

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.
Petitioner,

v.

OMNI MEDSCI, INC.,
Patent Owner.

Patent No. 9,651,533

Case IPR2019-00916

Petitioner's Reply

Table of Contents

I.	Introduction.....	1
II.	The Term “<i>Increases[ing] Signal-to-Noise Ratio by... Increasing a Pulse Rate of at Least One [LED]</i>” Reflects Common Scientific Knowledge	2
A.	Scientifically, Increasing LED Pulse Rate Will Increase SNR	3
B.	The Construction of “<i>Increases[ing] Signal-to-Noise Ratio by... Increasing a Pulse Rate of at Least One [LED]</i>”	5
III.	Argument.....	9
A.	Lisogurski Alone Discloses a Device Configured to Increase the Pulse Rate of an LED and Thereby Increase SNR	9
B.	Lisogurski and Carlson Teach a Light Source “<i>Configured to Increase Signal-to-Noise Ratio by... Increasing a Pulse Rate</i>” of an LED.....	12
1.	Carlson’s Device Changes Pulse Rate During Operation.....	13
2.	The Combined Teachings of Lisogurski and Carlson Teach a Device that Increases Pulse Rate for the Purpose of Increasing SNR	16
C.	Omni’s Procedural Arguments Are Incorrect	22
D.	Dependent Claims.....	25
IV.	Conclusion	25

TABLE OF AUTHORITIES

Cases	Page(s)
<i>Broadcom Corp. v. Emulex Corp.</i> , 732 F.3d 1325 (Fed. Cir. 2013)	7
<i>In re Keller</i> 642 F.2d 413 (Fed. Cir. 1981)	17
<i>MCM Portfolio LLC v. Hewlett-Packard Co.</i> , 812 F.3d 1284 (Fed. Cir. 2015)	17, 23
<i>In re Merck & Co., Inc.</i> , 800 F.2d 1091 (Fed. Cir. 1986)	17, 20
<i>ParkerVision, Inc. v. Qualcomm Inc.</i> , 903 F.3d 1354 (Fed. Cir. 2018)	7

I. Introduction

Omni MedSci (“Omni”) admits that Lisogurski and Carlson describe devices that meet every limitation of the challenged claims except “*increasing a signal-to-noise ratio by increasing the pulse rate*” of a light emitting diode (LED). But the evidence in this record also clearly establishes that Lisogurski, both alone and in combination with Carlson, teaches and makes obvious that limitation as well.

Initially, Omni admits that Lisogurski describes a device configured to increase the pulse rate of its LED (Resp., 22), and its expert Dr. MacFarlane admits that increasing the pulse rate of an LED generally increases the signal-to-noise ratio (“SNR”) (Ex.1060, 37:17-22). Those admissions are fatal to Omni’s assertions in its Response. That is because the Lisogurski device will, in certain physiological situations, increase the pulse rate of an LED and that increase will necessarily increase SNR as well.

Omni tries to distinguish Lisogurski by asserting its device does not *intend* to increase SNR by increasing the pulse rate. But “intent” is irrelevant for a device claim—the question is whether the prior art device can perform the recited function or not. And just as a device may infringe a claim without intending to do so, a device can satisfy a claim element regardless of intent.

Even if not explicitly taught by Lisogurski alone, the combination of Lisogurski and Carlson makes obvious a device that “*increase[es] a signal-to-*

noise ratio by increasing the pulse rate” of its LED. As the Board found, Lisogurski discloses a device that increases the pulse rate of its LED, but does not explicitly describe doing that for the purpose of increasing SNR. Inst. Dec., 30-31. Apple explained, however, that Lisogurski teaches the skilled person that the firing of its LED can be varied (e.g., by altering its intensity) for the purpose of improving SNR, and this would have motivated the skilled person to look for additional way to achieve that goal. Pet., 24-26. Carlson specifically identifies increasing an LED’s pulse rate as a way to increase SNR and provides a reason for doing that—to dynamically offset noise from ambient light when performing physiological measurements.

Omni tries to draw a narrow distinction between the art and the claims, asserting that neither Lisogurski nor Carlson *alone* teaches a device that increases its pulse rate with the intent of increasing SNR. Resp., 26. Not only is Omni wrong about what the art teaches, but Omni ignores that the combined teachings *together* suggest configuring Lisogurski to increase the pulse rate of its LEDs for the purpose of increasing SNR as taught by Carlson. The Board should find the challenged claims obvious.

