detected light when the LEDs are “off,” which again includes any light outside of the red and infrared ranges of wavelengths, and (3) subtracting the second measurement from the first measurement, which retains only the information from the red and infrared ranges of wavelengths and effectively excludes any light outside of those ranges. *See* EX1027, 10:48-64, 12:23-27; 6:7-31; EX2046, ¶¶104-22. In other words, Lisogurski discloses a method for limiting the detected light to a particular range of wavelengths (the problem described in Carlson) but without relying on the optical wavelength filter of Carlson. EX2046, ¶¶104-22.

Accordingly, Petitioner fails to meet its burden for Ground 1.

B. Ground 2: Lisogurski, Carlson, and Walker (Claims 6 and 14)

In Ground 2, Petitioner argues that dependent claims 6 and 14 are obvious over Lisogurski, Carlson, and Walker. Petition, 45. Claims 6 and 14 recite “light with a bandwidth between [approximately] 20 nanometers to [approximately] 40 nanometers.” EX1001, 30:11-13; 31:21-24. Petitioner concedes that Lisogurski and Carlson do not disclose this feature and rely on Walker for allegedly teaching the claimed range. Petition, 45-48.

Petitioner does not argue that collateral estoppel applies to claims 6 and 14, which were not addressed in the prior '533 IPR or '484 IPR. For example, Petitioner does not cite the previous FWD (EX1008) for claim 6 and claim 14's "emits light with a bandwidth between 20 nanometers to 40 nanometers" element (Petition, 45-57). These dependent-claim limitations were not adjudicated in the prior '533 IPR or '484 IPR.

As set forth below, Petitioner failed to meet its burden for Ground 2 because Walker does not disclose the claimed range and Petitioner does not argue, let alone show, that it would have been obvious to modify Walker to meet the claimed range. Moreover, even if Walker did disclose the claimed range, Petitioner failed to show that a POSITA would have been motivated to combine Walker with Lisogurski and Carlson.

1. Walker Does Not Disclose the Claimed Bandwidth Range

Walker does not disclose the claimed 20-40 nm bandwidth range. EX2046, ¶¶127-29. Instead, Walker states that "the light source 20 may emit light having a bandwidth in the range of 20 to **50 nm**." EX1044, 2:8-27; 2:57-3:12. The claimed bandwidth range (20 nm to 40 nm) is narrower than the bandwidth range described in Walker. EX2046, ¶¶ 128-29.

A broader prior art range does not anticipate a narrower claimed range. *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999 (Fed. Cir. 2006) ("*Titanium*

Metals stands for the proposition that an earlier species reference anticipates a later genus claim, not that an earlier genus anticipates a narrower species.”). Even where a broader range mathematically encompasses a narrower range, “the inquiry does not end there.” *OSRAM Sylvania, Inc. v. Am. Induction Techs., Inc.*, 701 F.3d 698, 706 (Fed. Cir. 2012) (rejecting “the conclusory claim that less than 0.5 torr necessarily falls within “approximately 1 torr or less” as a matter of fact”). The Federal Circuit has emphasized that “[h]ow one of ordinary skill in the art would understand the scope of the disclosure or, stated differently, how one of ordinary skill in the art would understand the relative size of a genus or species in a particular technology is of critical importance.” *Id.*; see also *UCB, Inc. v. Actavis Lab'ys UT, Inc.*, 65 F.4th 679, 687 (Fed. Cir. 2023) (“the prior art anticipates the claimed range ‘only [] if it describes the claimed range with sufficient specificity such that a reasonable fact finder could conclude that there is no reasonable difference in how the invention operates over the ranges,’ internal citations omitted).

The Board has applied this framework to deny institution where, as here, Petitioner relies on a broader prior art range to anticipate a narrower claimed range that is not described with “sufficient specificity.” *Moses Lake Indus., Inc., v. Enthone, Inc.*, IPR2014-00246, Paper 6 at 15 (PTAB Jun. 18, 2014). In *Moses*, the Board explained that although the petitioner’s expert “acknowledge[d] the difference” between the ranges, the expert did “not indicate how [prior art] counsels

for the narrower range.” *Id.*

The same is true here: Dr. Mercier's assertion that “[b]ecause a bandwidth of 20 to 40 nm falls within the range of 20 to 50 nm, a POSITA would have understood Walker to teach or render obvious an LED emitting light with a bandwidth of 20–40 nm” is conclusory. EX1003, ¶139; *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15-17 (PTAB Aug. 24, 2022) (precedential) (testimony restating “the petitioner's arguments without any additional supporting evidence or reasoning” is accorded “little weight”); 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”). Petitioner and Dr. Mercier do not even attempt to show that the 20 to 50 nm range in Walker counsel for the narrower range required by claims 6 and 14.

