UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

Case IPR2020-01524
Patent 10,433,776

PETITIONER'S NOTICE OF APPEAL TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Pursuant to 35 U.S.C. §§ 141(c) and 319, and 37 C.F.R. § 90.2(a), notice is hereby given that Petitioner Apple Inc. hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision in Case No. IPR2020-01524 entered April 29, 2022 (Paper 29) ("Final Written Decision") by the Patent Trial and Appeal Board ("the Board"), and from all underlying orders, decisions, rulings, and opinions related thereto and included therein. This appeal is timely under 35 U.S.C. § 142, 37 C.F.R. § 90.3, Federal Rule of Appellate Procedure 15(a)(1), and Federal Circuit Rule 15(a)(1).

For the limited purpose of providing the Director with the information required by 37 C.F.R. § 90.2(a)(3)(ii) and Federal Rule of Appellate Procedure 15(a)(2)(C), the expected issues on appeal include, but are not necessarily limited to:

1. The Board's construction of claim terms of U.S. Patent No. 10,433,776 (the "'776 patent"), including the "duty cycle" limitations, the Board's interpretation of those constructions, and the Board's application of those constructions to the prior art;
2. The Board's decision that claims 1–16 of the '776 patent were not shown to be unpatentable under 35 U.S.C. § 103 as obvious over U.S. Patent No. 5,555,882 to Richardson ("Richardson"), alone (for claims 1–9, and 11–16), or in view of:

a. U.S. Patent No. 6,178,343 to Bindszus ("Bindszus") for claims 9 and 10;

b. U.S. Patent No. 6,527,729 to Turcott ("Turcott") for claims 1–9, and 11–16; and

c. Turcott and Bindszus for claims 9 and 10.

3. All of the Board's subsidiary findings supporting its determination that claims 1–16 of the '776 patent were not shown to be unpatentable under 35 U.S.C. § 103; the Board's failure to consider evidence of record properly; the Board's legal errors in undertaking the obviousness analysis; the Board's findings that conflict with the evidence of record and are not supported by substantial evidence; and

4. All other issues decided adversely to Petitioner in any orders, decisions, rulings, or opinions underlying or supporting the Final Written Decision.

Pursuant to 35 U.S.C. § 142 and 37 C.F.R. § 90.2(a)(1), this notice is being filed with the Director of the U.S. Patent and Trademark Office, and a copy is also being filed with the Board. In addition, pursuant to Federal Circuit Rule 15(a)(1) and 37 C.F.R. § 90.2(a)(2), Petitioner also is electronically filing this notice with the Clerk of the U.S. Court of Appeals for the Federal Circuit, and paying the fee set forth in Federal Circuit Rule 52.

Respectfully submitted,

Date: June 9, 2022

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4) and 42.205(b), the undersigned certifies that on June 9, 2022, a complete and entire copy of this Petitioner's Notice of Appeal was provided via email to the Patent Owner by serving the correspondence address of record as follows:

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I hereby certify that, in addition to being filed electronically through the Board's E2E System, the original version of the foregoing Notice of Appeal was delivered by USPS Certified Mail on June 9, 2022, with the Director of the United States Patent and Trademark Office, at the following address:

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I hereby certify that on June 9, 2022, a true and correct copy of the foregoing Notice of Appeal, along with a copy of the Institution Decision, was filed

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Paper 29
Entered: April 29, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

IPR2020-01524
Patent 10,433,776 B2

Before JOSIAH C. COCKS, ROBERT L. KINDER, and AMANDA F. WIEKER, *Administrative Patent Judges.*

KINDER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Apple Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–16 ("challenged claims") of U.S. Patent No. 10,433,776 B2 (Ex. 1001, "the '776 patent"). Paper 2 ("Pet."). Masimo Corporation ("Patent Owner") waived filing a Preliminary Response. Paper 6. We instituted an *inter partes* review of all challenged claims on all asserted grounds of unpatentability, pursuant to 35 U.S.C. § 314. Paper 7 ("Inst. Dec.").

After institution, Patent Owner filed a Response (Paper 15, "PO Resp.") to the Petition, Petitioner filed a Reply (Paper 18, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 20, "Sur-reply"). An oral hearing was held on January 19, 2022, and a transcript of the hearing is included in the record. Paper 28 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Based on the record before us and for the reasons set forth below, Petitioner has not met its burden of showing, by a preponderance of the evidence, that any challenged claim of the '776 patent is unpatentable.

B. Related Matters

The parties identify the following matters related to the '776 patent:

Masimo Corporation v. Apple Inc., Civil Action No. 8:20-cv-00048 (C.D. Cal.) (filed Jan. 9, 2020);

Apple Inc. v. Masimo Corporation, IPR2020-01520 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,258,265 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01521 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,292,628 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01523 (PTAB Sept. 9, 2020) (challenging claims of U.S. Patent No. 8,457,703 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01526 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 6,771,994 B2);

Apple Inc. v. Masimo Corporation, IPR2020-01536 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553);

Apple Inc. v. Masimo Corporation, IPR2020-01537 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553);

Apple Inc. v. Masimo Corporation, IPR2020-01538 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2); and

Apple Inc. v. Masimo Corporation, IPR2020-01539 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2).

Pet. 68; Paper 3, 2–3.

The parties further identify certain pending patent applications, as well as other issued applications, that claim priority to, or share a priority claim with, the ’776 patent. Pet. 68; Paper 3, 1.

C. The ’776 Patent

The ’776 patent is titled “Low Power Pulse Oximeter,” and issued on October 8, 2019, from U.S. Patent Application No. 16/174,144, filed October 29, 2018. Ex. 1001, codes (21), (22), (45), (54). The ’776 patent claims priority through a series of continuation applications to Provisional Application No. 60/302,564, filed July 2, 2001. *Id.* at codes (60), (63).

The ’776 patent relates to a pulse oximeter that may reduce power consumption in the absence of certain parameters that may be monitored to

trigger or override the reduced power consumption state. *Id*. at code (57). "In this manner, a pulse oximeter can lower power consumption without sacrificing performance during, for example, high noise conditions or oxygen desaturations." *Id.*

As depicted below, the low power pulse oximeter has signal processor (340) that derives physiological measurements (342), including oxygen saturation, pulse rate, and plethysmograph, from input sensor signal (322). Ex.1001, 4:65–5:16, Figs. 3, 4.

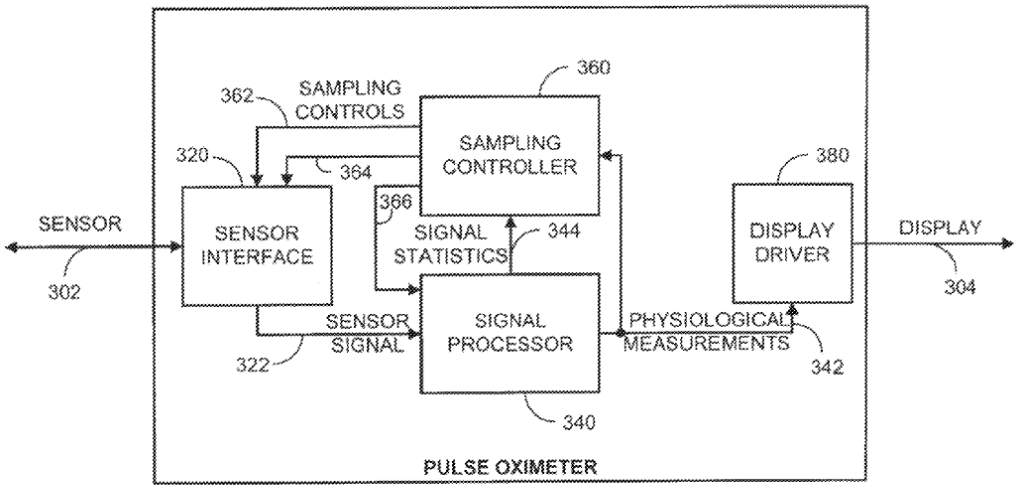


FIG. 3

Figure 3 illustrates a top-level block diagram of a low power pulse oximeter. *Id.* at 4:41–42. Signal processor (340) may also derive signal statistics (344), such as signal strength, noise, and motion artifact. *Id.* at 5:16–17, Figs. 3, 4. Physiological measurements (342) and signal statistics (344) may be input into sampling controller (360), which outputs sampling controls (362) that in turn are used to regulate pulse oximeter power dissipation by causing sensor interface (320) to vary the sampling characteristics of sensor port (302) and by causing signal processor (340) to

vary its sample processing characteristics. *Id.* at 5:17–26, Figs. 3, 4. According to the '776 patent, power dissipation "is responsive not only to output parameters, such as the physiological measurements 342, but also to internal parameters, such as the signal statistics 344." *Id.* at 5:26–29.

The pulse oximeter uses the physiological measurements and signal statistics to determine "the occurrence of an event or low signal quality condition." Ex. 1001, 6:28–31. An event determination is based upon the physiological measurements and "may be any physiological-related indication that justifies the processing of more sensor samples and an associated higher power consumption level, such as oxygen desaturation, a fast or irregular pulse rate or an unusual plethysmograph waveform." *Id.* at 6:31–37. A low signal quality condition is based upon the signal statistics and "may be any signal-related indication that justifies the processing or more sensor samples and an associated higher power consumption level, such as a low signal level, a high noise level or motion artifact." *Id.* at 6:37–42.

The pulse oximeter "utilizes multiple sampling mechanisms to alter power consumption." Ex. 1001, 5:62–64. One sampling mechanism is "an emitter duty cycle control" that "determines the duty cycle of the current supplied by the emitter drive outputs 482 to both red and IR sensor emitters." *Id.* at 5:64–6:2. The sampling mechanisms "modify power consumption by, in effect, increasing or decreasing the number of input samples received and processed." *Id.* at 6:12–14. "Sampling, including acquiring input signal samples and subsequent sample processing, can be reduced during high signal quality periods and increased during low signal quality periods or when critical measurements are necessary." *Id.* at 6:14–

18. "In conjunction with an intermittently reduced duty cycle or as an independent sampling mechanism, there may be a 'data off' time period longer than one drive current cycle where the emitter drivers . . . are turned off." *Id.* at 7:11–15. The occurrence of an event or low signal quality triggers a higher duty sensor sampling, allowing high fidelity monitoring of the event and providing a larger signal-to-noise ratio. *Id.* at 8:47–61.

