

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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APPLE INC.  
Petitioner,

v.

VALENCELL, INC.  
Patent Owner.

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IPR2017-01947  
Patent 9,044,180 B2

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Before BRIAN J. McNAMARA, JAMES B. ARPIN, and  
SHEILA F. McSHANE, *Administrative Patent Judges*.

McSHANE, *Administrative Patent Judge*.

DECISION  
Granting Institution of *Inter Partes* Review  
*37 C.F.R. § 42.108*

## I. INTRODUCTION

### *A. Background*

Apple Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–32 (“the challenged claims”) of U.S. Patent No. 9,044,180 B2 (Ex. 1001, “the ’180 patent”) pursuant to 35 U.S.C. §§ 311–319. Paper 2 (“Pet.”). Valencell, Inc. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 6 (“Prelim. Resp.”).

We have authority under 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the Petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

We determine that Petitioner demonstrates that there is a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. For the reasons set forth below, we institute an *inter partes* review of claims 1–21 and 24–32.

### *B. Related Proceedings*

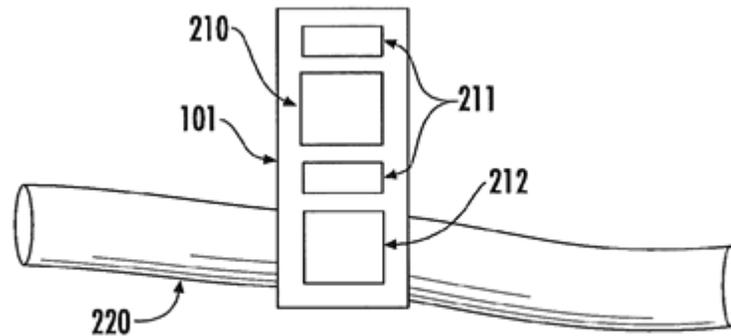
Petitioner indicates that it is not aware of any civil action or proceeding concerning the ’180 patent. Pet. 73. The parties identify U.S. Patent Application No. 14/023,127 as claiming priority to the ’180 patent. *Id.*; Paper 5, 1.

### *C. The ’180 Patent*

The ’180 patent is entitled “Noninvasive Physiological Analysis Using Excitation-Sensor Modules And Related Devices And Methods” and issued on June 2, 2015, from an application filed on July 18, 2012.

Ex. 1001, at [22], [45], [54]. The '180 patent claims priority to U.S. Patent Application No. 12/256,793—now U.S. Patent No. 8,251,903 B2—and U.S. Provisional Patent Application No. 61/000,181. *Id.* at [60], [63].

The '180 patent is directed generally to wearable sensors for monitoring health. Ex. 1001, 1:16–17, 1:46–49. The '180 patent further is directed to removing noise from the wearable sensors. *Id.* at 1:46–49. In order to accomplish this, excitation-sensor module 101, as shown in Figure 2 reproduced below, takes measurements from two adjacent areas of the body.



**FIG. 2**

Figure 2 depicts “an excitation-sensor module 101 positioned noninvasively over the surface 120 (i.e., the skin) of an organism such that an optical emitter 212 is positioned over an area largely covering or completely covering a blood vessel and an optical emitter 210 is positioned over an area near, but not covering, the blood vessel.” Ex. 1001, 6:45–50. Signals received from light scattered in the region not over the blood vessel may be subtracted from signals received from light scattered from the region covering the blood vessel to obtain a cleaner signal. *Id.* at 6:53–62.

Claims 1, 26, and 29 are independent claims, with illustrative claim 1 of the '180 patent reproduced below.

1. A method of monitoring at least one physiological property of an organism, comprising:

directing energy at a target region of the organism and at a region adjacent the target region, wherein the target region comprises more blood flow than the adjacent region;

detecting an energy response signal from the target region and an energy response signal from the adjacent region;  
and

processing the detected signals to produce an extracted energy response signal, comprising subtracting a signal associated with motion of the organism,

wherein the directing, detecting and processing steps are performed by a device worn by the organism.

Ex. 1001, 12:54–67.

*D. Asserted Grounds of Unpatentability*

Petitioner asserts the following grounds of unpatentability:

Ground	Claim(s)	References
§ 103(a)	1–17 and 21–32	Kondo, <sup>1</sup> Hatschek, <sup>2</sup> and Stivorac <sup>3</sup>
§ 103(a)	18	Kondo, Hatschek, Stivorac, and Kim <sup>4</sup>
§ 103(a)	19, 20	Kondo, Hatschek, Stivorac, and Villers <sup>5</sup>

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<sup>1</sup> U.S. Patent Application Publication No. 2003/0109791 A1 (published June 12, 2003). Ex. 1163.

<sup>2</sup> U.S. Patent No. 5,299,570 (issued April 5, 1994). Ex. 1164.

<sup>3</sup> U.S. Patent Application Publication No. 2004/0039254 A1 (published February 26, 2004). Ex. 1049.

<sup>4</sup> U.S. Patent No. 5,448,082 (issued September 5, 1995). Ex. 1167.

<sup>5</sup> U.S. Patent Application Publication No. 2005/0007582 A1 (published January 13, 2005). Ex. 1168.