2. Petitioner Has Not Shown that the Claimed Range is Obvious

Even if Petitioner had argued that it would have been obvious to narrow the 20-50 nm bandwidth range described in Walker to the claimed 20-40 nm bandwidth range (which Petitioner did not), Petitioner presents no evidence that such a modification would have been obvious. Petition, 48-49 (citing EX1003 ¶¶138-39, 143-44).

A POSITA would understand that narrowing bandwidth involves tradeoffs,

like increased cost and complexity and potentially increased size, which is counter to the purported portability advantage of Lisogurski. EX2046, ¶¶127-29. Narrowing the bandwidth range involves multiple tradeoffs that Petitioner does not acknowledge or address. EX2046, ¶¶127-29. First, narrower bandwidth LEDs were more expensive, and in some cases, “significantly more expensive.” EX2046, ¶129. Petitioner’s own reference, Tam, confirms that LEDs with “tighter bandwidths” come “at a premium price.” EX1046, 9:61-62. Second, narrower bandwidth LEDs are more complex because achieving a tighter bandwidth “often requires additional components like filters that increase component count and the size of the device.” EX2046, ¶129. A POSITA would recognize that increased size directly undermines Lisogurski’s goal of a portable device. *Id.* Third, narrowing bandwidth presents further tradeoffs in terms of power budget, thermal headroom, and optical loss. *Id.* Petitioner identifies no reason why a POSITA would have accepted these tradeoffs to narrow Walker’s 20-50 nm range to the claimed 20-40 nm range. Petition, 47-50.

Under Federal Circuit precedent, “the benefits, both lost and gained, should be weighed against one another” in an obviousness analysis. *Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000); *see also Arctic Cat Inc. v. Bombardier Recreational Products Inc.*, 876 F.3d 1350, 1360 (Fed. Cir. 2017) (“Evidence suggesting reasons to combine cannot be viewed in a vacuum apart from evidence suggesting reasons not to combine”). Thus, even if Petitioner proposed

narrowing Walker's range to meet the claimed range (it did not), its failure to acknowledge or address the drawbacks associated with such a modification and failure to identify any benefit associated with such a modification are fatal.

3. A POSITA Would Not Have Combined Walker with Lisogurski and Carlson

Even if, *arguendo*, Walker disclosed the claimed bandwidth range, Petitioner failed to show that a POSITA would have been motivated to combine Walker with Lisogurski and Carlson.

In the "Motivation to Combine" section of the Petition, Petitioner argues that "[a] POSITA would have considered the systems taught by Lisogurski and Carlson together with Walker, as all three are analogous art directed to pulse oximeters and mobile, medical monitoring systems." Petition, 47. But the mere fact that Lisogurski, Carlson, and Walker are analogous and discuss related technology, standing alone, does not supply a motivation to combine them to arrive at the claimed inventions. *Johns Manville Corp., v. Knauf Insulation, Inc.*, IPR2018-00827, Paper 9 at 10 (PTAB Oct. 16, 2018) (showing "that a reference is analogous art or relevant to the field of endeavor of the challenged patent is not sufficient to establish that one of ordinary skill would have had reason to combine its teachings with other prior art in the manner set forth in the claim."); *Securus Techs., Inc. v. Glob. Tel*Link Corp.*, 701 F. App'x 971, 977 (Fed. Cir. 2017) ("[A] broad characterization of [prior art] as

both falling within the same alleged field... without more, is not enough for Securus to meet its burden of presenting a sufficient rationale to support an obviousness conclusion...such short-cut logic would lead to the conclusion that any and all combinations of elements known in this broad field would automatically be obvious, without the need for any further analysis”).