D. Illustrative Claim

Of the challenged claims, claims 1 and 11 are independent. Claim 1 is illustrative and is reproduced below.

> 1.[p] A method of operating a patient monitor configured to monitor at least a pulse rate of a patient by processing signals responsive to light attenuated by body tissue, the method comprising:
>
> [a] operating the patient monitor according to a first control protocol, wherein said operating includes activating a first control protocol light source in accordance with the first control protocol, the first control protocol light source including one or more of a plurality of light sources;
>
> when operating according to the first control protocol, calculating, by the patient monitor, measurement values of the pulse rate, the measurement values responsive to light from the first control protocol light source, detected by a detector of an optical sensor after attenuation by body tissue of the patient using the patient monitor;
>
> [b] generating a trigger signal, wherein generating said trigger signal is responsive to at least one of: a comparison of processing characteristics to a predetermined threshold, a physiological event, or signal quality characteristics of signals received from the detector;
>
> [c] in response to receiving the trigger signal, operating the patient monitor according to a second control protocol different

> from the first control protocol, wherein said operating includes activating a second control protocol light source in accordance with the second control protocol, the second control protocol light source including one or more of the plurality of light sources; and
>
> when operating the patient monitor according to the second control protocol, calculating the measurement values of the pulse rate, the measurement values responsive to light from the second control protocol light source, detected by the detector after attenuation by the body tissue of the patient using the patient monitor,
>
> [d] wherein said operating of the patient monitor according to the first control protocol operates the first control protocol light source according to a first duty cycle and said operating of the patient monitor according to the second control protocol operates the second control protocol light source according to a second duty cycle, wherein power consumption of the first control protocol light source according to the first duty cycle is different than power consumption of the second control protocol light source according to the second duty cycle.

Ex. 1001, 11:40–12:21 (bracketed identifiers p–d added). Independent claim 11 is an apparatus claim that includes limitations substantially similar to limitations [a]–[d] of claim 1. *Id.* at 12:60–14:9.

E. Applied References

Petitioner relies upon the following references:

> Richardson et al., U.S. Patent No. 5,555,882, filed August 24, 1994, issued September 17, 1996 (Ex. 1004, "Richardson");
>
> Bindszus et al., U.S. Patent No. 6,178,343 B1, filed May 20, 1999, issued January 23, 2001 (Ex. 1005, "Bindszus"); and
>
> Turcott, U.S. Patent No. 6,527,729 B1, filed October 11, 2000, issued March 4, 2003 (Ex. 1006, "Turcott").

Pet. 3–4.

Petitioner also submits, *inter alia*, the Declaration of Brian W. Anthony, Ph.D. (Ex. 1003). Patent Owner submits, *inter alia*, the Declaration of Vijay K. Madisetti, Ph.D. (Ex. 2002). The parties also provide deposition testimony from Dr. Anthony and Dr. Madisetti, including from this proceeding and others. Exs. 1038, 2005, 2006.

F. Asserted Grounds of Unpatentability

We instituted an *inter partes* review based on the following grounds. Inst. Dec. 9, 23.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–8, 11–16	103	Richardson (first mapping)
1–9, 11–16	103	Richardson (second mapping)
9, 10	103	Richardson (either mapping) and Bindszus
1–9, 11–16	103	Richardson and Turcott (first mapping)
1–9, 11–16	103	Richardson and Turcott (second mapping)
9, 10	103	Richardson and Turcott (either mapping) and Bindszus

II. DISCUSSION

A. Claim Construction

For petitions filed on or after November 13, 2018, a claim "shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b)." 37 C.F.R. § 42.100(b) (2019). Petitioner submits that no claim term requires express construction. Pet. 7. Nonetheless, we determine that the parties' briefing

identifies certain aspects of the claim language that implicate claim construction, as discussed below.

1. Whether the "first duty cycle" must be different from the "second duty cycle."

Each independent claim requires "a first duty cycle" and "a second duty cycle." For example, claim 1 requires in pertinent part:

> wherein said operating of the patient monitor according to the first control protocol operates the first control protocol light source according to *a first duty cycle* and said operating of the patient monitor according to the second control protocol operates the second control protocol light source according to *a second duty cycle*.

Ex. 1001, 12:11–16 (emphases added), 14:1–4 (claim 11).

Petitioner has based its patentability analysis on two alternative claim interpretations (two distinct "mappings") of the claim limitations related to a "first duty cycle" and "second duty cycle." *See* Pet. 3, 16. The first mapping, which Petitioner classifies as the proper construction, requires that the first and second duty cycles be different. Pet. 16 ("Accordingly, Richardson teaches operating the patient monitor according to different duty cycles, *under the proper construction of 1[d]*." (emphasis added)), Pet. 50 ("[u]nder the proper construction of 1[d] requiring a different duty cycle for operating the infrared light source in State 2 than the duty cycle for operating the infrared or red light source in State 1"), 56 (similar argument). Petitioner argues that under a proper construction, the first and second duty cycles cannot be identical, but the Petition does not provide any argument or basis for this reasoning.

Petitioner, in an alternative mapping, then posits a second claim interpretation theory for the "first duty cycle" and "second duty cycle"

limitations in which the first and second duty cycles need *not* be different. Pet. 30. Specifically, Petitioner argues, "Richardson teaches this limitation under an alternate construction of this limitation that does not require different duty cycles for the first duty cycle and the second duty cycle." *Id.*

Patent Owner, relying on the testimony of Dr. Madisetti, contends that the Board should construe the "first duty cycle" to be different from the "second duty cycle," consistent with Petitioner's first mapping. PO Resp. 22 (citing Ex. 2002 ¶¶ 48–53). Patent Owner argues the Specification of the '776 patent requires different first and second duty cycles whereas claims 1 and 11 use "first" and "second" to distinguish the duty cycles. *Id.* at 23 (citing *Merck & Co. v. Teva Pharms. USA, Inc.,* 395 F.3d 1364, 1372 (Fed. Cir. 2005) ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so."). Patent Owner contends that "[c]laims 1 and 11 further clarify that one of the differences between the first and second control protocols are the duty cycles." *Id.* (citing Ex. 1001, 12:11–21).

During the oral hearing, Petitioner conceded that it was now accepting the position that the first and second duty cycle must be different. Tr. 6:1–7 (Petitioner's counsel stating that "the parties agree that the claims require the first and second duty cycle to be different").

We determine that the surrounding claim language and the Specification of the '776 patent support the now agreed upon interpretation that the first and second duty cycle must be different. *See* Ex. 1001, 11:45–46, 11:63–65, 12:11–21, 6:64–7:2 (distinguishing constant duty cycle pulse oximeters), 7:2–4, 8:4–24, Fig. 8.

As discussed more below, Petitioner has conceded that the grounds of unpatentability based upon its second mapping of Richardson are no longer viable under the interpretation that the first and second duty cycle must be different. *See* Tr. 6:8–9, 27:4–24; Pet. 16, 26. Based on Petitioner's concession, our analysis below focuses on those arguments directed to the first mapping of Richardson – "[t]he first mapping assumes that the claims require the first and second duty cycles to be different." Tr. 6:2–3.

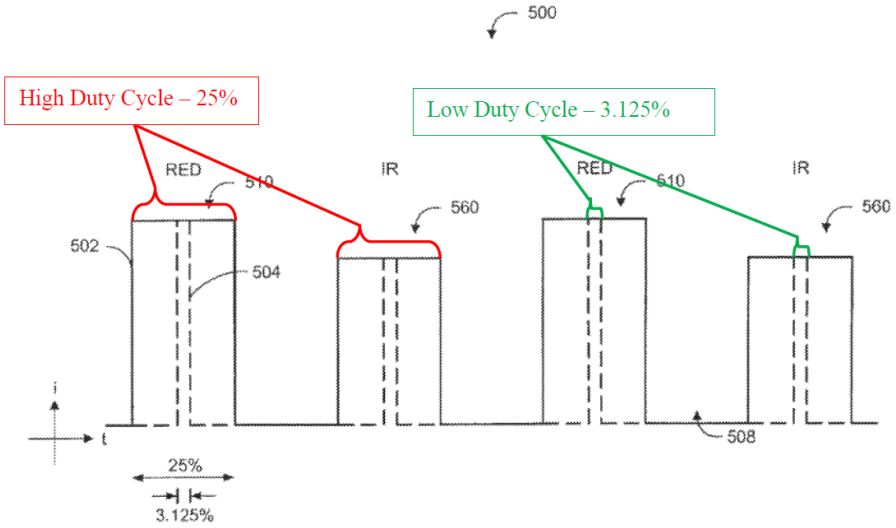
2. Construction of "duty cycle" and whether the "duty cycle" can be 0%.

Patent Owner requests that we "construe 'duty cycle' to mean 'the ratio of operating time (or on time) of a light source to the total time period during which the light source is intermittently operated, expressed as a percentage.'" PO Resp. 17 (citing Ex. 2002 ¶ 36). Further, according to Patent Owner, "[t]he 'first duty cycle' and 'second duty cycle' cannot be 0% based on the claims and '776 patent specification." *Id.* at 19 (citing Ex. 2002 ¶¶ 40–47).