Ground	Claim(s)	References
§ 103(a)	1, 4, 5, 11–14, 24–26, 29, and 32	O’Sullivan <sup>6</sup> and Steuer <sup>7</sup>
§ 103(a)	2, 3, 6–10, 15–17, 27, 28, 30, and 31	O’Sullivan, Steuer, and Stivoric
§ 103(a)	18	O’Sullivan, Steuer, and Kim
§ 103(a)	19 and 20	O’Sullivan, Steuer, and Villers
§ 103(a)	21	O’Sullivan, Steuer, and Lewis <sup>8</sup>

Pet. 5.

## II. ANALYSIS

### A. *Unconstitutionality of Inter Partes Reviews*

Patent Owner objects to the use of *inter partes* reviews as unconstitutional based, at least, upon the reasons presented in the petition for certiorari that was granted in *Oil States Energy Services, LLC v. Greene’s Energy Group, LLC*. Prelim. Resp. 52; *see Oil States Energy Servcs. LLC v. Greene’s Energy Grp., LLC*, No. 16-712, 137 S. Ct. 2239 (2017).

Patent Owner’s arguments relate to the constitutionality of *inter partes* review generally. At this time, no court has found *inter partes* review unconstitutional, and we are bound by Federal Circuit precedent. *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284 (Fed. Cir. 2015), *cert. denied*, 85 U.S.L.W. 3163, 3165, 137 S. Ct. 292 (2016). *Oil States* is before the U.S. Supreme Court, and Patent Owner’s arguments as to jurisdiction are premature.

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<sup>6</sup> U.S. Patent No. 5,494,043 (issued February 27, 1996). Ex. 1165.

<sup>7</sup> U.S. Patent No. 6,725,072 B2 (issued April 20, 2004). Ex. 1166.

<sup>8</sup> U.S. Patent No. 5,139,025 (issued August 18, 1992). Ex. 1169.

*B. Claim Construction*

In an *inter partes* review, the Board interprets claim terms in an unexpired patent according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as they would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A claim term, however, “will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history.” *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002).

Petitioner proposes interpretations for the several claim terms including “adjacent,” with Patent Owner also addressing the interpretation of this term. *See* Pet. 10–15; Prelim. Resp. 17–24.

Petitioner proffers that the claim term “adjacent” should be construed to allow interpretation in at least two ways: adjacent in a direction of depth into the body, and adjacent in a direction lateral along the surface of the body. Pet. 11. Petitioner alleges that the Specification of the ’180 patent defines “adjacent” as “a structure or feature that is disposed ‘adjacent’ another feature may have portions that *overlap or underlie* the adjacent feature.” *Id.* (citing Ex. 1001, 5:17–21 (emphasis added)).

Patent Owner contends, however, that the Specification does not express an intent to redefine the term “adjacent,” but “merely clarifies that adjacent features can have overlapping or underlying portions.” Prelim. Resp. 19. Patent Owner asserts that the use of the word “portions” in the

cited sentence in the Specification is significant, and, although portions may *overlap or underlie*, there is no support that overlapping features that are on entirely different planes would be adjacent. *Id.* Patent Owner contends that Petitioner does not identify any embodiments which support Petitioner’s proposed construction, and the Specification also does not discuss the penetration depth of the directed energy as an example of “adjacency.” *Id.* at 19–20. Patent Owner avers that the Specification “only discusses adjacency in terms of the regions to which the optical emitters direct light,” and that the Specification supports “adjacent” as two regions that overlap, but, nonetheless, are laterally adjacent. *Id.* at 20–21 (citing Ex. 1001, 1:64–2:1, 2:6–13, 2:31–37, 2:39–45, 2:51–54, 2:55–59, 3:8–12, 3:13–17, 3:17–38, 3:49–53, 6:45–65, Fig. 2).

Patent Owner further argues that the term “adjacent” does not require construction as its usage throughout the Specification is consistent with the plain and ordinary meaning of “next to or adjoining,” as evidenced by cited dictionary definitions. Prelim. Resp. 22 (citing Ex. 2001; Ex. 2003). Patent Owner argues, however, that, if claim construction is required, it should be applied to the broader phrase of “a region adjacent to the target area” and that the interpretation of the phrase should be “an area that is laterally next to or adjoining the area to which energy is directed,” and does not include “areas that are at entirely disparate depths.” *Id.* at 22–23.

The Specification discloses “detecting an energy response signal from the target region and an energy response signal from a region adjacent to the target region,” with a “processor [] configured to subtract the energy response signal from the region adjacent to the target region from the energy response signal from the target region to produce an extracted energy

response signal.” Ex. 1001, 2:32–34, 51–59. The Specification further states that, “an optical emitter [] is positioned over an area largely covering or completely covering a blood vessel and an optical emitter 210 is positioned over an area near but not covering, the blood vessel.” *Id.* at 6:47–50. Further,

[an] embodiment utilizes multiple emitters, multiple detectors, or both, with each emitter and detector located in a distinct region in the vicinity of a blood vessel—either directly over the blood vessel or near but not covering the blood vessel. If the optical emitters and detectors are located too far apart from the region of interest, it can be difficult to extract the desired physiological-related signal. This is because optical scatter from separate areas can be too dissimilar for successful differential amplification and extraction of a clear physiologically related signal.

*Id.* at 9:60–10:2.