In the same section, Petitioner does not specifically explain what “teachings of Walker” would allegedly be implemented in Lisogurski. Petition, 47; EX2046, ¶¶131-33. And while Petitioner refers to “an improved wearable sensor” and “miniaturized medical monitoring systems,” it fails to explain how modifying Lisogurski with Walker would lead to an “improved” system or result in a “miniaturized” system. *Id.* Similarly, Petitioner refers to “increasing the accuracy, portability, and versatility of a wearable optical sensor,” but does not allege, let alone show, that modifying Lisogurski with Walker would result in increased accuracy, portability, or versatility. Petition, 48.

In the “Analysis of Ground 2” section, Petitioner argues that a “POSITA would have been motivated to implement the light emitting diodes from Walker into the sensor unit of Lisogurski” as this would result in “an improved wearable sensor that can be worn by a patient for continuously monitoring blood oxygen with increased accuracy.” Petition, 49. Petitioner, however, fails to explain *how* implementing Walker’s LEDs into Lisogurski would result in improved wearable

device or improved accuracy. *Id.*

To the extent Walker discusses “versatility,” continuous monitoring, and “increased accuracy,” Walker attributes those benefits to its ability to pierce body parts or attach to existing piercings, not to choosing a 20–40 nm LED bandwidth. Petition, 45-49; EX1044, 1:48-2:28; 4:18-37; EX2046, ¶134. As Dr. Efimov further explains, Walker’s transillumination through pierced tissue is not a proxy for reflectance on intact skin, and a POSITA would not expect that LED specifications optimized for transillumination through pierced tissue would be directly applicable to reflectance measurements on intact skin. EX2046, ¶¶136-40. Nor does Petitioner tie narrowing to 20–40 nm to any identified limitation or noise source in Lisogurski’s device, which already improves SNR with drive cycle modulation, dark subtraction, LED brightness control, and front end analog/digital conditioning without adding bandwidth constraints (the specification describes measuring ambient light during “dark” periods and subtracting it from “on” periods, and lists front end elements 152, 156, 158, 160, and 162 providing analog and digital conditioning of the detector signal). EX1027, 6:7-31; 9:46-60; 12:42-49; 13:13-20; 13:31-14:10; 14:46-55; EX2046, ¶¶111, 118, 121.

Walker’s disclosure that its light source “may emit...20 to 50 nm” leaves open the full range, and Petitioner does not explain why a POSITA would select 20–40 nm over 50 nm or wider in a battery powered reflectance wearable like Lisogurski’s

where spectral narrowing can trade off against power budget, thermal headroom, optical loss, and sourcing/cost. EX1044, 2:57-3:4; EX2046, ¶¶141. As Dr. Efimov explains, Petitioner's assertion that narrowing would "increase accuracy" is unsupported here because accuracy depends on many factors including signal processing algorithms, sensor placement, and ambient light rejection—which Lisogurski already addresses without narrowing LED bandwidth to 20–40 nm. EX1027, 6:7-31; 12:42-49; 14:46-55; EX2046, ¶¶135.

Dr. Mercier's characterization of the Walker combination as "routine," "straightforward," and yielding "predictable results" repeats conclusory phrases without identifying a reflectance-specific problem that narrowing to 20–40 nm would solve or evidence that LED bandwidth is a result-effective variable in Lisogurski. EX1003, ¶¶111, 138-44. This is legally insufficient. The Federal Circuit has held that "[a]bsent some articulated rationale, a finding that a combination of prior art would have been 'common sense' or 'intuitive' is no different than merely stating the combination 'would have been obvious.'" *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017); *see also In re Stepan Co.*, 868 F.3d 1342, 1346 (Fed. Cir. 2017) ("Missing from the Board's analysis is an explanation as to *why* it would have been routine optimization to arrive at the claimed invention.")

Moreover, "routine design choice" would only apply where there is "a finite, and in the context of the art, small or easily traversed, number of options." *Ortho-*

McNeil Pharm., Inc. v. Mylan Lab'ys, Inc., 520 F.3d 1358, 1364 (Fed. Cir. 2008).

Petitioner has not shown this to be the case. The prior art discloses a wide array of LED bandwidth options: Walker discloses 20-50 nm (EX1044, 3:3-4), and Tam discloses 12-35 nm in the visible range and 30-50 nm in the red to near infrared range (EX1046, 14:42-47). Given the breadth of bandwidth options, Petitioner has not established that selecting the specific 20-40 nm range was “routine.” *See Leo Pharm. Prods., Ltd. v. Rea*, 726 F.3d 1346, 1356 (Fed. Cir. 2013) (“[T]he breadth of these choices and the numerous combinations indicate that these disclosures would not have rendered the claimed invention obvious to try”).