II. The Term “*Increas[ing] Signal-to-Noise Ratio by... Increasing a Pulse Rate of at Least One [LED]*” Reflects Common Scientific Knowledge

Independent claims 5 and 13 are apparatus claims that require “*a light source comprising a plurality of... light emitting diodes...configured to increase*

signal-to-noise ratio by...increasing a pulse rate of at least one of the plurality of semiconductor sources.” As the Board noted in its Institution Decision, the specification provides scant support for this limitation, and it provides no explanation of why increasing a pulse rate would increase SNR. Inst. Dec., 10. The specification does not, for example, state that its optical sensor must be specially configured to cause a particular type of increase in pulse rate in order to result in an increased SNR. Omni thus necessarily is drawing upon what would be known to a skilled person for this limitation. It is thus informative to look at the science behind variables affecting SNR.

A. Scientifically, Increasing LED Pulse Rate Will Increase SNR

Modulating or pulsing a signal is a standard technique to enhance the signal's detectability in the presence of noise, such as ambient light. Ex.1003, ¶45. In an optical sensor, an LED is pulsed, and each time it is, a detector measures the amount of light reflected back from the sample and determines how the sample is changing (*e.g.*, how the volume of blood in tissue is changing over time). Ex.1003, ¶¶39, 41-42. It was well-known that, in the presence of noise, increasing the rate at which an LED pulses (and the sampling rate, which is the rate at which the signal is measured) will generally increase the SNR. At his deposition, Omni's expert Dr. MacFarlane admitted this was a well-known scientific fact:

Q... Why is it that changing the pulse rate of an LED would change the signal-to-noise ratio?

A. There are a number of reasons... why that might happen. Generally speaking, the faster the modulation, ***the faster the pulse rate, the lower the background noise.***

That's a general statement that describes something that -- that's a general statement of -- of truth. There are -- there are counterexamples, but ***generally speaking, as – as you have a faster or an increased pulse rate, you see a lower noise environment.***

Ex.1060, 37:13-38:3.¹ Dr. MacFarlane also testified that increasing the pulse rate of an LED would typically increase SNR:

Q. Will you agree that in general, when you increase the pulse rate of an LED, you will increase the signal-to-noise ratio, though that won't always happen?

* * *

THE WITNESS: Yes.

Id., 39:12-17.

In its sur-reply, Omni may try to deny this scientific truth. For example, after his cross-examination was complete, Omni's counsel spoke to Dr. MacFarlane about his answers. Ex.1060, 85:9-21. On redirect, Dr. MacFarlane then tried to change his answer to the second question (the question at 39:12-17, quoted in the previous paragraph), testifying that "I'd like to change my answer

¹ All emphases added, unless otherwise noted.

from a yes to a no.” *Id.*, 81:17-18. That change in answer, made after discussions with counsel, lacks any credibility. Moreover, Dr. MacFarlane’s original answer was consistent with his prior testimony, where he stated “[g]enerally speaking, the faster the modulation, ***the faster the pulse rate, the lower the background noise...*** [T]hat’s a general statement... of truth.” *Id.*, 37:17-22. Dr. MacFarlane made no attempt square his changed answer with his prior testimony. And when asked on re-cross to identify scenarios when increasing pulse rate did not increase SNR, he could only postulate there might be hypothetical scenarios he could imagine, but did not identify any actual ones that would. Ex.1060, 83:5-10 (“Q. Do you know of any instances of when increasing the pulse rate of an LED does not increase the signal-to-noise ratio?... [A]: Hypothetically, I can imagine that being the case.”). Dr. MacFarlane’s testimony thus shows that a skilled person would expect that increasing the pulse rate of an LED would increase SNR, and it would be only in unusual circumstances that it would not.

B. The Construction of “*Increas[ing] Signal-to-Noise Ratio by... Increasing a Pulse Rate of at Least One [LED]*”

Ultimately, the precise construction of this term is irrelevant to the petition’s obviousness grounds because the combination of Lisogurski and Carlson suggest this claim element under the Board’s construction, Omni’s construction, and the claim’s plain and ordinary meaning. However, the Board’s interpretation of this

term could affect its determination as to whether Lisogurski alone teaches this claim element, and thus, its meaning is analyzed below.