We do not discern, as the Petitioner asserts, that the portion of the Specification stating “a structure or feature that is disposed ‘adjacent’ another feature may have portions that overlap or underlie the adjacent feature” represents a clear intent of the patentee to define the term “adjacent.” *See* Ex. 1001, 5:17–21. Rather, the use of “may have” indicates that adjacent structures could have “portions that overlap or underlie,” but does not suggest recasting the ordinary meaning of “adjacent” to extend to regions that overlap or underlie each other *in any dimension*. The Specification discloses that the target regions covering or not covering a blood vessel, respectively, should be near to each other because, if they are too far apart, it may be difficult to extract the desired signals. *See* Ex. 1001, 6:47–50, 9:60–10:2. This is consistent with dictionary definitions of “adjacent,” which include “next to or adjoining” (Ex. 2001), “situated near

or next” (Ex. 2002), and “close to, lying near” (Ex. 2003). The ordinary meaning of the term “adjacent” would not preclude structures that may have some portions that overlap or underlie each other. In light of the Specification, and for the purposes of this Decision, we interpret the ordinary meaning of the term “adjacent” as “situated near, close to, or adjoining.”

In this proceeding, we determine that no other terms require an express construction.

*C. Alleged Obviousness of In View of Kondo and Other Prior Art*

Petitioner contends that claims 1–17 and 21–32 would have been obvious over Kondo, Hatschek, and Stivoric; claim 18 would have been obvious over Kondo, Hatschek, Stivoric, and Kim; and claims 19 and 20 would have been obvious over Kondo, Hatschek, Stivoric, and Villers. Pet. 15–39. To support its contentions, Petitioner provides explanations as to how the prior art discloses each claim limitation. *Id.* Petitioner also relies upon the Declaration of Brian W. Anthony, Ph.D. (Ex. 1003) (“Anthony Declaration”) to support its positions. Patent Owner counters that the applied references do not render the claims obvious because the applied references fail to teach or suggest some claim limitations, and the rationale to combine the references is insufficient. Prelim. Resp. 24–38.

For purposes of this Decision, we are not persuaded by Petitioner’s explanation and evidence in support of the obviousness grounds asserted based upon the teachings of Kondo in combination with those of other prior art against claims 1–32. We begin our discussion with a brief summary of Kondo, Hatschek, Stivoric, Kim, and Villers and then address the evidence, analysis, and arguments presented by the parties.

1. Kondo (Ex. 1163)

Kondo discloses a biological data observation apparatus that monitors photoelectric volume pulse waves and uses a photoelectric sensor to irradiate light onto the blood vessel of a subject. Ex. 1063 ¶ 37. The photoelectric sensor has light emitting elements and light detecting elements that sense the relative change of blood flow as a change in the amount of light. *Id.* ¶ 40.

An embodiment of Kondo is shown in Figure 10, and reproduced below.

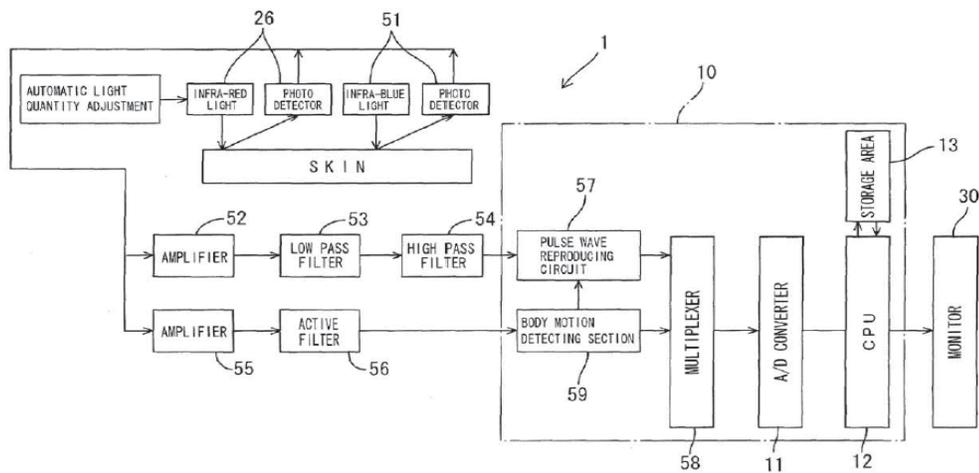


Figure 10 depicts a block diagram of the biological data observation apparatus with body sensor motion sensor 51 disposed side-by-side with photoelectric sensor 26. Ex. 1163 ¶¶ 22, 70, 71. Photoelectric sensor 26 irradiates light onto a blood vessel of a subject and measures photoelectric pulse waves. *Id.* ¶¶ 37, 46. Body motion sensor 51 emits LED light that “is reflected on a skin surface of the subject,” and with output of a phototransistor detecting slight motions of a subject. *Id.* ¶¶ 70, 71.

*2. Hatschek (Ex. 1164)*

Hatschek is directed generally to a system for measuring the saturation of gas in blood by generating light using different wavelengths emitted into the body and light receiving means for detecting the intensity of light scattered by the body. Ex. 1164, [57], 4:59–62, 5:1–19. Hatschek discloses that scattering of the desired light is predominantly done in the arteries present in the middle and/or deeper dermis. *Id.* at 5:20–24. Model calculations were done for skin divided into four layers with different light scattering and absorption properties: the horny layer of the epidermis, the germ layer, the outer layer of the dermis, and the middle and/or deeper layer of the dermis having arteries. *Id.* at 5:46–52.