C. Ground 3: Lisogurski, Carlson, and Tam (Claims 6 and 14)

In Ground 3, Petitioner argues that claims 6 and 14 of the '533 Patent are obvious over Lisogurski in view of Carlson and Tam. *See* Petition, 50-57. Similar to Ground 2, Petitioner concedes that Lisogurski and Carlson fail to disclose the claimed “bandwidth between [approximately] 20 nanometers to [approximately] 40 nanometers” relies on Tam for this limitation. *Id.*, 52-57; EX1001, 30:11-13; 31:21-24.¹ As discussed below, Petitioner failed to meet its burden for Ground 3 because

¹ As discussed above, Petitioner does not argue that collateral estoppel applies to claims 6 and 14. *Supra*, §VI.B.

Petitioner failed to show that a POSITA would have combined Tam with Lisogurski and Carlson.

Regarding motivation to combine, Petitioner first argues that “[a] POSITA would have considered the systems taught by Lisogurski and Carlson together with Tam, as all three are analogous art directed to pulse oximeters and mobile, medical monitoring systems.” Petition, 51. But the mere fact that Lisogurski, Carlson, and Tam are analogous art and discussed related technology, standing alone, does not supply a motivation to combine them to arrive at the claimed inventions. *Johns Manville*, IPR2018-00827, Paper 9 at 10 (showing “that a reference is analogous art or relevant to the field of endeavor of the challenged patent is not sufficient”); *Securus Techs.*, 701 F. App'x at 977 (“[A] broad characterization of [prior art] as both falling within the same alleged field... without more, is not enough for Securus to meet its burden of presenting a sufficient rationale to support an obviousness conclusion”). Moreover, the fact that one *could* combine aspects of Tam with Lisogurski does not mean one *would* do so. *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068-69 (Fed. Cir. 2018) (holding that it is error to focus “on what a skilled artisan would have been able to do, rather than what a skilled artisan would have been motivated to do”); *see also InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014).

Petitioner next argues that “[a] POSITA looking to improve the system in Lisogurski would therefore have been motivated to consider the teachings of Tam, which discusses an improved miniaturized sensor that offers increased portability.” Petition, 51. Petitioner fails to explain why a POSITA would “look[] to improve the system in Lisogurski,” in what way(s) a POSITA would want to “improve” Lisogurski, or how Tam’s teachings would allegedly improve Lisogurski. EX2046, ¶¶139-51. Similarly, Petitioner argues that “[i]ncorporating the teachings of Tam into the sensor unit in Lisogurski” would have been routine, predictable, and consistent with “trends in the market in 2012” but does not explain what “teachings” from Tam would be incorporated into Lisogurski or why they would be consistent market trends. Petition, 51-52.

In its “Analysis of Ground 3” section, Petitioner argues that “[a] POSITA would have been motivated to implement the LEDs from Tam’s portable oximeter into the system described by Lisogurski.” Petition, 56. Specifically, Petitioner argues that “Tam teaches increasing the accuracy of the measured signal from the components of hemoglobin by using bandwidth filters ... or by using LEDs with a bandwidth ranging from 15-40 nm” and that “implementing the LEDs from Tam’s system into Lisogurski’s sensor unit would have been obvious to a POSITA and would have achieved Tam’s and Lisogurski’s stated goals of increased accuracy and portability.” *Id.* Petitioner’s argument mischaracterizes Tam’s teachings. Tam does

not teach that “using LEDs with a bandwidth ranging from 15-40 nm” increases accuracy – it teaches the opposite.

Tam explains that multiple light sources were available for co-oximetry, including “light emitting diodes, laser diodes or small monochromatic light sources.” EX1046, 2:46-49; EX2046, ¶¶ 139-53. Tam explains that “the difficulty in using compact light sources for the measurement of hemoglobin derivatives was that differentiating between the optical characteristics of the various hemoglobin derivatives heretofore required the use of tightly controller diffraction gratings or very narrow bandwidth bandpass filters due to the overlapping visible absorption spectra of the various hemoglobin derivatives.” EX1046, 2:53-59; EX2046, ¶¶ 139-53.