Patent Owner contends that the person of ordinary skill in the art would have understood "duty cycle" to be "the ratio of operating time to total elapsed time of a device that operates intermittently, expressed as a percentage," because "[t]he '776 patent consistently describes the 'duty cycle' as the ratio of the operating time (or on time) of the red and infrared LEDs to the total time period during which the LEDs are intermittently operated, expressed as a percentage." PO Resp. 17–18 (citing Ex. 2004, 225; Ex. 2002 ¶¶ 37, 39; Ex. 1001, 2:43–44). Patent Owner notes that the '776 patent discloses a method of reducing the power consumption of a patient monitor by "intermittently reducing the drive current duty cycle." *Id.*

(quoting Ex. 1001, 6:59–7:11). Patent Owner notes that "[t]he 'drive current' is the current supplied by the red and infrared LED drivers (also called the 'emitter drivers')", and "[t]he LEDs operate (i.e., are turned on and emit light) when the LED drivers supply current." *Id.* at 18 (citing Ex. 1001, 2:43–44, 8:16–20; Figs. 4, 8).

Patent Owner relies on Figure 5 of the '776 patent, seen below, which "illustrates an 'emitter driver output current' versus time profile for a pulse oximeter." PO Resp. 18 (quoting Ex. 1001, 6:59–60).



Patent Owner's annotated Figure 5 depicts the LEDs operating in high duty cycle state 502 (red) and the LEDs operating in a low duty cycle state 504 (green). *Id.* According to Patent Owner, the illustration shows that when the LEDs are operating in a high duty cycle, they receive current from the emitter driver and are operating (i.e., are turned on and emit light) for 25% of the total time period during which the LEDs are intermittently operated, and conversely, when the LEDS are operating in a low duty cycle, the LEDs receive current and operate (i.e., are turned on and emit light) for 3.125% of the total time period during which the LEDs are intermittently operated. *Id.* at 19 (citing Ex. 1001, 6:58–61, 7:4–8, 8:15–24, Fig. 8). Patent Owner thus

contends that the '776 patent uses "duty cycle" to mean "the ratio of operating time to total elapsed time of a device that operates intermittently, expressed as a percentage." *Id.* (citing Ex. 2002 ¶¶ 37–39).

As to Patent Owner's contention that the first duty cycle and second duty cycle cannot be 0%, Patent Owner first looks to the surrounding language of claim 1, and notes it "requires 'operating the patient monitor according to a first control protocol,' where the first control protocol 'operates the first control protocol light source according to a first duty cycle.'" PO Resp. 20 (quoting Ex. 1001, 11:45–46, 12:11–13). Patent Owner next relies on the claim language "that 'when operating according to the first control protocol,' the patient monitor calculates 'measurement values of the pulse rate' that are 'responsive to light from the first control protocol light source.'" *Id.* (quoting Ex. 1001, 11:51–57). "Thus," according to Patent Owner, the claims "require the 'first control protocol light source' to generate light so that the patient monitor can calculate the pulse rate based on the light." *Id.* (citing Ex. 2002 ¶ 41). Patent Owner reasons that "if the first control protocol light source had a duty cycle of 0%, the light source would be inactive and would not generate light." *Id.* (citing Ex. 2002 ¶ 42). Accordingly, if the first control protocol light source had a duty cycle of 0%, Patent Owner contends "the monitor could not calculate the 'measurement values of the pulse rate' as required by claims 1 and 11," and, therefore, "the 'first duty cycle' must be a percentage greater than zero so that the first control protocol light source generates light, thereby permitting the monitor to calculate 'measurement values of pulse rate' responsive to that light." *Id.*

Patent Owner notes that the claim language related to the second control protocol operating the second control protocol light source is similar to that above, such that the patient monitor calculates "measurement values of the pulse rate" that are "responsive to light from the second control protocol light source." PO Resp. 20–21 (quoting Ex. 1001, 12:4–10). Patent Owner similarly argues that "the 'second duty cycle' must be a percentage greater than zero so that the second control protocol light source generates light, thereby permitting the monitor to calculate 'measurement values of pulse rate' responsive to that light." *Id.* at 21.

Next, Patent Owner notes that the Specification "never mentions a duty cycle of 0%," but instead the Specification "consistently describes a patient monitor having high and low duty cycles greater than 0%." *Id.* (citing Ex. 1001, 2:39–44, 7:4–11, 8:14–15; Ex. 2002 ¶¶ 45–46). Patent Owner points out that the duty cycle of the preferred embodiment "is varied within a range from about 25% to about 3.125%." *Id.* (quoting Ex. 1001, 7:4–9).

Next, Patent Owner distinguishes the "data off state" from the duty cycle. PO Resp. 21–22. According to Patent Owner, the "data off state" is the situation of having the LEDs inactive for longer than one cycle. *Id.* (citing Ex. 1001, 7:11–15; Ex. 2002 ¶ 46). Patent Owner argues that the Specification distinguishes the data off state from the first and second duty cycles and further relies on the language stating "[i]n conjunction with an intermittently reduced duty cycle or as an independent sampling mechanism, there may be a 'data off' time period longer than one drive current cycle where the emitter drivers are turned off." *Id.* at 22 (quoting Ex. 1001, 7:11–15 (emphasis omitted)) (citing Ex. 1001, 8:14–15, 8:16–32, 8:47–61).

Patent Owner contends this language is "an example of first and second duty cycles in conjunction with a data off state," and "[a] data off state is a different state where the light sources are turned off for more than one period." Tr. 25:20–26:5. Further, Patent Owner contends that "in conjunction with" means that "it works together with." Tr. 32:2–3, 32:11–14 ("I think it has its plain meaning. It means together with. They operate together with each other. . . . It doesn't mean that they operate simultaneously and it doesn't mean that they are replacements for each other.").

Petitioner contends that the "first duty cycle" can be 0%. Pet. Reply 1. Petitioner does not expressly disagree with the proposed construction of duty cycle to require a ratio of operating time, but Petitioner is firm that the duty cycle may be calculated to be zero percent. *See id.* at 1–3; Tr. 42:3–20 ("[T]hey're adding on this requirement that that ratio can't be zero. It's not like you have a ratio of zero to some positive value is undefined. That actually you can compute that, it's zero. So, I don't see how the restriction that it can't be zero flows from an argument that it has to be a ratio."). Petitioner contends that nothing in the claim language or specification of the '776 patent supports a restriction that the "first duty cycle" cannot be 0%. Pet. Reply 1.

According to Petitioner, the claim requirements identified by Patent Owner are still satisfied when the "first duty cycle" is 0%. *Id.* More "[s]pecifically, claims 1 and 11 recite 'the first control protocol light source including ***one or more of a plurality of light sources***' and 'operating of the patient monitor according to the first control protocol operates the first control protocol light source according to a first duty cycle.'" *Id.* (quoting

Ex. 1001, 11:48–50, 12:11–13, 13:5–7, 13:35–14:1). Petitioner contends that "[a]s long as one of the plurality of light sources is operated at a duty cycle greater than 0%, the patient monitor can calculate measurement values of the pulse rate from that one light source even if another of the plurality of light sources is operated at a duty cycle of 0%." *Id.* at 2.

Petitioner next points to the claim language of dependent claims 6 and 15 that requires a "data off state." Pet. Reply 2. Petitioner argues that the language, "operating the patient monitor in accordance with the first control protocol comprises operating the first control protocol light source in a data off state," allows for the "first duty cycle" to be 0%. *Id.* (quoting Ex. 1001, 12:43–46, 14:23–26). According to Petitioner, the "first duty cycle" corresponds to "a data off state" and a "light source operating with a duty cycle of 0% is operating in a data off state." *Id.*

Petitioner reads the language from the Specification stating that operating in the data off state can be "[i]n conjunction with an intermittently reduced duty cycle," as allowing the data off state and the reduced duty cycle to occur at the same time; i.e., the reduced duty cycle can correspond to the data off state. *Id.* at 3 (citing Ex. 1001, 7:11–15) (emphasis omitted). Further, Petitioner contends that the Specification describes three control states: "high duty cycle," "low duty cycle," and "data off," but the Specification "does not indicate which control state corresponds to the claimed 'first duty cycle' and 'second duty cycle.'" *Id.* (citing Ex. 1001, 8:14–32, 8:47–61).

Based on the final record, we find Patent Owner's proposed interpretation of "duty cycle" persuasive. The evidence cited supports "duty cycle" to mean "the ratio of operating time (or on time) of a light source to

the total time period during which the light source is intermittently operated, expressed as a percentage." *See* Ex. 2002 ¶ 36 (relying on an electronics dictionary and testifying as to how the '776 patent uses "duty cycle" consistent with its plain and ordinary meaning to require a ratio of operating time to total elapsed time). We are persuaded by the Specification of the '776 patent describing the "duty cycle" as the ratio of the operating time (or on time) of the red and infrared LEDs to the total time period during which the LEDs are intermittently operated, expressed as a percentage. *See* Ex. 1001, 2:43–44; Ex. 2004, 225; Ex. 2002 ¶¶ 37, 39. The duty cycle is described as consistently being "in the range of about 3.125% to about 25%." Ex. 1001, 2:43–44, Figs. 5, 8.

The weight of the evidence, including the claim language and Specification, convinces us that neither the first nor the second duty cycles can be 0%. The claims require the first and second control protocol light sources to generate light so that the patient monitor can calculate a pulse rate based on the light. *See* Ex. 1001, 11:45–12:21 ("when operating according to the first control protocol, calculating . . . measurement values of the pulse rate, . . . responsive to light from the first control protocol light source" and "calculating the measurement values of the pulse rate, . . . responsive to light from the second control protocol light source"); Ex. 2002 ¶¶ 41, 42. The first and second duty cycles cannot be 0% because the light sources of the first and second control protocol light source would not generate light to enable pulse rate calculation as required by the claims. *See* Ex. 2002 ¶ 42 ("[I]f the first control protocol light source had a duty cycle of 0%, the light source would be inactive and would not generate light. If the light source did not generate light the monitor could not calculate the 'measurement

values of the pulse rate" as required by claims 1 and 11.") ¶ 44 ("[A]s with the first control protocol light source, if the second control protocol light source had a duty cycle of 0%, the light source would be inactive and would not generate light."); Ex. 1001, 12:12–13.