Figure 1, reproduced below, is a schematic diagram, which is not to scale, of the skin of a living body, showing a sensor applied to the skin and a measuring device connected to the sensor which is shown in front view. Ex. 1164, 6:66–7:2.



parameters.” *Id.* ¶ 7. Stivoric discloses that noise from footsteps may be removed from acoustic signals related to the heart of the wearer. *Id.* ¶ 151.

#### 4. *Kim (Ex. 1167)*

Kim is directed generally to light emitting diodes (“LEDs”) used as optical sensors for both emitting and detecting light. Ex. 1167, [57], 2:66–3:2. Kim discloses that an LED may be used as a detector “by applying a reverse biased voltage to it.” *Id.* at 1:51–52. Kim further discloses a matched-wavelength, emitter and detector system consisting of two LEDs that are forward biased and reversed biased, so that a first LED operates as an emitter of light at a predetermined wavelength and a second LED operates as a detector of the same light. *Id.* at 5:35–41.

#### 5. *Villers (Ex. 1168)*

Villers is directed generally to optical sensors that may be used for a wide variety of biomedical applications including “collecting data from living subjects.” Ex. 1168, ¶¶ 3, 20–25, Fig. 1. Villers discloses the use of a light source such as LEDs that are implemented as a “typical monolithic sensor.” *Id.* ¶ 25, Fig. 1.

#### 6. *Analysis*

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter 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 ordinary skill in the art;<sup>9</sup> and (4) when in evidence, objective evidence of nonobviousness.<sup>10</sup> *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

*a. Claims 1–17 and 21–32*

Claims 1, 26, and 29 are the only independent claims of the '180 patent. Ex. 1001, 12:54–67, 14:24–35, 14:44–56.

Petitioner contends that the teachings of Kondo, in view of those of Hatschek and Stivoric, teach or suggest all of the limitations of claim 1, including the steps of monitoring a physiological property of an organism, directing energy at a target region and at a region adjacent to the target region, where the target region has more blood flow than the adjacent region, detecting energy responses from the regions, processing the detected signals to produce an extracted energy response signal that subtracts out a motion signal, wherein the steps are performed by a worn device. Pet. 16–21. Petitioner relies upon Kondo's disclosure of its photoelectric sensor 26 irradiating light onto a subject's blood vessel for the teaching of the limitation "directing energy at a target region" and Kondo's body motion sensor 51 for teaching the limitation of "directing energy" to "a region adjacent [to] the target area." *Id.* at 16–17 (citing Ex. 1163 ¶¶ 37, 40, 62, 71; Ex. 1003 ¶¶ 95–97). Petitioner refers to Kondo's disclosure that "body

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<sup>9</sup> Petitioner proposes an assessment of the level of ordinary skill in the art. Pet. 10; *see* Ex. 1003 ¶ 50. At this time, Patent Owner does not propose an alternative assessment. Prelim. Resp. 1–53. On this record, we adopt Petitioner's proposed assessment.

<sup>10</sup> Patent Owner does not present arguments or evidence of objective indicia in its Preliminary Response.

motion sensor 51 . . . disposed side by side with the photoelectric sensor 26,” with photoelectric sensor 26 irradiating light onto a blood vessel of a subject and body motion sensor 51 emitting light that “is reflected on a skin surface of the subject.” *Id.* (citing Ex. 1163 ¶¶ 37, 46, 62, 71; Ex. 1003 ¶¶ 95–97). To support Dr. Anthony’s testimony regarding the understanding of one of skill in the art, Petitioner relies on the skin structure depicted in Figure 1 of Hatschek, alleging that it would have been obvious that the skin may be divided into two adjacent layers, the epidermis which lacks blood vessels and the dermis containing blood vessels and “[t]he epidermis is directly above and adjacent to the dermis.” *Id.* at 18 (citing Ex. 1164, 7:26–42, Fig. 1; Ex.1003 ¶¶ 72, 73, 100).

Although each of independent claims 26 and 29 has some varying limitations from claim 1, the claims are substantially similar, and Petitioner relies upon similar evidence and arguments relating to the issues we address below that are common to each of the independent claims. *See* Pet. at 21–23.

On this record, we are not persuaded that Petitioner has provided sufficient support that the combination of the teachings of Kondo, Hatschek, and Stivoric adequately teaches or suggests all of the limitations of claims 1, 26, and 29.

The Petition alleges that, “[w]hile Kondo does not explicitly say that the ‘skin surface’ is ‘adjacent’ [to] the ‘blood vessel’ region, or that the ‘blood vessel’ region contains more blood flow than the ‘skin surface,’” this would have been obvious to a [person of ordinary skill in the art (“POSA”)].” Pet. 17 (citing Ex. 1003 ¶ 98). Petitioner argues that a person of ordinary skill in the art would have “understood that the different layers

of skin irradiated by sensors 26 and 51—the blood vessel region and the skin surface, respectively—constitute such overlapping areas” and, therefore, would have been considered to be adjacent each other. *Id.* (citing Ex. 1003 ¶ 99). Petitioner also contends that “[t]he Kondo-based grounds address the claims from the perspective of the target region underlying the adjacent region, such that the two regions are adjacent in a direction of depth.” *Id.* at 39. In further support, Petitioner contends that Hatschek evidences the known structure of the skin where “the epidermis 5, [] lacks blood vessels, and the dermis 6 contain[s] the blood vessels.” *Id.* at 18 (citing Ex. 1164, 7:26–42, Fig. 1; Ex. 1003, ¶¶ 72, 73, 100). Petitioner argues that a person of ordinary skill in the art would have understood that the dermis would have more blood than the epidermis, and that the different layers of skin irradiated “constitute [] overlapping areas and would have been considered by a POSA to be adjacent each other.” *Id.* at 17–18 (citing Ex. 1003 ¶¶ 99–101).