The Board preliminarily construed this term to mean “a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes *is capable of* having its pulse rate increased to increase a signal-to-noise ratio.” Inst. Dec., 10. Omni raises two issues with the Board’s construction.

First, Omni asserts the claim requires the light source to increase the pulse rate while the Board’s construction allows another entity to do so. Resp., 11 (“The Board’s construction improperly broadens the limitation permitting, e.g., a human, to increase the pulse rate.”). But Omni’s criticism is irrelevant—it does not dispute that Lisogurski’s device can increase the pulse rate of an LED, and thus meets even Omni’s narrower reading.

Second, Omni contends the Board’s use of the phrase “capable of” was incorrect, and that the claim instead requires a device that is “configured to” increase a pulse rate of an LED to increase SNR. Resp. 11. Omni does this based on its erroneous belief that the “intent” of a device must be considered, rather than what the device actually does.

Importantly, under both the Board’s and Omni’s constructions, there is no dispute that there is: (i) an action that the device must take (increasing the pulse

rate of an LED) and (ii) a result of that action (an increased SNR). There also is no dispute that Lisogurski teaches a device that is “configured to” take the action specified by the claim: increasing the pulse rate of an LED. Ex.1060, 59:1-5 (“Q... Do you agree that Lisogurski describes a device that is configured to increase the emitter firing rate in some circumstances?... A. I believe so.”); Resp., 22 (“Lisogurski discloses a pulse oximeter having an adjustable ‘firing rate’”); Ex.1011, 35:29-31 (“decreasing the duration of the ‘off’ periods (i.e., increasing the emitter firing rate) relates to an increased sampling rate.”).

Thus, the issue in dispute is narrow—whether the claims only encompass a device that **intends** to increase SNR when it increases the pulse rate of an LED?² The answer to that question under well-established Federal Circuit precedent is no. The Federal Circuit “explained long ago that ‘apparatus claims cover what a device is, not what a device does.’” *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018); see *Application of Michlin*, 256 F.2d 317, 320 (C.C.P.A. 1958) (“It is well settled that patentability of apparatus claims must depend upon structural limitations and not upon statements of function.”). Moreover, “[i]t is well settled that an [apparatus] that ‘that sometimes, but not always, embodies a

² The Board preliminarily found that Lisogurski alone does not disclose increasing pulse rate for the purpose of increasing SNR. Inst. Dec., 30.

claim[] nonetheless” satisfies the claim. *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1333 (Fed. Cir. 2013). A device that performs a specified action and causes the result specified by the claim satisfies the claim requirements, irrespective of whether the device intended to do so or not.³

Here, the claim language specifies what the device is: it is a device that can increase the pulse rate of an LED and can thereby increase SNR. Moreover, the device need not increase SNR every time it increases the pulse rate of an LED. Consequently, the claim term is satisfied by a device that increases a pulse rate of an LED, and where doing so at least sometimes results in an increased SNR. Lisogurski's device does that,⁴ and thus, meets the Board's construction (as well as Omni's literal construction) as well as the claim's plain and ordinary meaning. Construing the claims to include an “intent” requirement pursuant to Omni's “configured to” construction would be clear legal error.

³ Omni's expert had no opinion on whether the claim included an intent element. Ex.1060, 44:5-13 (Dr. MacFarlane testifying “I don't have an opinion on” whether the claim require[s] the device to intend to increase SNR).

⁴ Even if this term had an intent element, it would have been obvious based on the combination of Lisogurski and Carlson, as explained in §III.B, below.

III. Argument

A. Lisogurski Alone Discloses a Device Configured to Increase the Pulse Rate of an LED and Thereby Increase SNR

Lisogurski alone discloses a device that increases the firing (*pulse*) rate of at least one of its LEDs and thereby meets the limitation of a “*a light source comprising a plurality of... [LEDs]...configured to increase signal-to-noise ratio by... increasing a pulse rate of at least one of the [LEDs].*”

Initially, it is undisputed that Lisogurski alone discloses a device “configured to” increase the firing (*pulse*) rate of at least one of its LEDs. See Ex.1011, 25:52-55. As Lisogurski states:

[T]he sampling rate may represent the amount of time between “on” periods. For example, the time between “on” periods may be the length of time of “off” period 220 of FIG. 2A.... [D]ecreasing the duration of the “off” periods (i.e., ***increasing the emitter firing rate***) relates to an increased sampling rate.