Based on the context of the claim language, and supporting explanations in the Specification, we determine that a 0% duty cycle is not within the scope of the invention. As explained persuasively by Dr. Madisetti:

> If the light source did not generate light, the monitor could not calculate the "measurement values of the pulse rate" as required by claims 1 and 11. For this reason, the "first duty cycle" must be a percentage ***greater*** than zero (i.e., it cannot be 0%) so that the first control protocol light source generates light, thereby permitting the monitor to calculate "measurement values of pulse rate" responsive to that light.

Ex. 2002 ¶ 42. *See also* Tr. 44:14–20 ("[T]he claims require that when you're operating according to the first control protocol you must calculate measurement values of the pulse rate and when you're operating according to the second control protocol, . . . you must calculate the measurement values of the pulse rate and the problem is if the LEDs are turned off you cannot calculate the measurement value.").

We find unpersuasive Petitioner's reliance on the claim language requiring "the first control protocol light source including one or more of a plurality of light sources," to argue that as long as one of the plurality of light sources is operated at a duty cycle greater than 0%, the patient monitor can calculate measurement values of the pulse rate from that one light source. *See* Pet. Reply 1–2 ("As long as one of the plurality of light sources is operated at a duty cycle greater than 0%, the patient monitor can calculate

measurement values of the pulse rate from that one light source even if another of the plurality of light sources is operated at a duty cycle of 0%."). As Patent Owner notes, "[t]he claims do not state that 'one or more of a plurality of light sources' operate according to a first duty cycle," but instead, "the claims state, 'the first control protocol operates the first control protocol light source according to a first duty cycle.'" Sur-reply 2 (emphasis omitted). Thus, we agree with Patent Owner that the claims presume that the individual light source(s) that comprise the first protocol light source operate as a unit according to the same, first duty cycle. *See id.*

Dr. Madisetti testifies persuasively that a person of ordinary skill in the art would not have understood a "first duty cycle" or a "second duty cycle" to encompass two distinct percentages of on time for the different LEDs that may make up the "protocol light source." Ex. 2002 ¶ 68. For example, the Specification of the '776 patent consistently describes patient monitors having multiple LEDs, which operate as a unit at the same low or high duty cycle. *See* Ex. 1001, 6:59–7:18, Fig. 5. As noted by Patent Owner, the '776 patent does not disclose monitors that simultaneously drive multiple LEDs at different duty cycles. *See* Sur-reply 3; Ex. 2002 ¶¶ 45–46. We also agree with Dr. Madisetti that a person of ordinary skill in the art "would not have understood 'duty cycle' to refer to the additive percentages of 'on time' of two drive signals that drive different LEDs." Ex. 2002 ¶ 68.

The "data off" state claimed in claims 6 and 15 does not support Petitioner's position that the first duty cycle can be 0%. The '776 patent distinguishes between high and low duty cycles and a "data off state" where the LEDs are inactive for longer than one cycle. *See* Ex. 2002 ¶¶ 45–46. We do not agree with Petitioner that to satisfy claims 6 and 15, the first duty

cycle can be in a data off state. Pet. Reply 2. Notably, claims 6 and 15 do not state that the first duty cycle is a data off state, as Petitioner argues. Rather, claims 6 and 15 use the word "comprises," which requires operating according to the first control protocol to encompass operating the first control protocol light source both "according to a first duty cycle" (claims 1/11) and "a data off state" (claims 6/15). *See* Sur-reply 4. As noted above, the LEDs have to be on in claims 1/11 for the surrounding claim requirements to function. The argument that the system of claims 1/11 could operate in just a data off state is inconsistent with the claim language and the more logical reading of claims 6 and 15 is that the data off and reduced duty cycle states can operate "in conjunction with" each other, not simultaneously. *See* Ex. 1001, 8:33–46, Fig. 8 (duty cycles and data off states not simultaneous). *See* Tr. 46:1–4 ("[A] data off state is not a duty cycle. It's not a first duty cycle, it's not a second duty cycle, so the idea that there can be this zero percent duty cycle that's inconsistent with the specification and it's inconsistent with the claims.").

The Specification identifies two of the control states as "duty cycles," and a third distinct time interval as a "data off state"; thus, the claimed first and second duty cycles can be the low or high duty cycles, but not a data off state. *See* Ex. 1001, 8:33–46 (identifying "low duty cycle" and "high duty cycle" as two control states but noting that the pulse oximeter may "enter the data off state" during a distinct "third time interval"). Further, the Specification distinguishes operating between the data off state and the low duty cycle showing that these states were not contemplated to be one in the same. *See id.* ("alternates between the data off state 818 and the low duty cycle state 814"); *see also id.* at Fig. 8 (duty cycles and data off states not

simultaneous). Thus, we agree with Patent Owner that "[t]he data off state is consistently described as being different from the first and second duty cycles or the low duty cycle and the high duty cycle." Tr. 45:19–21.

Based on the above evidence and arguments, we determine that neither the first nor the second duty cycles can be 0%.

3. Other Claim Terms

Upon consideration of the entirety of the arguments and evidence presented, we conclude no further explicit construction of any claim term is needed to resolve the issues presented by the arguments and evidence of record. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed "only to the extent necessary to resolve the controversy" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of non-

obviousness.[1] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also "determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

Petitioner identifies the appropriate level of skill in the art as that possessed by a person having "a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information, including but not limited to physiological monitoring technologies." Pet. 6 (citing Ex. 1003 ¶ 32 ("someone with a working knowledge of physiological monitoring technologies")). "Alternatively, the person could have also had a

[1] Neither party has introduced objective evidence of non-obviousness. *See* Tr. 23:25–24:3.

Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline." *Id.*

Patent Owner makes several observations regarding Petitioner's identified level of skill in the art but, "for this proceeding, [Patent Owner] applies the asserted level of skill identified in the Petition." PO Resp. 11–12.

We adopt Petitioner's assessment as set forth above, which appears consistent with the level of skill reflected in the Specification and prior art.

D. Obviousness over the Teachings of Richardson (First Mapping)

Petitioner contends that claims 1–8 and 11–16 of the '776 patent would have been obvious over the teachings of Richardson. Pet. 8–26. Patent Owner disagrees. PO Resp. 25–45; Sur-reply 2–5, 7–11.

Based on our review of the parties' arguments and the final record, we determine that Petitioner has not met its burden of showing by a preponderance of the evidence that claims 1–8 and 11–16 are unpatentable.

1. Overview of Richardson (Ex. 1004)

Richardson is titled "Method and Apparatus for Reducing Ambient Noise Effects in Electronic Monitoring Instruments." Ex. 1004, code (54). Richardson "relates to a method and apparatus for detecting and reducing the effects of ambient electromagnetic noise . . . on electronic instruments." *Id.* at 1:11–15, 2:35–37. Richardson discloses "a method and apparatus for adapting to noise sources affecting a pulse oximeter." *Id.* at code (57). Richardson describes evaluating various frequencies to determine their respective noise levels and selecting one to act as the operating

demultiplexer frequency. *Id.* "During normal operation of the pulse oximeter, the various available demultiplexer frequencies are periodically scanned to determine which has the lowest associated noise," and "[t]he noise level associated with the operating frequency is used to determine the signal-to-noise ratio of the pulse oximeter signals" in order to "qualify certain signals from the pulse oximeter." *Id.* Richardson may rely upon noise levels to conserve power by reducing LED drive current while maintaining a safe signal-to-noise ratio. *Id.* at 3:3–7.

In Richardson, the pulse oximeter includes light sources that emit red and infrared light alternately into a patient's tissue and a photodetector that senses the light transmitted through the tissue. Ex. 1004, 1:37–45, 2:61– 62, 4:2–5. Based on the changes in red and infrared light transmission, the pulse oximeter measures a physiological parameter. *Id.* at 1:46–61. Richardson addresses background noise by determining the noise level at each available operating frequency, and then selecting the frequency with the least noise to serve as the operating frequency for the instrument. *Id.* at 2:37–47. Richardson also periodically rescans the available frequencies to reevaluate the noise level and switches to a less noisy frequency, if available. *Id.* Richardson claims that these "techniques allow the invention to adapt to the total noise found in a given environment, such as a hospital." *Id.* at 2:49–51.

The oximeter operates in one of three states: State 0, State 1, or State 2. *Id.* at 5:41–43. In State 0, the oximeter turns off the light sources and monitors the photodetector signal at a given frequency to monitor noise in the oximeter signal. *Id.* at 2:57–64, 5:17–24, 5:43–53. The measured noise level is used to select a frequency at which the contribution of noise to the signal is relatively low. *Id.* at 3:1–17, 5:53–54, 7:58–63. After selecting a

frequency, the oximeter operates in a normal operating state, State 1, where both light sources are activated alternately at a frequency and the physiological parameter is monitored. *Id.* at 5:55–57, 6:66–7:3, 7:58–63, 8:46–49. When the oximeter is operating in State 1, the oximeter displays blood saturation values, a pulse waveform, and heart rate estimates and provides an audible pulse tone. *Id.* at 9:33–38, 9:43–47. If the oximeter determines that the signal-to-noise ratio decreases below an acceptable level, it reverts from State 1 to State 0 to search for a new frequency. *Id.* at 5:64–67, 7:3–18, 8:41–43, 8:50–64.

The oximeter may transition from State 1 to State 2 to reassess the noise at the current operating frequency. Ex. 1004, 6:1–2, 8:46, 9:39–43. In State 2, the red light source is turned off, and a new noise level is calculated by measuring the ambient noise in the red channel only. *Id.* at 6:2–4, 9:40–43, 9:52–63. In State 2, the infrared channel is operating, and the oximeter monitors the pulse rate, displays a pulse waveform and heart rate estimates, and provides an audible pulse tone. *Id.* at 6:4–7, 9:43–47. After calculating the new noise level, the oximeter returns to State 1 and operates normally using the new noise level. *Id.* at 6:7–10, 9:63–65.