Petitioner’s evidence and explanations are insufficient to support a finding that Kondo teaches or suggests the claim 1 limitations of the “directing energy at a target region of the organism and at a region adjacent the target region, wherein the target region comprises more blood flow than the adjacent region” step as well as the “detecting” step. Kondo discloses that its photoelectric sensor 26 and body motion sensor 51 are side-by-side,<sup>11</sup> with photoelectric sensor 26 irradiating light onto a blood vessel of a subject

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<sup>11</sup> Because Figure 10 of Kondo is a block diagram, actual physical spatial relationships are not sufficiently discernable from it. Although the “side-by-side” description in the Specification may refer to the orientation of the respective boxes depicted in Figure 10 that are associated with photoelectric sensor 26 and body motion sensor 51, for the purposes of this Decision, we take the “side-by-side” description to refer to the physical orientation of the respective sensors within the pulse-wave measuring device.

and the body motion sensor 51 reflecting light on a skin surface of the subject. Ex. 1163 ¶¶ 37, 71. The “target region” of claim 1 as mapped to Kondo is “onto a blood vessel” (*id.* ¶ 37), and “a region adjacent the target region” is the top of the skin surface, because the light is “reflected” (*id.* ¶ 71). *See* Pet. 16–17. As Hatschek’s Figure 1 depicts, and Petitioner relies upon to support the understanding of one of skill in the art, blood vessels comprising arteries 13 and veins 12 and the smallest blood vessels for microscopic circulation (arterioles 9, venules 10, and capillary loops 11)<sup>12</sup>, are at a depth below the surface of the skin. As such, the “a region adjacent the target region” and the “target area” as mapped to Kondo, in light of Hatscek, are located, respectively, at the skin surface and at a blood vessel that is at some depth below the skin surface. The Petition does not address or explain directly how Kondo’s regions are “adjacent” in view of the light being directed to different depths, but rather conflates the issue to asserting that “[t]he epidermis is directly above and adjacent to the dermis.” Pet 18. Kondo’s disclosures are more specific as to where the target regions are, i.e., the skin surface and blood vessel, rather than Petitioner’s more generalized assertion of emitting light to the general dermis and epidermis areas.

Petitioner relies upon its proposed claim construction with the argument that the respective regions of Kondo merely have to “overlap or underlie” one another. Pet. 17. However, under the claim interpretation adopted for the purposes of this Decision, although “adjacent” areas may (or may not) overlap or underlie each other, the areas must, nevertheless, be

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<sup>12</sup> Petitioner does not identify onto which type of blood vessel Kondo’s photoelectric sensor 26 irradiates light in the view of one of ordinary skill in the art in its assertions.

“situated near, close to, or adjoining.” *See supra* Section II.B. Under this adopted claim interpretation, the evidence provided in support of Petitioner’s challenge is insufficient. As discussed above, even though the respective sensors 26 and 51 are disclosed to be “side-by-side” in Kondo, the target area and the area alleged to be adjacent to the target area will be at different depths in the skin layers. Besides the reference to the dermis and epidermis discussed above, which we discount, the Petition and Dr. Anthony’s testimony fail to point to any evidence or explain the proximate locations of different regions at different depths disclosed in Kondo. As such, we find the Petition deficient in its claim 1 obviousness challenge under the combined teachings of Kondo, Hatschek, and Stivoric. We also find the Petitioner’s obviousness challenge to independent claims 26 and 29 under the combined teachings of Kondo, Hatschek, and Stivoric is deficient for similar reasons.

Each of claims 2–17, 21–25, 27, 28, and 30–32 depend, directly or indirectly, from independent claims 1, 26, and 29. Ex. 1001, 13:1–15:4. Accordingly, in light of Petitioner’s failure to demonstrate a reasonable likelihood of prevailing on its assertion that independent claims 1, 26, and 29 are obvious over the combined teachings of Kondo, Hatschek and Stivoric, the obviousness challenges to dependent claims 2–17, 21–25, 27, 28, and 30–32 also fail.

*b. Claim 18*

Petitioner asserts that claim 18 is rendered obvious over Kondo, Hatschek, Stivoric, and Kim. Pet. 35–37. Claim 18 depends from independent claim 1. Ex. 1001, 13:58–64. As discussed above with regard to the ground challenging claim 1 based on the combined teachings of

Kondo, Hatschek, and Stivoric, Petitioner has not shown sufficiently that the applied references teach or suggest the “directing” or “detecting” step limitations. Petitioner does not allege that Kim teaches these limitations, but rather relies upon Kim to teach the additional limitation recited in claim 18. *See* Pet. 35–37. In light of Petitioner’s failure to demonstrate a reasonable likelihood of prevailing on its assertion that claim 1 is obvious over the combined teachings of Kondo, Hatschek, and Stivoric, the obviousness challenge to dependent claim 18 also fails.