Ex.1011, 35:24-31. Omni admits this, stating that “Lisogurski discloses a pulse oximeter having an adjustable ‘firing rate.’” Resp., 22. Even Dr. MacFarlane admitted that Lisogurski discloses this:

Q... Do you agree that Lisogurski describes a device that is configured to increase the emitter firing rate in some circumstances?

* * *

THE WITNESS: I believe so.

Ex.1060, 59:1-5.

In its Response, Omni argues that Lisogurski does not meet this limitation because, even though Lisogurski varies the LED firing rate, Lisogurski discloses only that the firing rate is varied for the purpose of remaining synchronous with cardiac cycle and not with the intent to increase SNR. Resp., 14-16. Omni is wrong about what Lisogurski discloses and about what the claim requires.

Lisogurski describes applying cardiac cycle modulation to the pulsing of its LEDs, which means that its device will increase the sampling rate and emitter firing rate to become or remain synchronous with a cardiac cycle. Ex.1011, 25:49-55; 31:11-24, 31:39-55; *see* Inst. Dec., 30. When Lisogurski's device applies that modulation technique, depending on the individual's cardiac cycle, the device will increase its LED pulse rate. Ex.1003, ¶96 ("Cardiac cycle modulation schemes would adjust the brightness of a light in a way that is synchronized to the cardiac cycle and similar to or faster than the cardiac pulse rate."). Consistent with Dr. Anthony's explanation, this could occur when a person's heart rate increases, which would result in Lisogurski's device increasing its LED's firing rate to remain synchronous with the faster cardiac cycle. The skilled person reading Lisogurski's description of cardiac cycle modulation would have understood that when Lisogurski's device increases the LED firing rate in this manner, it would increase the signal relative to the noise (*e.g.*, ambient light) present in the measurement, and thus would increase SNR. *See* Ex.1060, 37:17-22, 39:12-17.

Lisogurski's description of what happens when its device increases the LED firing rate is consistent with the general knowledge that it would increase SNR. Lisogurski explains that "increasing the sampling rate for a portion of the cardiac cycle may **result in more accurate and reliable physiological information.**" Ex.1011, 33:46-52. Although Lisogurski does not use the term "SNR" in this passage, a skilled person would have understood that the physiological information is "more accurate and reliable" because its SNR is higher. Thus, as Dr. Anthony explains:

Lisogurski states that increasing the sampling rate 'may result in more accurate and reliable physiological information.' Ex.1011 (Lisogurski), 33:56-58. Therefore, Lisogurski explains that the LED firing rate can be increased to increase signal-to-noise ratio.

Ex.1003, ¶116.

Omni cannot reasonably dispute this understanding of Lisogurski. First, Omni admitted that cardiac cycle modulation is a technique for increasing SNR, stating that "Lisogurski teaches [] different techniques for improving SNR..., [including] by modulating the light signal to correlate with 'physiological pulses' such as a 'cardiac pulse.'" Resp., 15. Second, Dr. MacFarlane has admitted that "[g]enerally speaking, the faster the modulation, **the faster the pulse rate, the lower the background noise...** [T]hat's a general statement... of truth." Ex.1060, 37:17-22.

As explained in the claim construction section above, the claim is satisfied by any device that increases a pulse rate and that results in increased SNR, irrespective of whether its intent to do so. It is also irrelevant under the claims why the device is increasing the pulse rate of its LEDs, such as for synchronizing with the cardiac cycle. Thus, as even Omni's expert acknowledged, a skilled person reading Lisogurski would have understood that when its device increases its LED firing rate, it will increase SNR as well. Therefore, Lisogurski meets this claim limitation.

B. Lisogurski and Carlson Teach a Light Source “*Configured to Increase Signal-to-Noise Ratio by... Increasing a Pulse Rate*” of an LED

Even if the Board were to find that Lisogurski alone does not disclose this claim element, the combination of Lisogurski and Carlson would render a device including that element obvious. Omni's primary argument for why Lisogurski and Carlson do not do so together is that neither Lisogurski *alone* nor Carlson *alone* teaches a device that, while in operation, actively increases the pulse rate of an LED for the purpose of increasing SNR. Omni's arguments rely on a mischaracterization of what Carlson teaches, a legally erroneous formulation of obviousness, and an illusory distinction between Lisogurski and the claims that is both extremely narrow and wrong.

