IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

OMNI MEDSCI, INC., *Plaintiff*, v. SAMSUNG ELECTRONICS, CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., FOSSIL GROUP, INC., FOSSIL STORES I, INC., FOSSIL PARTNERS, L.P., ONEPLUS TECHNOLOGY (SHENZHEN) CO., LTD., and ŌURA HEALTH OY, *Defendants*.	Civil No. 2:24-cv-01070-JRG-RSP JURY TRIAL DEMANDED

DEFENDANTS' INVALIDITY AND
SUBJECT MATTER ELIGIBILITY CONTENTIONS

Pursuant to Patent Rules 3-3 and 3-4 and the Docket Control Order entered by the Court (Dkt. 46), Defendants Samsung Electronics, Co. Ltd., Samsung Electronics America, Inc. (collectively "Samsung"), Fossil Group, Inc., Fossil Stores I, Inc., Fossil Partners, L.P. (collectively "Fossil"), and Ōura Health Oy ("Oura") (collectively "Defendants") hereby provide their Invalidity Contentions to Omni MedSci, Inc. ("Omni" or "Plaintiff").

Defendants' Invalidity Contentions include the accompanying claim charts concerning U.S. Patent Nos. 9,055,868 ("the '868 Patent"); 9,651,533 ("the '533 Patent"); 10,517,484 ("the '484 Patent"); 10,874,304 ("the '304 Patent"); 11,160,455 ("the '455 Patent"); 12,193,790 ("the '790 Patent") (collectively the "Asserted Patents").[1]

Defendants also submit their Subject Matter Eligibility Contentions concerning the

[1] The '484, '455, and '790 Patents are asserted against only Samsung and Fossil, not Oura.

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Asserted Patents in accordance with the Court's July 25, 2019, Standing Order Regarding Subject Matter Eligibility Contentions Applicable to All Patent Infringement Cases Assigned to Chief District Judge Rodney Gilstrap ("Standing Order") and the Docket Control Order.

I. Introduction

As disclosed in its respective P. R. 3-1 Infringement Contentions served on Defendants, Plaintiff asserts the following patents and claims:

Patent	**Asserted Claims**[2]	**Omni's Alleged Priority Date**	**Chart Prefix**
'868 Patent	Samsung: 7, 9 Fossil: 7-9 Oura: 7, 9	September 3, 2002	A
'533 Patent	Samsung: 11, 12 Fossil: 12 Oura: 11, 12	December 31, 2012	B
'484 Patent	Samsung: 8-10 Fossil: 8-9 Oura: n/a	December 31, 2012	C
'304 Patent	Samsung: 11, 14-16, 19-22 Fossil: 11, 14, 19-20 Oura: 11-14, 19-20	December 31, 2012	D
'455 Patent	Samsung: 1-3, 8-10, 15 Fossil: 1, 8 Oura: n/a	December 31, 2012	E
'790 Patent	Samsung: 7 Fossil: 7 Oura: n/a	December 31, 2012	F

The claims identified above are referenced as "the Asserted Claims" unless reference is made specifically with respect to particularly identified one or more of the Asserted Patents and/or one or more of the Asserted Claims. By identifying Omni's alleged priority date for the Asserted Claims of each patent above, Defendants do not concede that Omni's claims of priority are correct.

[2] *See* n.1.

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Further, the citation of prior art herein and the accompanying exhibits are not intended to reflect Defendants' claim construction contentions, which will be disclosed in due course in accordance with the Docket Control Order. Instead, Defendants' Invalidity Contentions and Subject Matter Eligibility Contentions as set forth herein and in the accompanying exhibits may reflect Plaintiff's apparent claim constructions based on its Infringement Contentions, with which Defendants disagree.

As further detailed in and supported by these Invalidity Contentions, Defendants contend that each of the Asserted Claims is invalid under at least 35 U.S.C. §§ 101, 102, 103, and/or 112.[3] Defendants reserve the right to prove the invalidity of the Asserted Claims on bases other than those required to be disclosed in these disclosures pursuant to P.R. 3-3.

II. Amendment / Supplementation

Defendants' Invalidity Contentions and Subject Matter Eligibility Contentions pertain to the Asserted Claims as identified in Plaintiff's Infringement Contentions. To the extent the Court later allows Plaintiff to amend its infringement contentions and/or assert one or more claims other than the Asserted Claims, Defendants reserve the right to modify, amend, or supplement these Invalidity Contentions and Subject Matter Eligibility Contentions accordingly—for example, to show the invalidity and/or ineligibility of any such newly Asserted Claims.