*c. Claims 19 and 20*

Petitioner asserts that claims 19 and 20 are rendered obvious over the combined teachings of Kondo, Hatschek, Stivoric, and Villers. Pet. 37–39. Claims 19 and 20 indirectly depend from independent claim 1. Ex. 1001, 13:65–14:3. As discussed above with respect to the ground challenging claim 1 based on the combined teachings of Kondo, Hatschek, and Stivoric, Petitioner has not shown sufficiently that the prior art discloses the “directing” or “detecting” step limitations. Petitioner does not allege that Villers teaches these limitations, but rather relies upon Villers to teach the additional limitations recited in claims 19 and 20. *See* Pet. 37–39. In light of Petitioner’s failure to demonstrate a reasonable likelihood of prevailing on its assertion that claim 1 is obvious over the combined teachings of Kondo, Hatschek, and Stivoric, the obviousness challenges to dependent claims 19 and 20 also fails.

*D. Alleged Obviousness of In View of O’Sullivan and Other Prior Art*

Petitioner contends that: claims 1, 4, 5, 11–14, 24–26, 29, and 32 would have been obvious over the combined teachings of O’Sullivan and

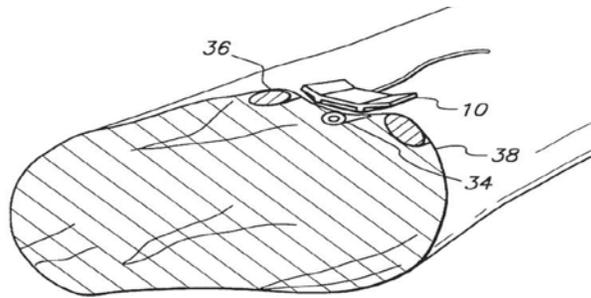
Steuer; claims 2, 3, 6–10, 15–17, 27, 28, 30, and 31 would have been obvious over the combined teachings of O’Sullivan, Steuer, and Stivoric; claim 18 would have been obvious over the combined teachings of O’Sullivan, Steuer, and Kim; claims 19 and 20 would have been obvious over the combined teachings of O’Sullivan, Steuer, and Villers; and claim 21 would have been obvious over the combined teachings of O’Sullivan, Steuer, and Lewis. Pet. 39–72. To support its contentions, Petitioner provides explanations as to how the prior art discloses each claim limitation. *Id.* Petitioner also relies upon the Anthony Declaration to support its positions. Patent Owner counters that these combinations of the applied references do not render the challenged claims obvious because the applied references fail to teach some claim limitations and because Petitioner’s rationale to combine the references is insufficient. Prelim. Resp. 39–52.

On this record, we are persuaded by Petitioner’s explanation and evidence in support of the challenges to claims 1–21 and 24–32 as rendered obvious over the combined teachings of O’Sullivan and those of other prior art. We begin our discussion with a brief summary of O’Sullivan, Steuer, and Lewis and then address the evidence, analysis, and arguments presented by the parties.

*1. O’Sullivan (Ex. 1165)*

O’Sullivan is directed generally to a “noninvasive method of continuously measuring an arterial pulse for use in monitoring arterial blood pressure and/or pulse amplitude.” Ex. 1165, 1:5–8.

O’Sullivan discloses the use of a sensor module as depicted in Figure 3, reproduced below.



**FIG. 3**

Figure 3 depicts a schematic diagram of positioning of sensor 10 directly over radial artery 34, with tendon 36 and bone 38 depicted to offset the artery. Ex. 1165, 4:29–30, 6:24–27. O’Sullivan states that it is directed to

a center element and 2 smaller elements on each side of the center element. The center element is placed directly over the artery. The smaller side elements are positioned off the sites directly over the artery, and are minimally sensitive to the pressure wave signal from the artery; but because of their proximity to the center element they have substantially the same sensitivity to the artifact signal as the center piezoelectric strip that is positioned over the artery.

Ex. 1165, 2:34–43.

## 2. *Steuer (Ex. 1166)*

Steuer is directed generally to a non-invasive apparatus for measurement of vascular blood flow. Ex. 1166, 1:26–29. Steuer uses optical sensors consisting of LED photoemitters and complementary photodetectors. *Id.*, [57], 2:48–50. Sensors may be placed on the skin over vasculature, and measurements from adjacent regions normalize signals and act as a baseline to remove unwanted signals from a blood flow signal. *Id.* at 3:1–10, 5:56–63, 7:20–25.

Figure 7, reproduced below, depicts illuminated volumes in tissue.