1. Carlson's Device Changes Pulse Rate During Operation

Omni devotes a substantial portion of its brief to mischaracterizing Carlson's teachings. Resp., 17-22, 24-26. Omni asserts that Carlson shows a pulse oximeter where a person makes design choice as to the pulse rate of an LED when creating the oximeter, and that Carlson does not describe a device that actively increases the LED's pulse rate during operation. Resp., 17. Omni's interpretation of Carlson is factually incorrect.

As explained in the Petition, Carlson teaches techniques for increasing the SNR of a pulsoximeter to improve its performance in the presence of noise, such as ambient light from sunlight or fluorescent lights. Pet., 23-24; see Ex.1009, [0002] (Carlson's goal is "increasing the technical performance of pulsoximetry in terms of quality and robustness of the measurement signal versus environmental disturbances and energy consumption"), [0067]-[0068] (describing indoor and outdoor lighting). Carlson also explains that, whether used indoors or outdoors, the amount of ambient light varies over time. Ex.1009, [0007] ("environmental optical radiation strongly varies as a function o[f] time and place where the pulsoximeter is used, e.g. day versus night, indoor versus outdoor"), [0067]-[0068] (describing indoor and outdoor lighting). Carlson, thus, makes crystal clear that its device is designed to address **changing** environmental conditions that translate into a continually varying amount of ambient light that has to be addressed.

To handle interference from ambient light when it is present, Carlson explains that its device “**temporarily** modulate[s] the amplitude of the optical radiation of, e.g., the LED at a carrier frequency f_c in order **to shift the power spectrum** of the pulsoximeter signals **into a higher frequency range** where environmental optical radiation is unlikely.” Ex.1009, [0020]; *see id.*, [0065]. In this passage, Carlson describes shifting the frequency of an LED’s emission “to a higher frequency range,” thus indicating that the LED previously emitted pulses at a lower frequency—*i.e.*, that Carlson is switching between at least two different frequencies. Ex.1009, [0020]. Carlson also states that its device **temporarily** makes this adjustment, *id.*, [0020], which means the device will change how its LEDs pulse based on the presence and characteristics of ambient light at any particular moment in time, *id.*, [0068]. Based on his reading of Carlson, Dr. Anthony explains that “Carlson teaches that increasing the modulation frequency of the pulsed LEDs improves the signal-to-noise ratio.” Ex.1003, ¶121; *see* Ex.1009, [0069].

Omni incorrectly portrays Carlson as disclosing a device that emits light continuously or constantly (*i.e.*, not pulsed) but in the presence of ambient light can switch to a pulsed mode of operation that pulses at a single, fixed pulse rate. Resp., 17-21; *id.*, 21 (“Carlson teaches only that, as an alternative to continuous light [], modulated light at a ‘chosen’ frequency” can be used). That interpretation

makes no sense in the context of Carlson's invention. For example, under Omni's reading, Carlson's device would consume excessive battery power, something that is entirely at odds with the stated purpose of its mobile, battery-powered device: to balance signal quality with energy consumption. Ex.1009, [0002] (describing "increasing the technical performance... versus environmental disturbances and energy consumption"), [0048].

Omni also asserts that Carlson's statements about temporarily modulating the signal refer to shifting the light's power spectrum, not to shifting the frequency (pulse rate) of the light pulses. Resp., 20. Omni's argument is inconsistent with Carlson's claims, which specify a device that includes "a light source amplitude modulating means to modulate the frequency of the emitted light" and that the means further can "*shift the frequency* of the emitted light." Ex.1009, claims 10-13. Thus, contrary to Omni's arguments, Carlson discloses shifting the frequency of the pulses between two different pulse frequencies. Read correctly, Carlson describes switching from a lower frequency pulse rate to a higher one to avoid interference caused by ambient light. Ex.1003, ¶121.