2. Independent Claims 1 and 11

Petitioner contends that claims 1 and 11 would have been obvious over Richardson. Pet. 10–17, 23–24. Because we determine that Richardson does not disclose all the limitations of claims 1 and 11, we focus our analysis below on those limitations. Specifically, limitations 1[d] and 11[d] of independent claims 1 and 11 require:

> [operating/operation] of the patient monitor according to the first control protocol operates the first control protocol light source

> according to a first duty cycle and said (operating/operation) of the patient monitor according to the second control protocol operates the second control protocol light source according to a second duty cycle.

See Pet. 15, 24. Based on our claim interpretations as set forth above, Petitioner's "first mapping" of Richardson does not disclose these limitations.

Petitioner's Contentions

Petitioner contends that it has established that Richardson discloses that the first control protocol (State 2) operates the first control protocol light source (the red LED) according to a first duty cycle of 0%, and the second control protocol (State 1) operates the second control protocol light source (the infrared LED) according to a second duty cycle of at least 25%. Pet. 17; Pet. Reply 7. "Relying on Dr. Anthony's testimony," Petitioner contends "that Richardson renders obvious that the power consumption of the first control protocol light source operating according to a duty cycle of 0% is different than the power consumption of the second control protocol light source operating according to a duty cycle of at least 25%." Pet. Reply 7 (citing Ex. 1003 ¶ 50); Pet. 17.

Petitioner contends that "in State 2, the red light source is turned off and has a duty cycle of 0%, and the infrared light source is operated with a duty cycle of at least 25%." Pet. 16 (citing Ex. 1003 ¶ 50; Ex. 1004, 9:40–43, 6:2–4, 9:52–63, 4:6–10). Petitioner notes that "[i]n State 1, both the red and infrared light sources are activated with a duty cycle of at least 25%," and as such, "Richardson discloses that the first control protocol, e.g., State 2, operates the first control protocol light source according to a first duty cycle, e.g., red LED at 0% duty cycle and infrared LED at 25% duty

cycle, and the second control protocol, e.g., State 1, operates the second control protocol light source according to a second duty cycle, e.g., red and infrared LEDs at 25% duty cycle." Pet. 16 (citing Ex. 1003 ¶ 50). Petitioner argues that Richardson teaches operating "the first control protocol light source according to a first duty cycle" because the red LED of the "first control protocol light source" is operated according to the "first duty cycle" of 0%. Pet. Reply 7.

Patent Owner Contentions

Patent Owner first contends that "Petitioner never identifies the first control protocol light source," and "is unclear whether it relies on the duty cycle of (1) the red LED, (2) the infrared LED, or (3) the red and infrared LEDs." PO Resp. 35. Further, Patent Owner argues that regardless of the light source selected, a person of ordinary skill in the art "would not have understood (1) the red, (2) the infrared LED, or (3) the red and infrared LEDs in States 1 and 2 to operate according to a 'first duty cycle' and a 'second duty cycle' under the proper construction of those terms." *Id.* at 35–36.

Patent Owner contends that neither the red LED nor the infrared LED operate according to a "first duty cycle." PO Resp. 36–37. First, Patent Owner argues that the red LED does not operate according to a "first duty cycle," because the red LED has a duty cycle of 0% in State 2 and a duty cycle of at least 25% in State 1. *Id.* at 36 (citing Pet. 16). Patent Owner notes that "Petitioner identifies Richardson's State 2 as the 'first control protocol' and State 1 as the 'second control protocol.'" *Id.* (citing Pet. 10). Patent Owner relies on the claim construction that a "duty cycle" cannot be 0%, and argues that "Petitioner admits that in State 2 'the red light source is

turned off,'" "[t]hus, under the proper construction of 'first duty cycle,' turning off the red LED in State 2 (Petitioner's 'first control protocol') is not operating according to a 'first duty cycle' as required by claims 1 and 11." *Id.* (citing Ex. 2002 ¶ 66).

Next, Patent Owner contends that "[t]he infrared LED does not operate according to a 'first duty cycle' and 'second duty cycle' under the proper construction of the terms." *Id.* (citing Ex. 2002 ¶ 67). This is so because the parties agree "that the infrared LED operates at the same duty cycle, 'at least 25%,' in States 1 and 2," and the first and second duty cycles must be different under the "proper" claim construction. *Id.* at 36–37 (citing Pet. 16, 24, 50, 54; Ex. 1004, 4:6–7) (emphasis omitted).

Analysis

As we determined above, the claimed first and second duty cycles cannot be 0%. This determination precludes Petitioner's first mapping of Richardson from reading on claims 1 and 11.

Petitioner identifies the first mapping of Richardson as the transition of Richardson's oximeter from State 2 to State 1. Pet. 10 ("For this first mapping of Richardson . . . the claim elements . . . are mapped to disclosure in Richardson describing the oximeter transitioning from State 2 (as the first control protocol) to State 1 (as the second control protocol)."). Petitioner argues that State 2 (blue below) is the "first control protocol" and State 1 (orange below) is the "second control protocol" required by claims 1 and 11.

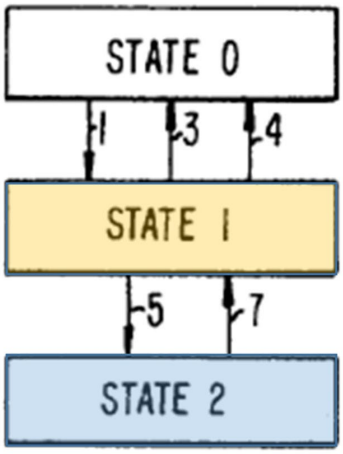


FIG. 2.

Patent Owner's annotated Figure 2 of Richardson (Ex. 1004) describes implementing the noise reduction methods in a pulse oximeter having three states, including State 1 (highlighted in orange) and State 2 (highlighted in blue). PO Resp. 33. Richardson's pulse oximeter transitions from State 1 to State 2 "[e]very 30 seconds," and "[t]he purpose of State 2 is to detect new noise sources that may have appeared since the last State 0 measurements." Ex. 1004, 9:39–42. In State 2, the oximeter reassesses the noise "by turning off one LED; typically the red LED," for about 1.4 seconds. *Id.* at 6:2–3, 9:52–53. When the 1.4 seconds (i.e., idle time) expires, the oximeter automatically returns to State 1 where it uses the newly estimated noise values. *Id.* at 9:63–65; *see also id.* at 9:66–10:5 (discussing idle time). When operating in State 1, the oximeter has both LEDs turned on. *Id.* at 5:55–67.

Petitioner argues that the red LED "has a duty cycle of 0%" in State 2 and a duty cycle of "at least 25%" in State 1. Pet. 16. Petitioner admits that in State 2 "the red light source is turned off." *Id.* As we determined in the claim construction analysis, a person of ordinary skill in the art would have

understood that the "first duty cycle" cannot be 0% based on the claims and Specification. Thus, under the proper construction of "first duty cycle," turning off the red LED in State 2 (Petitioner's "first control protocol") is not operating according to a "first duty cycle" as required by claims 1 and 11. Ex. 2002 ¶ 66.

Although not relied upon by Petitioner for this ground, the infrared LED also does not operate according to a "first duty cycle" and "second duty cycle" under the proper construction of the terms. *See* Ex. 2002 ¶ 67. This is so because the infrared LED operates at the same duty cycle, "at least 25%," in States 1 and 2. Pet. 16; PO Resp. 36; *see also* Ex. 1004, 4:6–7 ("a duty cycle of at least 1 in 4"). Further, as we determined above, and as agreed by the parties, the first and second duty cycles must be different under the proper claim construction. *See* Pet. 16, 24; PO Resp. 36–37. Consequently, operation of the infrared LED at the same duty cycle in State 2 and State 1 is not operating according to a "first duty cycle" and a "second duty cycle" as required by claims 1 and 11. Ex. 2002 ¶ 67.

Petitioner has not persuasively argued a combination of the red and infrared LEDs could be relied upon to show that Richardson operates according to a "first duty cycle" and a "second duty cycle." In Reply, Petitioner maintains that "Richardson teaches operating 'the first control protocol light source according to a first duty cycle' because the red LED of the 'first control protocol light source' is operated according to the 'first duty cycle' of 0%." Pet. Reply 9. Thus, Petitioner relies on just the red LED and not a combination of the red and infrared LEDs for operating the first control protocol light source according to a first duty cycle.

Having now considered the evidence in the complete record established during trial, we are persuaded that, based on this record, Petitioner has not demonstrated by a preponderance of the evidence that claims 1 and 11 would have been obvious over Richardson for the reasons set forth above.

3. Dependent Claims 2–8 and 12–16

Because each of dependent claims 2–8 and 12–16 depend from claims 1 or 11, we likewise determine that Petitioner has failed to demonstrate by a preponderance of the evidence that Richardson would have rendered obvious any of these dependent claims for the reasons set forth above for claims 1 and 11.

E. Obviousness over Richardson and Bindszus

Petitioner contends that claims 9 and 10 would have been obviousness over Richardson and Bindszus. Pet. 3. Based on the final record, and for the reasons set forth below, Petitioner has not cured the deficiencies set forth above related to Richardson and its failure to teach the claim limitations related to the claimed first and second duty cycle. For these reasons, this ground fails to show by a preponderance of the evidence that claims 9 and 10 of the '776 patent would have been unpatentable.