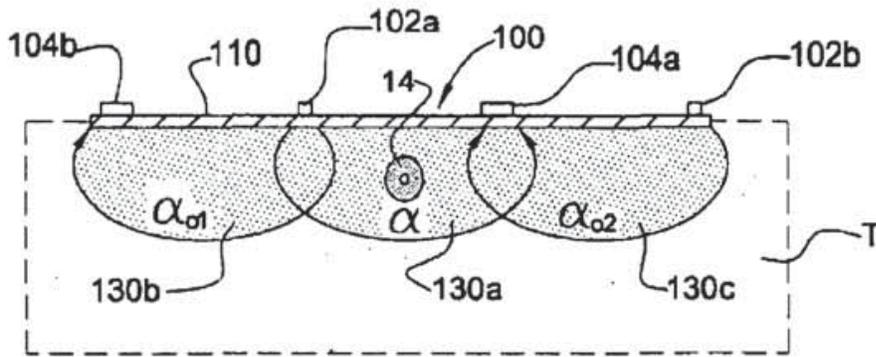


FIG. 7

Figure 7 shows illuminated volumes 130a, 130b, and 130c, or “glowballs,” produced by emitters 102a and 102b, vascular access site 14, sensor 100, substrate 110, tissue T, and detectors 104a and 104b. Ex. 1166, 3:39–41, 11:1–14, 11:33–46.

3. *Lewis (Ex. 1169)*

Lewis is directed generally to the use of optical sensors for evaluation of biological matter, such as human tissue. Ex. 1169, [57], 3:33–46. More specifically, Lewis discloses a sensor using multiple wavelengths. *Id.* at 3:32–37. Lewis discloses that the injection of light may include sequential bursts of particularly-selected light wavelengths, or narrow bands, into the selected body part at a given location. *Id.* at 4:3–11.

Figure 6, reproduced below, illustrates an arrangement of light source and light detection receivers. *Id.* at 5:3–6.

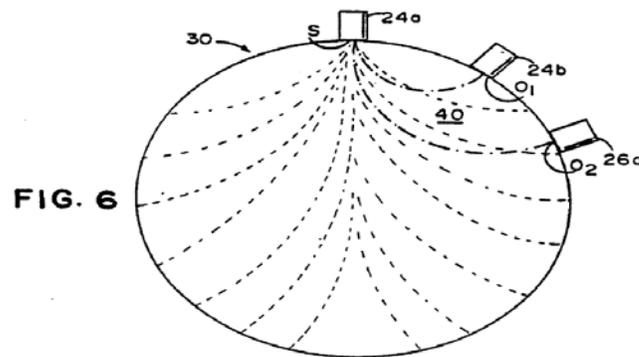


Figure 6 shows optical paths in dotted lines, source 24a, near receiver 24b, far receiver 26a, body portion 30, and tissue volume 40. Ex. 1169, 10:61–11:8, 11:41–59.

#### 4. Analysis

##### a. Independent Claims 1, 26, and 29

Petitioner asserts that O’Sullivan “describes a sensor that can be placed on the skin over an artery, and filter out motion noise by subtracting measurements from adjacent regions to produce a clean blood flow signal from the artery.” Pet. 40. Petitioner contends that, although O’Sullivan discloses the use of piezometric sensing, it also explicitly states that its sensor can be implemented using optical sensors. *Id.* (citing Ex. 1165, 12:55–61). Petitioner avers that a person of ordinary skill in the art “looking to implement O’Sullivan’s suggestion to use optical sensors would have looked to optical sensor arrangements that similarly attempted to noninvasively measure blood flow by comparing signals received from areas of high blood flow with signals received from areas with low blood flow.” *Id.* (citing Ex. 1003 ¶¶ 207–209). Petitioner asserts that, in light of O’Sullivan’s teaching on the use of optical sensors, a person of skill in the art “would have replaced the piezoelectric sensors of O’Sullivan with optical

emitters and detectors in the known manner described by Steuer.” *Id.* at 40–41 (citing Ex. 1003 ¶¶ 207–209). Petitioner contends that Steuer employs an optical sensor arrangement that is similar to O’Sullivan, where the sensor “can be placed on the skin over vasculature, using measurements from adjacent regions to remove unwanted noise from a blood flow signal.” *Id.* at 40 (citing Ex. 1166, 3:1–10, 5:56–63, 7:20–25; Ex. 1003 ¶¶ 83–87).

Petitioner further argues that O’Sullivan and Steuer teach or suggest all of the limitations of claim 1, including the steps of monitoring a physiological property of an organism, directing energy at a target region and at a region adjacent to the target region, where the target region has more blood flow than the adjacent region, detecting energy responses from the regions, and processing the detected signals to produce an extracted energy response signal that subtracts out a motion signal, with the steps are performed by a worn device. Pet. 41–49. Each of independent claims 26 and 29 has some limitations that vary from, but are similar to, claim 1, and Petitioner relies upon generally similar evidence and arguments for the obviousness challenges to those claims. *See id.* at 49–51.

On this record, we are persuaded that Petitioner has provided sufficient support that the combined teachings of O’Sullivan and Steuer adequately teach or suggests all of the limitations of claims 1, 26, and 29.

Patent Owner argues that Petitioner’s rationale to combine O’Sullivan and Steuer is insufficient because its allegation of simple substitution to obtain predictable results fails to identify what the predictable results would be. Prelim. Resp. 40. Patent Owner also alleges that the Petition fails to provide an explanation of how the combination would be implemented or why a person of ordinary skill in the art would look to Steuer because it does

not concern motion noise and is directed to bulk adsorptivity of a hemodialysis site rather than a blood pressure sensor. *Id.* at 40–42. Patent Owner argues that the Petitioner’s expert fails to provide a reason why a person of ordinary skill at the time of the invention would have combined the references, the supporting statements are conclusory, and hindsight reasoning is used. *Id.* at 39–44.