Reading Carlson to teach switching among different pulse frequencies rather than from continuous light emission to pulsed light emission also is consistent with common sense. Carlson describes interference from ambient light and teaches that such light varies over time depending on where a user is. Ex.1009, [0007]

(“environmental optical radiation strongly varies as a function o[f] time and place where the pulsoximeter is used, e.g. day versus night, indoor versus outdoor”). For example, Carlson recognizes that interference may occur at one frequency when indoors and at others when outdoors. Ex.1009, [0067] (“artificial light, such as e.g. electrical in-house light, is going up to approximately 120 Hz (USA)”), [0068] (“sunlight can have a dramatic influence, e.g. if a person is walking through streets with relatively quick changing conditions between sunlight and shadow. Another serious possibility is caused by a tree avenue when driving along the trees.”). Because the nature of ambient light changes over time, it would be natural to interpret Carlson as describing multiple pulse frequencies. See Ex.1060, 34:5-35:7 (Dr. MacFarlane agreeing that “Because sunlight variations and the weather are constantly changing environmental conditions, it would be impractical, as a matter of common sense, to have the user manually reconfigure the LED pulse rate as conditions change”). Omni’s interpretation is at odds with that understanding.

2. The Combined Teachings of Lisogurski and Carlson Teach a Device that Increases Pulse Rate for the Purpose of Increasing SNR

Omni’s primary argument for why Lisogurski and Carlson do not render this limitation obvious rests on a legally erroneous foundation. Omni asserts that the art does not teach “*increase[ing] signal-to-noise ratio by... increasing a pulse rate of*” an LED because neither Lisogurski ***alone*** nor Carlson ***alone*** teaches a device

that actively increases the pulse rate of an LED for the purpose of increasing SNR while the device is in operation. Omni ignores that “[n]on-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.” *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986); *see also In re Keller* 642 F.2d 413, 425 (Fed. Cir. 1981) (the test for obviousness is “what the combined teachings of the references would have suggested to those of ordinary skill in the art”); *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015) (“Moreover, [t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference....”). As explained in the Petition, the combined teachings of Lisogurski and Carlson suggest a device that meets the claims.

Initially, the distinction Omni is trying to draw between Lisogurski and Carlson and the challenged claims is very narrow. This is shown by several undisputed facts about what Lisogurski teaches:

- As explained in §III.A above, Lisogurski teaches a device that increases the pulse rate of its LED in some scenarios.⁵ Omni admits

⁵ Ex.1011, 27:44-49, 35:29-31 (“Similarly, decreasing the duration of the “off” periods (i.e., increasing the emitter firing rate) relates to an increased sampling

this, stating “Lisogurski discloses a pulse oximeter having an adjustable ‘firing rate.’” Resp., 22; Ex.1060, 59:1-5; Ex. 2122, ¶87 (same).

- Lisogurski teaches a device that attempts to increase SNR by altering characteristics of how the LEDs fire.⁶ Omni admits this, stating that “Lisogurski teaches [] different techniques for improving SNR, [including] by increasing the ‘brightness’ of the light source... and [] by modulating the light signal to correlate with ‘physiological pulses’ such as a ‘cardiac pulse.’” Resp., 15.
- Lisogurski teaches a device that detects increases in background noise and in response attempts to increase SNR.⁷ Omni admits this, stating

rate.”); see Ex.1011, 35:24-28, Ex.1003, ¶¶112-115, Inst. Dec., 30 (“That is, the LED firing rate is varied to become or remain synchronous with a cardiac cycle, not to increase the signal-to-noise ratio.”).

⁶ Ex.1011, 9:46-52 (“In some embodiments, the system may alter the cardiac cycle modulation technique based on the level of noise, ambient light...”), 27:44-49, Ex.1003, ¶¶118, 120; Ex.2122, ¶87.

⁷ Ex.1011, 9:50-52 (“The system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio.”); 5:56-61

that “Lisogurski discloses... increasing signal brightness to address interference caused by ambient light.” Resp., 22; Ex.2122, ¶87.

Omni nonetheless argues that the challenged claims are patentable because (i) Lisogurski is missing an explicit teaching that, in response to increased background noise, the firing rate of the LED can be increased *for the purpose of* increasing SNR and (ii) Carlson alone does not disclose increasing the pulse rate of an LED during operation, and therefore in Omni's view, the combination of Lisogurski and Carlson cannot do so either. Resp., 14-22. Omni's purported distinction is based on a mischaracterization of Carlson, and it is at odds with both common sense and the law.