1. Bindszus (Exhibit 1005)

Bindszus is titled "Pulse Rate and Heart Rate Coincidence Detection for Pulse Oximetry." Ex. 1005, code (54). Bindszus relates to a coincidence recognition unit that receives a first signal indicative of a pulse rate and a second signal indicative of a heart rate, then uses those signals to generate a

third signal indicative of the coincidence between the first signal and the second signal. *Id.* at code (57). Bindszus discloses methods of "validating the accuracy of measured oxygen saturation values." *Id.* at 1:5–7. Bindszus explains that a shortcoming of pulse oximetry is that it "relies on the fact that the arterial blood is the only pulsating component that causes a pulsatile change of the light absorption used to determine the oxygen saturation." *Id.* at 2:12–15.

2. Analysis

Petitioner relies on the combination of Richardson and Bindszus to achieve a system that provides the benefit of further improving the accuracy of oxygen saturation values derived by pulse oximetry. *See* Pet. 40–45; Ex. 1005, 2:24–28. Specifically, claims 9 and 10 depend from claim 1 and further require that "the physiological event includes at least one of oxygen desaturation, an abnormal pulse rate, or an abnormal plethysmograph waveform." Ex. 1001, 12:54–56. Petitioner alleges that a person of ordinary skill in the art would have recognized that the combination of "Richardson's pulse oximeter as suggested by Bindszus would include implementing a system that provides an output indicating whether the detected pulse rate is either abnormally higher or abnormally lower than the detected heart rate," which would cause a pulse oximeter to transition and select a new frequency at which to active the LEDs. Pet. 44–45.

Petitioner argues that Bindszus satisfies the additional limitations in dependent claims 9 and 10. *Id.* Petitioner does not argue that Bindszus satisfies any limitations in independent claims 1 and 11, and more specifically, the limitations examined above related to "first duty cycle" and "second duty cycle" that we determined Richardson failed to teach. For

these reasons, Petitioner has not persuasively shown that claims 9 and 10, which depend from claim 1, would have been obvious over the combination of Richardson and Bindszus.

F. Obviousness over Richardson and Turcott

Petitioner contends that claims 1–9 and 11–16 would have been obvious over Richardson and Turcott. Pet. 3, 45–54; Pet. Reply 17–23. Patent Owner opposes for several reasons. PO Resp. 52–63; Sur-reply 14–22. Based on the final record, and for the reasons set forth below, Petitioner has not shown by a preponderance of the evidence that these claims of the '776 patent would have been unpatentable over Richardson and Turcott.

1. Turcott (Exhibit 1006)

Turcott is titled "Method for Monitoring Patient Using Acoustic Sensor." Ex. 1006, code (54). Turcott relates to a "method for monitoring the progression of the disease of a heart failure patient" such that an implantable monitor "senses acoustic signals including heart and lung sounds within the patient." *Id.* at code (57). Turcott discloses an "implantable monitoring device[]" for "monitoring the status of a patient[] with a chronic disease such as heart failure using heart and lung sounds." *Id.* at 1:13–16. Turcott proposes implanting a device in the patient's chest that can detect the sounds made by the patient's heart and lungs and relay that information to the physician several times a day. *Id.* at 6:58–7:30. Turcott asserts that changes in the sounds made by the heart and lungs can signal a medical problem. *Id*.

Turcott's device is sized and shaped to be implanted within a tissue pocket in the patient. *Id.* at 8:65–9:4, 14:11–12 ("implantable hemodynamic

monitor is configured for subcutaneous or submuscular implantation"). The device includes a diaphragm, or other component, that can sense acoustic signals (i.e., sounds of the heart or lungs) at different time intervals. *Id.* at 6:58–17, 9:49–52. The device calculates the energy of the acoustic signal at each time and compares the energies to determine whether the condition of the patient has deteriorated. *Id.*

In one embodiment, the implantable device also includes a "light source 26 and detector 28, preferably LEDs and photodiode, respectively." *Id.* at 9:28–29. "The source and detector are preferably placed on the side of the device that, following implantation, faces the chest wall." *Id.* at 9:35–37. The source and detector are "used for both vascular plethysmography and for measuring the oxygen saturation of arterial hemoglobin." *Id.* at 9:30–32. Turcott discloses that "[t]he optical power generated by the [light] source is adjusted to optimize the signal to noise ratio and to minimize power consumption" by adjusting "the drive current" or "the duty cycle of the pulse train," and "[t]o conserve energy, the [light] source is preferably driven with a low duty cycle pulse train." *Id.* at 11:51–59

2. Independent Claims 1 and 11

Petitioner contends that claims 1 and 11 would have been obvious over the combination of Richardson and Turcott. Because we determine that Richardson and Turcott do not disclose certain limitations of claims 1 and 11 (*see* limitation 1[d] above), and because Petitioner has not provided a rational basis for combining Richardson and Turcott to arrive at these same limitations, Petitioner has not proven by a preponderance of the evidence that claims 1 and 11 are unpatentable. We examine these limitations below.

Petitioner's Contentions

Petitioner argues that "Richardson discloses that in State 2, the red light source 2 is turned off and has a duty cycle of 0%, and the infrared light source is operated with a duty cycle of at least 25%." Pet. 49 (citing e.g., Ex. 1003 ¶¶ 49–50, 86). According to Petitioner, in State 1, both the red and infrared light sources are activated with a duty cycle of at least 25%. Pet. 50. Petitioner argues that "Turcott describes a pulse oximeter where '[t]he optical power generated by the [light] source is adjusted to optimize the signal to noise ratio and to minimize power consumption' by adjusting 'the duty cycle of the pulse train,' and '[t]o conserve energy, the [light] source is preferably driven with a low duty cycle pulse train.'" *Id.* (quoting Ex. 1006, 11:51–59).

Based on these factors, Petitioner argues that a person of ordinary skill in the art

> would have recognized that the predictable modification of Richardson's oximeter as suggested by Turcott would include implementing the oximeter to reduce the duty cycle of the pulse train for operating the infrared light source in State 2, as compared to the duty cycle of the pulse train for operating the infrared or red light source in State 1, to minimize power consumption, as suggested by Turcott.

Pet. 50 (citing Ex. 1003 ¶ 87; Ex. 1006, 11:51–59).

Petitioner contends that a person of ordinary skill in the art would have been motivated to combine Richardson and Turcott "to achieve a pulse oximeter that optimizes the signal-to-noise ratio and minimizes power consumption." Pet. 46. According to Petitioner, Richardson contemplates adjusting the duty cycles because it discloses a "duty cycle of at least 1 in 4," and "Turcott confirms that reducing the duty cycle of the light source

optimizes the signal-to-noise ratio and minimizes power consumption." Pet. 46–47 (quoting Ex. 1004, 4:6–10) (citing Ex. 1006, 11:54–59); Pet. Reply 19 ("Richardson contemplates adjusting the duty cycles . . . and describes shifting the frequency of the pulse train . . . and that Turcott confirms that adjusting the duty cycle and/or shifting the frequency of the light source optimizes the signal-to-noise ratio and/or minimizes power consumption."). Petitioner relies on Richardson's description of shifting the frequency of the pulse train, which Turcott mentions is also performed in addition to adjusting the duty cycle. Pet. 47 (citing Ex. 1004, 3:1–17, 5:53–54, 7:58–63; Ex. 1006, 11:59–61).

Petitioner argues that a person of ordinary skill in the art would have been motivated to implement Turcott's teaching of reducing the duty cycle to lower power consumption in a pulse oximeter in combination with Richardson's pulse oximeter to further minimize power consumption. *Id.* According to Petitioner, the objectives of implementing Turcott's teaching of reducing the duty cycle to minimize power consumption and operating a pulse oximeter according to a first and second control protocol as taught by Richardson, would have been routine and straightforward to a person of ordinary skill in the art. *Id.*; Pet. Reply 20–21. Petitioner also argues that a person of ordinary skill in the art "would have also been motivated to adjust, e.g., by increasing, the duty cycle to optimize signal to noise ratio when the signal to noise ratio is low." Pet. Reply 21.

Patent Owner's Contentions

Patent Owner contends that "Turcott, like Richardson, does not disclose low power patient monitors that reduce power consumption by intermittently alternating between first and second duty cycles." PO

Resp. 56 (citing Ex. 2002 ¶ 100). Patent Owner argues that Turcott does not teach operating a light source according to two different duty cycles as required by the claims. *Id.* (citing Ex. 2002 ¶¶ 101–105). Instead, according to Patent Owner, "Turcott suggests operating a light source according to a ***single***, low duty cycle," whereas "Turcott states, '[t]o conserve energy, the source is preferably driven with a low duty cycle pulse train.'" *Id.* (quoting Ex. 1006, 11:51–52). Further, "Turcott never suggests a corresponding high duty cycle pulse train, much less intermittently changing from a low duty to a high duty cycle." *Id.* at 56–57 (citing Ex. 2002 ¶ 102).

Patent Owner notes that although Turcott discloses adjusting the duty cycle of the pulse train as one way of adjusting the optical power generated by the source to optimize the signal to noise ratio and to minimize power consumption, the adjustments are not in real-time and a person of ordinary skill in the art would have understood Turcott to suggest selecting such a configuration during product design or setup. *Id.* at 57 (citing Ex. 1006, 11:54–59; Ex. 2002 ¶¶ 103–104). As support for this position, Patent Owner points out that Turcott does not identify any conditions that would trigger a transition from a first duty cycle to a second duty cycle and Turcott does not disclose hardware and software necessary to make such real-time transitions. *Id.* Patent Owner argues that a person of ordinary skill in the art would have understood that Turcott does not disclose or enable "adjusting the drive current, the frequency of the pulse train, the pulse duration, or the duty cycle of the pulse train" in real-time during patient monitoring. *Id.*

Thus, according to Patent Owner, Turcott would not have motivated a person of ordinary skill in the art to "modify Richardson's operating states to have first and second duty cycles." *Id.* Instead, Dr. Madisetti testifies that

Turcott would have motivated a person or ordinary skill in the art to reduce all duty cycles in Richardson's oximeter uniformly during product design or setup. Ex. 2002 ¶ 104. Patent Owner concludes that a person of ordinary skill in the art would not have understood Turcott to disclose or suggest operating a monitor according to a "first duty cycle" and "second duty cycle," and would not have been motivated by Turcott to modify Richardson to operate according to the "first duty cycle" and "second duty cycle." PO Resp. 58 (citing Ex. 2002 ¶¶ 101–105).