Patent Owner further contends that neither O’Sullivan nor Steuer teaches the claim limitation of “processing steps are performed by a device worn by the organism.” Prelim. Resp. 44–48. More specifically, Patent Owner alleges there is no teaching of that limitation because O’Sullivan states that at least a portion of the processing circuitry is not in a device worn by the organism, and, although O’Sullivan includes a calculation means on a circuit board, it is disclosed in a different embodiment. *Id.* at 44–46. Patent Owner also argues that Steuer, if anything, suggests that processing would be done remotely. *Id.* at 46 (citing Ex. 1166, 6:12–21). Moreover, Patent Owner alleges that there is no explanation provided as to why one of skill in the art would combine the teachings of O’Sullivan and Steuer to teach this limitation. *Id.* at 46–48.

Patent Owner additionally argues that the references relied upon do not teach the limitations “directing energy at a target region” and “detecting ... an energy response signal from a region adjacent the target region” of claims 26 and 29 because there is no support that there is any “energy response signal” in response to directed energy. Prelim. Resp. 48–49. In particular, Patent Owner points to O’Sullivan, which it alleges is a “passive system.” *Id.* at 49.

At this juncture, we do not find Patent Owner's arguments to be persuasive. Petitioner has provided sufficient evidence of a rationale to combine references on this record because: (1) O'Sullivan explicitly discloses that optical sensors may be substituted into its invention; (2) Steuer relates to analogous vascular volume detection with optical sensors; and (3) Dr. Anthony's supporting testimony is sufficient concerning the combination in view of a person of ordinary skill in the art. *See KSR*, 550 U.S. at 421 (when "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product [was] not of innovation but of ordinary skill and common sense.") Additionally, we find the evidence and explanations provided in the Petition concerning the teaching of the limitation that processing is performed in a device worn by an organism to be sufficient at this juncture. For instance, Steuer discloses that its sensor contains a circuit and may be placed on the skin. Ex. 1166, 14:3–9, 16:6–12, Fig. 34. Finally, we find that the teachings of the applied references in combination is also sufficient to teach a "energy response signal" of claims 26 and 29; for example, Steuer discloses the use of optical emitters and detection of optical signals from the same, and, in combination with O'Sullivan, the optical emitters/detectors are used in adjacent areas. *See id.* at 5:26–31, 15:44–56; *see also* Pet. 44.

*b. Claims 2–21, 24, 25, 27, 28, and 30–32*

Petitioner additionally asserts that dependent claims 4, 5, 11–14, 24, 25, and 32 would have been obvious over the combined teachings of O'Sullivan and Steuer; claims 2, 3, 6–10, 15–17, 27, 28, 30, and 31 would have been obvious over the O'Sullivan/Steuer combination in view of the

teachings of Stivoric; claim 18 would have been obvious over the O’Sullivan/Steuer combination in view of the teachings of Kim; claims 19 and 20 would have been obvious over the O’Sullivan/Steuer combination in view of the teachings of Villers; and claim 21 would have been obvious over the O’Sullivan/Steuer combination in view of the teachings of Lewis. Pet. 39–72.

Patent Owner presents no responsive arguments to the obviousness challenges to these claims, except for arguments addressed to claims 1, 26, and 29. *See* Prelim. Resp. 39–52. We have reviewed the Petitioner’s evidence and explanations on the alleged teaching of the limitations of claims 2–21, 24, 25, 27, 28, and 30–32, and the rationale for the combination of prior art teachings, and are persuaded that the evidence provided is sufficient for purposes of this Decision.

Based on the record before us, we are persuaded that Petitioner demonstrates a reasonable likelihood of prevailing on its challenge to claims 1–21 and 24–32 as obvious over the teachings of O’Sullivan in combination with those of other prior art.

### III. CONCLUSION

In summary:

<b>Statutory Basis/Reference(s)</b>	<b>Claims Challenged</b>	<b>Claims Instituted</b>
§ 103(a)	1–32	1–21 and 24–32

We have not yet made a final determination with respect to the patentability of any challenged claim or the construction of any claim term.

#### IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, an *inter partes* review is hereby instituted based on the following grounds:

A. claims 1, 4, 5, 11–14, 24–26, 29, and 32 as unpatentable under § 103(a) as rendered obvious over the combined teachings of O’Sullivan and Steuer;

B. claims 2, 3, 6–10, 15–17, 27, 28, 30, and 31 as unpatentable under § 103(a) as rendered obvious over the combined teachings of O’Sullivan, Steuer, and Stivoric;

C. claim 18 as unpatentable under § 103(a) as rendered obvious over the combined teachings of O’Sullivan, Steuer, and Kim;

D. claims 19 and 20 as unpatentable under § 103(a) as rendered obvious over the combined teachings of O’Sullivan, Steuer, and Villers; and

E. claim 21 as unpatentable under § 103(a) as rendered obvious over the combined teachings of O’Sullivan, Steuer, and Lewis;

FURTHER ORDERED that no other grounds are authorized for this *inter partes* review other than those specifically identified above; and

FURTHER ORDERED that notice is hereby given of the institution of a trial commencing on the entry date of this decision, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4.

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