Tam teaches that “small optical components alone, such as LEDs having bandwidths *from about 7 to 100 nm*, would *not allow accurate measurements* or even have the capability of distinction between hemoglobin derivatives.” EX1046, 13:45-52 (emphases added); EX2046, ¶¶ 139-53. According to Tam, “[i]t is for this reason that co-oximeters of the past have relied upon tightly controlled optical components requiring diffraction gratings, tight bandpass filters, tightly controller laser diodes and the like as the optical components of choice.” EX1046, 13:48-52; EX2046, ¶¶ 139-53. While LEDs “in tighter bandwidths” compared to the 7 to 100

nm range were available, they came “at a premium price.” EX1046, 9:61-62; EX2046, ¶¶139-53.

Tam's system “is generally enabled to be portable by three design characteristics,” including (1) using small optical components that do not require tight controls; (2) performing the measurement on whole blood; and (3) using ratiometric calculations.” EX1046, 13:19-25; EX2046, ¶¶139-53. Tam states that “it is specifically the use of small optical components that allow the mechanical design and electronics of the co-oximeter to be small enough to be portable” and “[u]se of whole blood allows the design to be smaller still.” EX1046, 13:26-30. To achieve these benefits, Tam discloses “procedures for measurement have been developed to accommodate the performance characteristics of the smaller optical components utilized” (EX1046, 13:40-44) and provides a detailed discussion of a “Ratiometric Refinement” (EX1046, 14:57-16:29). EX2046, ¶¶139-53. By using ratiometric calculations, Tam's system “utilizes compact light sources with bandwidths in the range of 7-100 nm without the use of narrow bandpass filters and/or complex diffraction gratings.” EX1046, 2:36-39; EX2046, ¶¶139-53.

Contrary to Petitioner's suggestion, Tam is clear that using LEDs with a bandwidth between 20 nm and 40 nm will *not* result in accurate multi-species hemoglobin measurements unless used with either (1) tightly controlled optical components like complex diffraction gratings and tight bandpass filters or (2)

radiometric calculations. EX2046, ¶¶139-53. According to Tam, only the latter option achieves increased portability. EX1046, 13:19-23; EX2046, ¶¶139-53. Importantly, Petitioner does *not* propose modifying Lisogurski to use Tam's radiometric calculations. Petition, 50-57; *see also* EX1003, ¶¶112-16, 145-54. A POSITA would not modify Lisogurski with Tam to use LEDs with a bandwidth between 7 to 100 nm (let alone 20 to 40 nm) because Tam teaches that either (1) the measurements will be inaccurate without radiometric calculations or (2) such LEDs require complex controls that decrease portability. EX1046, 13:45-52; EX2046, ¶¶139-53. Thus, contrary to Petitioner's suggestion, modifying Lisogurski with Tam would not "improve" Lisogurski's system. EX2046, ¶¶139-53.

Even setting aside Tam's teaching that LEDs with bandwidths between 20 and 40 nm will not yield accurate measurements without radiometric calculations or tightly controlled optical components—neither proposed by Petitioner—Dr. Mercier's characterization of the Tam combination as "straightforward," yielding "predictable results," and "achieved with routine effort" is legally insufficient. EX1003 ¶¶115, 151. The Federal Circuit has held that "[a]bsent some articulated rationale, a finding that a combination of prior art would have been 'common sense' or 'intuitive' is no different than merely stating the combination 'would have been obvious.'" *Van Os*, 844 F.3d at 1361; *see also Stepan*, 868 F.3d at 1346 ("Missing from the Board's analysis is an explanation as to *why* it would have been routine

optimization to arrive at the claimed invention.”). Moreover, Tam discloses bandwidths in the 7-100 nm range—far broader than Walker’s 20-50 nm range—and given this breadth, Petitioner cannot establish that selecting the specific 20-40 nm range was “routine.” *See Leo Pharm.*, 726 F.3d at 1356 (“[T]he breadth of these choices and the numerous combinations indicate that these disclosures would not have rendered the claimed invention obvious to try.”).

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 the challenged claims and reserves the right to do so should institution be granted. The absence of a response by Patent Owner to any of the positions presented in the Petition or the 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

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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 9,706 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.

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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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