Patent Owner next argues that "Petitioner does not explain why Turcott would have motivated a person of ordinary skill in the art to adjust the duty cycle in Richardson's State 2 ('first mapping')." PO Resp. 58 (emphasis omitted). Patent Owner contends that using Turcott's teaching of reducing the duty cycle to lower power consumption in a pulse oximeter does not provide a motivation to adjust the duty cycle between two states. *Id.* (citing Ex. 2002 ¶¶ 106–112).

Patent Owner, relying on the testimony of Dr. Madisetti, contends that if a person of ordinary skill in the art wanted to '"minimize power consumption' of a patient monitor, the person would have set the activation of the sensor at a single level associated with a low power consumption." *Id.* Dr. Madisetti testifies that:

> The person of ordinary skill in the art would have had no motivation to use a different "duty cycle" where one of the duty cycles would have resulted in a higher power consumption level. Operating Richardson's oximeter at a constant power consumption level would have been consistent with Richardson's disclosure, which describes operating Richardson's light sources at a constant duty cycle of at least 25%. Ex. 1004 (Richardson) at 4:6–7.

Ex. 2002 ¶ 107. Patent Owner further contends that "Petitioner never identifies any motivation for a POSITA to intermittently change between a 'first duty cycle' and a 'second duty cycle' during patient monitoring." PO Resp. 59.

Next, Patent Owner argues that a person of ordinary skill in the art "would have been discouraged from changing the duty cycle, as argued by Petitioner, without proper patient and signal protections in place." *Id.* (citing Ex. 2002 ¶ 108). Patent Owner points out that at certain critical times during low signal quality periods or when critical measurements are necessary, it would be necessary to trigger the monitor to increase the duty cycle. *Id.* Yet, neither Richardson nor Turcott teach a feedback loop whereby physiological measurements or internal parameters are used to adjust the duty cycle. *Id.* (citing Ex. 2002 ¶ 108). Patent Owner argues that Petitioner likewise does not propose modifying Richardson or Turcott to include such a feedback loop. *Id.*

Patent Owner contends that because Turcott is an implantable device, a person of ordinary skill in the art would have desired a constant low duty cycle for such a device. PO Resp. 60. Patent Owner argues that Turcott does not disclose adjusting the activation level of its sensors in real-time, but prefers a constant low duty cycle in order to prolong the life of the device. *Id.* (citing Ex. 2002 ¶ 109). Running the implantable device at a different, higher power consumption level, as required by the challenged claims, would reduce the life of the device, according to Patent Owner. *Id.*

Patent Owner next argues that a person of ordinary skill in the art would not have been motivated to use Richardson as the starting point for a low power patient monitor. PO Resp. 60. This is so because "Richardson's

device 'requires a computational overhead to constantly monitor which frequency of operation provides the least noise.'" *Id.* (quoting Ex. 2008, 4:30–42). Thus, according to Patent Owner, a person of ordinary skill in the art would not have envisioned Richardson as the starting point for a low power patient monitor. *See* Ex. 2002 ¶ 110.

Patent Owner further argues that "Petitioner does not explain how the combination of Richardson and Turcott would operate to adjust Richardson's duty cycle." PO Resp. 60 (citing Ex. 2002 ¶¶ 111–112). Patent Owner notes that "in order for Richardson's oximeter to adjust the duty cycle of Richardson's LEDs, the oximeter must send a signal to the emitter drivers and the emitter drivers must be capable of changing the duty cycle of supplied current between different non-zero duty cycles." *Id.* at 61 (citing Ex. 2002 ¶ 112). "Yet, Richardson does not send a signal to the emitter drivers to change the duty cycle," but instead, "only turns the LEDs off or operates the LEDs at a 25% duty cycle." *Id.* at 61 (citing Ex. 2002 ¶ 112). Dr. Madisetti testifies that "Richardson would need, at a minimum, additional hardware and/or software to change the duty cycles and some sort of trigger to change the duty cycles," yet, "Richardson discloses neither." Ex. 2002 ¶ 112.

Patent Owner contends that a person of ordinary skill in the art would not have been motivated to reduce Richardson's duty cycle of the pulse train for operating the infrared light source in State 2 and instead would have been discouraged from making such a reduction. PO Resp. 62 (citing Ex. 2002 ¶ 113). Patent Owner notes that "[i]n State 2, Richardson's oximeter reassesses the noise 'by turning off one LED; typically the red LED.'" *Id.* (quoting Ex. 1004, 6:2–3). Patent Owner relies on Richardson's disclosure

"that '[t]he red LED is turned off for approximately 1.4 seconds,'" and "[w]hen the one LED is turned off, 'the pulse oximeter cannot calculate blood oxygen saturation, but it can monitor pulse rate and otherwise give the appearance of operating normally.'" *Id.* (quoting Ex. 1004, 9:52–53, 6:4–7). "Thus," according to Patent Owner, when Richardson is "in State 2, the functionality of the oximeter is compromised," and "'the pulse oximeter may continue to display the last computed oxygen saturation number throughout State 2 even though no new saturations numbers can be computed.'" *Id.* at 63 (quoting Ex. 1004, 9:47–51) (citing Ex. 2002 ¶ 115). Dr. Madisetti testifies that because the information generated by the active LED becomes critical in State 2 and the only source of real-time information about the patient's condition for the oximeter, a person of ordinary skill in the art "would not have been motivated to reduce the duty cycle of the only active LED because that reduction in the duty cycle could result in erroneous or unreliable readings." Ex. 2002 ¶ 115.

Patent Owner further notes that any power savings from reducing the duty cycle in State 2 of the active LED would be negligible because Richardson's oximeter remains in State 2 for only about 1.4 seconds, or less than about 4.7% of its operating time (i.e., approximately 1.4 seconds / 30 seconds). PO Resp. 63. Because the power savings would be minimal, a person of ordinary skill in the art would not have been motivated to risk the health and safety of a patient for such a minimal power savings. Ex. 2002 ¶ 116.

Analysis

Based on the final record before us, the combination of Richardson and Turcott does not teach operating according to first and second duty

cycles as claimed. Petitioner has also not persuasively demonstrated that a person of ordinary skill in the art would have been motivated to combine Richardson and Turcott to adjust the duty cycle of Richardson's oximeter as alleged by Petitioner.

Petitioner argues that the references render the limitations of claims 1(d) and 11(d) obvious because "Richardson contemplates adjusting the duty cycles" and "Turcott confirms that adjusting the duty cycle . . . of the light source optimizes the signal-to-noise ratio and/or minimizes power consumption." Pet. Reply 19; Pet. 46–51. We disagree for several reasons.

First, Petitioner has not persuasively established that Richardson's disclosure of operating at a duty cycle of at least 25% contemplates using multiple duty cycles as set forth in the claims. *See* Pet. Reply 19 ("Richardson contemplates adjusting the duty cycles" because it discloses a "duty cycle of at least 1 in 4."). Further, the claims do not require merely "adjusting" a duty cycle. Rather, the claims require a transition from the patient monitor operating according to a first control protocol to a second control protocol, in which a second control protocol light source is operated according to a second duty cycle different from the first. *See, e.g.*, Ex. 1001, claim 1. Petitioner has not shown that any reference or combination of references meets these limitations. We find Dr. Madisetti's testimony persuasive that Richardson does not mention or suggest operating according to different non-zero duty cycles during patient monitoring. Ex. 2002 ¶ 119. Richardson merely states, "[a] clock controls the sequential output of light from the light emitting diodes and to a duty cycle of at least 1 in 4." Ex. 1004, 4:6–7. Thus, while Richardson recognizes the light emitting diodes could operate at a single duty cycle of at least 25%, Richardson contains no

disclosure suggesting that its light source could operate at a first duty cycle and then transition to a second duty cycle as the claims require. Ex. 2002 ¶ 119.

Next, Turcott, like Richardson, does not disclose low power patient monitors that reduce power consumption by transitioning between first and second duty cycles. *See* Ex. 2002 ¶ 100. Likewise, Turcott does not teach operating a light source of a patient monitor according to first duty cycle and then transitioning to a second duty cycle as required by the claims. *Id.* ¶¶ 100–105. Turcott states, "[t]o conserve energy, the source is preferably driven with a low duty cycle pulse train." Ex. 1006, 11:51–52. We find persuasive Dr. Madisetti's testimony that "Turcott encourages using a single low duty cycle, but it does not disclose intermittently changing between two different duty cycles." Ex. 2002 ¶ 100.

Petitioner relies on portions of Turcott that state "[t]he optical power generated by the source is adjusted to optimize the signal to noise ratio and to minimize power consumption." Ex. 1006, 11:54–57; Pet. 46, 49, 50. Turcott conveys that this "can be done by adjusting the drive current, the frequency of the pulse train, the pulse duration, or the duty cycle of the pulse train." Ex. 1006, 11:57–59. Dr. Anthony contends that Turcott describes shifting the frequency of the pulse train and adjusting the duty cycle from one duty cycle to another, and infers that these things could be done during normal operation of the device to reduce power consumption. *See, e.g.*, Ex. 1003 ¶¶ 81, 82, 87. We do not agree that Turcott teaches shifting the frequency of the pulse train or adjusting the duty cycle during normal operation of the device as alleged by Petitioner. We have considered Dr. Anthony's testimony as to these points, but we determine that the scope

of Turcott's teachings are better explained by Dr. Madisetti. We find more persuasive Dr. Madisetti's testimony and reasoning that a person of ordinary skill in the art would have understood that Turcott's adjustments would happen during device design or setup, and not during operation of the device. Ex. 2002 ¶¶ 101–105. This is so because Turcott discloses operating at a single, low duty cycle that minimizes power consumption. *See* Ex. 2002 ¶ 104; Ex. 1006, 11:51–52 ("To conserve energy, the source is preferably driven with a low duty cycle pulse train."). We also find persuasive Dr. Madisetti's cross-examination testimony that the use of the terminology "optical power generated by the source is adjusted" in Turcott, "refers and describes to a POSA that it's adjusted, past tense, at design time or manufacturing or setup," and that "Turcott refers to this adjusted in past tense through the term 'adjusting' referring to that time at manufacturing or setup." Ex. 1038, 22:16–24:15.