These Invalidity Contentions and Subject Matter Eligibility Contentions are based on Defendants' current understanding of the Asserted Claims and Plaintiff's apparent view of the scope of those claims as shown, for example, in Plaintiff's Infringement Contentions. A *Markman*

[3] References to Title 35 of the United States Code are to statutes prior to amendment under the America Invents Act ("AIA"), to the extent that the Asserted Patents have effective filing dates prior to applicable AIA effective dates, and to the current statutory provisions with respect to Asserted Patents having effective filing dates after the applicable AIA effective dates.

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Order in this case has not yet been issued, and in no way should these Invalidity Contentions and Subject Matter Eligibility Contentions be taken as any admission or acquiescence by Defendants as to the proper scope of the Asserted Claims and/or proper claim constructions of terms and phrases recited in those claims. By identifying prior art that anticipates and/or renders obvious the Asserted Claims, Defendants do not admit that the claim limitations are capable of construction, do not admit that any claim limitations are supported with an appropriate written description and enabling disclosure in the applicable patent specifications, and do not adopt Plaintiff's apparent claim constructions or admit the accuracy of any particular claim construction.[4] Defendants reserve all rights to later challenge or oppose any claim constructions advanced by Plaintiff and to present their own claim construction positions as permitted by the Court.

Defendants further reserve the right to revise these Invalidity Contentions and Subject Matter Eligibility Contentions in view of the Court's construction of terms and phrases recited in one or more of the Asserted Claims, additional information obtained during discovery, additional infringement theories put forth by Plaintiff during fact and/or expert discovery, any findings as to the priority date(s) of the Asserted Claims, and/or positions that Plaintiff, its fact witnesses, or its expert witness(es) may take concerning claim construction, infringement, and/or invalidity issues, as permitted by the Court. Defendants further reserve the right to supplement their accompanying P.R. 3-4(b) document productions should they later discover additional prior art documents, information, testimony, prior art systems and related documentation, and/or software or hardware

[4] Defendants do not concede that Plaintiff's apparent interpretation of the claims is correct, but rather assert the well-established principle that whatever infringes a claim if later in time anticipates if earlier in time. *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1378 (Fed. Cir. 2001). Thus, where Plaintiff for purposes of its infringement case alleges that a feature of an accused product meets a particular limitation recited in one or more of the Asserted Claims, then that feature, should it be found in the prior art, would also cause that limitation to be met for invalidity purposes.

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code, including information provided by third parties after the date of service of these Invalidity Contention and Subject Matter Eligibility Contentions.

Additionally, Plaintiff has not identified in its contentions regarding the level of ordinary skill in the art for any of the Asserted Patents. Thus, Defendants have based their Invalidity and Subject Matter Eligibility Contentions on the level of skill in the art apparent from the face of the asserted patents. For the avoidance of doubt, Defendants contend that the asserted claims are invalid for the reasons set forth in their Invalidity and Subject Matter Eligibility contentions under any plausible definition of the level of ordinary skill for each of the Asserted Patents. Nevertheless, Defendants reserve the right to revise these Invalidity Contentions and Subject Matter Eligibility Contentions in response to any position taken by Plaintiff on the level of ordinary skill in the art applicable to a given Asserted Patent.

Defendants may further rely on inventor admissions concerning the scope or state of the prior art relevant to the Asserted Claims, the patent prosecution histories of the Asserted Patents, related patents and/or patent applications, any deposition or trial testimony of the named inventors on the Asserted Patents, and the papers filed and any evidence produced or submitted by Plaintiff in connection with these cases or other related litigation. Defendants reserve the right to contend that one or more of the Asserted Claims are invalid under 35 U.S.C. § 102(f) in the event Defendants obtain evidence that one or more of the named inventors did not invent the subject matter in the Asserted Claims.

Prior art not included in these Invalidity Contentions and Subject Matter Eligibility Contentions, whether known or not known to Defendants, may become relevant. Defendants are currently unaware of the extent, if any, to which Plaintiff will contend that limitations of the Asserted Claims are not disclosed in the prior art identified in these Invalidity Contentions and

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Subject Matter Eligibility Contentions. Accordingly, Defendants reserve the right to identify other references that would disclose the allegedly missing limitation(s) of the claimed method, device, or system.