As explained in §III.B.1, above, and contrary to Omni's assertions, Carlson does disclose a device that changes the pulse rate of an LED in operation. However, even if Omni were correct that Carlson discloses only selecting a pulse rate at design time, that would be irrelevant. The salient point is that Carlson

(“Conventional servo algorithms may adjust the light drive signals due to, for example, ambient light changes,...”); Ex.1003, ¶¶118 (“Lisogurski explains that increasing the signal-to-noise ratio in its system is important...”), 120 (“Lisogrurski explains that the firing rate of the LEDs can be adjusted in response [to] changes in environmental conditions, such as changes in background or ambient light.”).

teaches that when ambient light is present, SNR can be increased by increasing a pulse rate of an LED to a frequency range that mitigates ambient noise. Ex.1009, [0069] (“The frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which...is in the range of above approximately 1000 Hz.”). Thus, the combined teachings of Lisogurski and Carlson suggest a device that meets the claims. *In re Merck & Co., Inc.*, 800 F.2d at 1097.

As the Board found, Lisogurski already teaches a device that (i) can increase the pulse rate of an LED while the device is in operation, and (ii) attempts to increase SNR in the presence of ambient light. Inst. Dec., 36 (“Together, the references teach that a pulsoximeter can detect a change in background noise and modify the LED firing rate based on the detected change (as taught by Lisogurski)...”). The purported missing element is an explicit teaching that Lisogurski can increase pulse rate ***for the purpose*** of increasing SNR. But that teaching is supplied by Carlson, which shows that the skilled person would have understood that using a higher pulse rate for an LED can increase SNR in the presence of noise from ambient light. Ex. 1009, [0069] (“The frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which...is in the range of above approximately 1000 Hz.”); Ex.1003, ¶¶119-

121. It is irrelevant whether Carlson discloses a device that actively changes a pulse rate because Lisogurski already discloses a device that does.

In describing the combination, Apple explained that Lisogurski describes several methods for increasing SNR when increased background noise is detected. Pet., 24-26. The skilled person would have recognized the importance of SNR in Lisogurski's system and would have been motivated to incorporate additional, known methods of doing so. Ex.1003, ¶¶118-121. Lisogurski identifies ambient light as one source of background noise that needs to be mitigated. See Ex.1011, 5:55-59 (a "[c]onventional servo algorithm [that] may adjust the light drive signals due to, for example, ambient light changes..."); see *id.*, 9:46-60 ("In some embodiments, the system may change from a modulated light output to a constant light output in response to noise, patient motion, or ambient light."). This would have led the skilled person to consider Carlson, which teaches that when ambient light is present, SNR can be increased by increasing the pulse rate of an LED. Pet., 25-26; Ex.1003, ¶¶81-85.

Configuring Lisogurski in this manner also would have been consistent with the skilled person's general knowledge. As Dr. MacFarlane admitted, "[g]enerally speaking, the faster the modulation, ***the faster the pulse rate, the lower the background noise...*** [T]hat's a general statement... of truth." Ex.1060, 37:17-22. That general knowledge is reflected in Carlson, which teaches the same thing. As

Apple explained in the Petition, the skilled person would have found configuring Lisogurski's device to increase the signal to noise ratio by increasing the LED's firing rate to have been a predictable arrangement of known elements, with each performing the same function it was known to perform and yielding what one would expect from an arrangement. Pet. 39; *see* Ex.1003, ¶122.

The Board correctly found that the combination of Lisogurski and Carlson teach a device that increases SNR by increasing the pulse rate of an LED. Omni's arguments to the contrary are based on a mischaracterization of the references and an inaccurate application of the law and should be rejected.

C. Omni's Procedural Arguments Are Incorrect

In addition to substantively challenging whether Lisogurski and Carlson teach all the elements of the claims, Omni raises several unfounded procedural arguments challenging the Board's institution decision.

First, Omni incorrectly argues that the Petition was limited to arguing bodily incorporation of a feature of Carlson into Lisogurski's device, and that the Petition lacked any arguments that the limitation-at-issue is obvious based on the combined teachings of Lisogurski or Carlson. Resp., 23. Simply reading the Petition refutes Omni's contentions—it shows that Apple's arguments were based on the combined teachings of Lisogurski and Carlson. In the Petition, Apple explained that “Lisogurski teaches that the firing rate of the LEDs can be adjusted in response

changes in environmental conditions, such as changes in background noise or ambient light,” Pet., 38, and that it would have been “obvious to configure Lisogurski to increase the firing rate (frequency) of LEDs as taught by Carlson, given that Carlson teaches that increasing the modulation frequency of the pulsed LEDs improves the signal-to-noise ratio,” Pet., 39. Contrary to Omni’s assertion, Apple relied on teachings from both reference to explain how this limitation was satisfied. Apple did not limit its argument to asserting that Carlson alone taught this claim element.