We further base our determinations as to Turcott's teachings on the following evidence and argument set forth by Patent Owner (Sur-reply 15–16) and Dr. Madisetti (Ex. 2002 ¶¶ 100, 104, 109): (1) Turcott never discloses or suggests transitioning the duty cycle during operation and Turcott also does not disclose or enable making duty cycle adjustments in real-time during continuous monitoring as Petitioner alleges, (2) Turcott does not identify any conditions during patient monitoring that would trigger

any duty cycle adjustments,[2] (3) Turcott does not disclose the hardware and software necessary to make such duty cycle adjustments in real-time, and (4) Turcott describes an implantable device[3] where a constant low duty cycle would have been important to prolong the device's life. Petitioner attempts to backfill the lack of disclosure examined above by simply alleging that the significant changes that would be required to incorporate Turcott's teachings into Richardson are within the skill level of the person of ordinary skill in the art. *See* Pet. Reply 22. Based on the final record before us, Petitioner's contentions lack evidentiary support.

Petitioner also has not persuasively demonstrated that a person of ordinary skill in the art would have been motivated to combine Richardson and Turcott to adjust the duty cycle of Richardson's oximeter. *See* Ex. 2002 ¶ 112. We find persuasive Dr. Madisetti's testimony that the teachings

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[2] The claims require operating the patient monitor according to second control protocol based on a "response to receiving [a] trigger signal." Ex. 1001, 11:63. Petitioner does not identify any such trigger signal in Turcott that would cause the optical power generated by the light source to be adjusted. *See* Pet. 49; Ex. 1003 ¶ 85. Petitioner also does not explain how any alleged trigger signal in Richardson could be integrated with the teachings of Turcott. *See id.*

[3] Patent Owner alleges that Turcott's device is "an implantable, invasive device." *See, e.g.*, Sur-reply 16. As Petitioner points out, Turcott at least suggests that some of its sensors "can be used in noninvasive, external embodiments, in contrast to incorporation in an implantantable monitor." Pet. Reply 21–22 (quoting 1006, 11:66–12:15). However, Turcott describes the "Field of the Invention" as "implantable monitoring devices" and discourages the use of noninvasive sensors. Ex. 1006, 1:14–17, 11:66–12:28 ("the preferred embodiment for these sensors is in an implanted, extravascular configuration"). Petitioner also did not rely on any alleged "noninvasive" embodiments for its obviousness arguments. *See* Pet. 45–48 (citing Ex. 1006, 11:15–61). Regardless, this single factor is not dispositive.

found in Turcott would not have motivated a person of ordinary skill in the art to modify Richardson's operating states to transition between first and second duty cycles as claimed. Ex. 2002 ¶ 104. To the contrary, we agree with Patent Owner that Turcott would have motivated a person of ordinary skill in the art to reduce all duty cycles in Richardson's oximeter uniformly during product design or setup. *Id.*

Petitioner maintains that a person of ordinary skill in the art "would have been motivated to modify Richardson based on Turcott's teachings to achieve a pulse oximeter that optimizes the signal-to-noise ratio and minimizes power consumption." Pet. Reply 20. In light of the final record before us, we do not find Petitioner's contentions sufficient to meet its burden.

Patent Owner has shown persuasively that a person of ordinary skill in the art that was intent on minimizing power consumption would have run the system at a single, low duty cycle to consume the least amount of power. *See* PO Resp. 58–59. Both Richardson and Turcott operate in this manner and neither reference suggests deviating from this approach. *Id.* at 56–59; Ex. 1006, 11:51–52; Ex. 1007, 36:6–15. Expanding Turcott's teaching of reducing a single duty cycle to minimize power consumption to capture a pulse oximeter transitioning between a first and second control protocol as claimed is not supported by the evidence before us.

In light of this evidence, Petitioner shifts its argument to assert, "a POSITA would not have merely wanted to minimize power consumption of the patient monitor, but would have also wanted to optimize signal to noise ratio." Pet. Reply 21 ("POSITA would have also been motivated to adjust, e.g., *by increasing*, the duty cycle to optimize signal to noise ratio when the

signal to noise ratio is low.") (emphasis added). This argument is not persuasive for the reasons set forth below. The argument is also contradictory because Dr. Anthony conversely stated that "Turcott confirms that *reducing* the duty cycle of the light source optimizes the signal-to-noise ratio." Ex. 1003 ¶ 81 (emphasis added).

Regardless, Petitioner does not persuasively show why a person of ordinary skill in the art would have been motivated to "optimize" Richardson's signal-to-noise ratio. *See* Pet. 46–48; Ex. 1003 ¶¶ 81–83 (providing no explanation). Richardson already teaches a distinct method for its oximeter to achieve a low signal-to-noise ratio. Richardson discloses a method of "identifying a pulse oximeter demultiplexing frequency at which the contribution of noise to the signal is relatively low." Ex. 1004, 3:7–10; *see also* PO Resp. 31–32 ("selecting the frequency with the least noise to serve as the operating frequency" and "also periodically rescans the available frequencies to reevaluate the noise level and switches to a less noisy frequency") (citing Ex. 1004, 2:37–51). Because Richardson already purports to solve the problem Petitioner identified as the motivation to combine, and because Petitioner never adequately explains why Richardson's existing method for handling the signal-to-noise ratio is insufficient and would have required supplementation with Turcott, we determine that Petitioner's basis for modifying Richardson in light of Turcott is not supported by a preponderance of the evidence before us. *See* Sur-reply 18.

We have considered Petitioner's additional reasons for combining Richardson and Turcott, but find that these explanations are not tied to any particular claim limitation and are also unsupported by the final record. *See*

Pet. 47–48 ("obvious to modify Richardson with Turcott because doing so entails the use of known solutions" and arguing, in general, that "Turcott's teachings" could be applied to "Richard's pulse oximeter" because the results were predictable). Further, to the extent that the "technique of reducing [a] duty cycle to lower power consumption" was indeed "well-known," (Pet. 48) this technique is not what is claimed and does not support Petitioner's conclusion that actively operating a patient monitor according to two distinct control protocols with first and second duty cycles as claimed was also well-known.

Patent Owner identifies other reasons why a person of ordinary skill in the art would not have been motivated to combine Richardson and Turcott. *See* PO Resp. 58–62; Sur-reply 19. In light of our analysis above, and Petitioner's burden to show a reasonable basis for combining the references, which we determine they have not met, we need not address Patent Owner's additional reasons.

3. Dependent Claims 2–9 and 12–16

Because of each of dependent claims 2–8 and 12–16 depend from claims 1 or 11, we likewise determine that Petitioner has failed to demonstrate by a preponderance of the evidence that Richardson and Turcott would have rendered obvious any of these dependent claims for the reasons set forth above for claims 1 and 11.

G. Obviousness over Richardson, Turcott, and Bindszus

Petitioner contends that claims 9 and 10 would have been obviousness over Richardson, Turcott, and Bindszus. Pet. 62–63. Based on the final record, and for the reasons set forth above and below, Petitioner has not

shown by a preponderance of the evidence that these claims of the '776 patent would have been unpatentable over Richardson, Turcott, and Bindszus.

In the ground based on Richardson, Turcott, and Bindszus, Petitioner argues that Bindszus satisfies the additional limitations in dependent claims 9 and 10. Pet. 62–63. Petitioner does not argue that Bindszus satisfies any limitations in claim 1 that we found lacking above. *Id.* For these reasons, Petitioner has not persuasively shown that claims 9 and 10 would have been obvious over the combination of Richardson, Turcott, and Bindszus.

H. Obviousness over the "Second Mapping" of Richardson Alone or in Combination with Turcott or in Combination with Bindzus and Turcott

As noted above in the "Asserted Grounds," Petitioner asserts three distinct grounds of unpatentability based on the "second mapping" of Richardson. *See also* Pet. 3 (asserting (i) Richardson, (ii) Richardson and Turcott, and (iii) Richardson, Turcott, and Bindszus).

As we explained above in the claim construction analysis, Petitioner's "second mapping" of Richardson is based on a claim construction position that Petitioner has abandoned. *See* Pet. 26, 30 ("Richardson teaches this limitation under an alternate construction of this limitation that does not require different duty cycles"). During the oral hearing, Petitioner conceded that it was now accepting the position that that the first and second duty cycle must be different. Tr. 6:1–7 (Petitioner's counsel stating that "the parties agree that the claims require the first and second duty cycle to be different."). For the reasons set forth above, we agree that the first and second duty cycle must be different. Accordingly, each of the grounds

based on the "second mapping" of Richardson has been conceded by Petitioner. Petitioner has not shown by a preponderance of the evidence that any claim of the '776 patent is invalid based upon the "second mapping" of Richardson.

III. CONCLUSION

In summary:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–8, 11–16	103	Richardson (first mapping)		1–8, 11–16
1–9, 11–16	103	Richardson (second mapping)		1–9, 11–16
9, 10	103	Richardson (either mapping) and Bindszus		9, 10
1–9, 11–16	103	Richardson and Turcott (first mapping)		1–9, 11–16
1–9, 11–16	103	Richardson and Turcott (second mapping)		1–9, 11–16
9, 10	103	Richardson and Turcott (either mapping) and Bindszus		9, 10
Overall Outcome				1–16

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–16 of the ’776 patent are not determined to be unpatentable; and

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

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