Second, Omni asserts that it was procedurally improper for the Board to conclude that Apple established a prima facie case of obviousness where neither Carlson nor Lisogurski alone disclose “*increasing a signal-to-noise ratio by increasing the pulse rate.*” Resp., 23-26. But again, Omni misstates the legal test for obviousness. The test for obviousness “[is not whether] the claimed invention [is] expressly suggested in any one or all of the references” but rather, “the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *MCM Portfolio*, 812 F.3d at 1294. As explained above, the combined teachings of Lisogurski and Carlson render the limitation-at-issue obvious.

Third, Omni argues that, Carlson does not disclose a device that actively adjusts the pulse rate of an LED while the device is in operation, and therefore, the

Board cannot rely on Dr. Anthony's testimony because he "never asserted obviousness" based on the assumption that Carlson showed only a design-time choice of pulse rate. Resp., 25-26, 31. Not so. The Board is well within its purview to consider evidence, like Dr. Anthony's declaration, and to weight it by taking into consideration the different assumptions or views underlying an expert's opinion. Patent Trial and Appeal Board Consolidated Trial Practice Guide, p. 35 (Nov. 2019) ("The Board has broad discretion to assign weight to be accorded to expert testimony."). Nothing precludes the Board from relying on Dr. Anthony's testimony and doing so does not render the Board's decision improper.

Finally, Omni argues that the Board acted improperly by adopting an argument that Omni believes was not presented in the Petition. Resp., 27, 30-32. But as explained above, Apple did assert that the combined teachings of Carlson and Lisogurski rendered this claim element obvious. In the Institution Decision, the Board accurately summarized Apple's argument, concluding the following:

Together, the references teach that a pulsoximeter **[1]** can detect a change in background noise and modify the LED firing rate base on the detected change (as taught by Lisogurksi), and **[2]** can modify the frequency of the LED firing rate to be greater than the frequency of the background noise (as taught by Carlson).

Inst. Dec., 36 (citing Ex.1011, 37:6-9, 1:67-2:3; Ex.1009, ¶¶65, 69) (reference numerals added by Omni, see Resp. at 29). Contrary to Omni's argument, the Board did not advance a new argument in its Institution Decision.

The Board's Institution Decision regarding the combination of Lisogurski and Carlson was correct and the Board should maintain it.

D. Dependent Claims

Aside from its challenge to the independent claims, Omni raises no challenge to the Board's finding that the depend claims are unpatentable. Therefore, the Board should maintain its determination that the dependent claims are unpatentable.

IV. Conclusion

Apple respectfully submits that the Board should cancel the challenged claims.

Dated: April 30, 2020

Respectfully Submitted,

/Jeffrey P. Kushan/
Jeffrey P. Kushan
Registration No. 43,401
Sidley Austin LLP
1501 K Street NW
Washington, DC 20005
jkushan@sidley.com
(202) 736-8914

Lead Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

I hereby certify that this brief complies with the type-volume limitations of 37 C.F.R. § 42.24, because it contains 5,529 words (as determined by the Microsoft Word word-processing system used to prepare the brief), excluding the parts of the brief exempted by 37 C.F.R. § 42.24.

Dated: April 30, 2020

Respectfully Submitted,

/Jeffrey P. Kushan/
Jeffrey P. Kushan
Reg. No. 43,401
SIDLEY AUSTIN LLP
1501 K Street NW
Washington, DC 20005
Attorney for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on this 30th day of April, 2020, copies of this
Petitioner's Reply, Attachments and Exhibits have been served in its entirety by
email on the following counsel of record for Patent Owner:

Thomas A. Lewry
John S. LeRoy
Robert C. J. Tuttle
John M. Halan
Christopher C. Smith
BROOKS KUSHMAN P.C.
OMSC0110IPR2@brookskushman.com

Dated: April 30, 2020

Respectfully submitted,

/Jeffrey P. Kushan/
Jeffrey P. Kushan
Reg. No. 43,401
Attorney for Petitioner