The references identified in these Invalidity Contentions and Subject Matter Eligibility Contentions, which include the attached claim charts, may disclose the elements of the Asserted Claims explicitly and/or inherently, render those elements alone or in combination obvious to those of ordinary skill in the art even absent an explicit or inherent disclosure, and/or they may be relied upon to show the state of the art in the relevant time frame. References identified in these Invalidity Contentions and Subject Matter Eligibility Contentions, as well as the "References Cited" on the face of the Asserted Patents and the patents cited within the body of the Asserted Patents, may be used to illustrate, but not limit the scope of, the state of the art to which the Asserted Patents pertain (i.e., at a time prior to the date of alleged inventions of the Asserted Claims of the Asserted Patents). Moreover, Defendants reserve the ability to rely on later-identified sources of information, including but not limited to witness testimony and other discovery, to establish the state of the art in the relevant time frame pertaining to the Asserted Patents.

Because discovery has just recently begun, Defendants anticipate that additional prior art and invalidity bases may be found. Defendants' investigation and analysis of the prior art is continuing, and thus Defendants reserve the right to supplement, amend, and/or revise the information provided herein as Defendants conduct further investigation and/or analysis, including identifying, charting, and relying on additional references.

Additionally, in view of likely third-party discovery that will be taken, Defendants reserve the right to present additional items of prior art under 35 U.S.C. §§ 102(a), (b), (e), and/or (g) and/or § 103 located during discovery or further investigation, and to assert contentions of

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invalidity under 35 U.S.C. §§ 102(c), (d), or (f). For example, Defendants expect to issue subpoenas to third parties believed to have knowledge, documents, and/or other evidence concerning invalidity of one or more of the Asserted Claims.

In addition to the positions and prior art identified in these Invalidity Contentions and Subject Matter Eligibility Contentions (including the accompanying claim charts), Defendants also incorporate by reference all invalidity contentions and subject matter eligibility contentions, prior art,[5] and invalidity claim charts (including, without limitation, all anticipation positions, obviousness positions [including all prior art combinations and motivations to combine], indefiniteness positions, written description positions, and non-enablement positions) concerning one or more of the Asserted Patents, as disclosed at any time. This includes without limitation disclosures in previous or related litigation, in United States Patent & Trademark Office ("USPTO") proceedings, by the Plaintiff, by any other parties accused of patent infringement by the Plaintiff, or by the named inventors or any individuals associated with the prosecution and/or any form of post-grant review or reexamination of the Asserted Patents.

Specifically, for example, Defendants identify, as prior art upon which they may rely to show the invalidity of the Asserted Claims, the prior art references disclosed by parties in any other litigation (including inter partes review and/or reexamination proceedings) involving one or more of the Asserted Patents, any patent related to any of the Asserted Patents, and/or any other patent allegedly assigned to Plaintiff claiming priority to the Asserted Patents (collectively, "Other Omni Proceedings").

Plaintiff has a present and ongoing duty to produce to Defendants all relevant documents

[5] Prior art appearing in the file histories of the Asserted Patents is not required to be separately produced by Defendants under P. R. 3-4(b).

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from any Other Omni Proceedings, including but not limited to all prior art, invalidity contentions, and expert reports on invalidity (among other relevant items).

Defendants reserve the right to supplement or otherwise amend these Invalidity Contentions and Subject Matter Eligibility Contentions in response to any relevant discovery provided by third parties, Plaintiff, opening or rebuttal expert reports, fact or expert depositions, or in response to any claim construction ruling(s) issued by this Court (regardless of how and when such ruling is made). Defendants also reserve the right to supplement or otherwise amend these Invalidity Contentions and Subject Matter Eligibility Contentions in response to any rebuttal evidence disclosed by Plaintiff or as otherwise may be necessary or appropriate under the circumstances.

III. P. R. 3-3(a) – Identification of Prior Art

Pursuant to P.R. 3-3(a), and subject to Defendants' reservations of rights, Defendants identify each item of prior art that anticipates or renders obvious the Asserted Claims below.[6]

A. U.S. Patent No. 9,055,868

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the '868 Patent are provided in attached Exhibits A1 through A10.

[6] Defendants' disclosure of prior art is premised on the alleged priority dates of the Asserted Patents as identified in Plaintiff's Infringement Contentions. Defendants contend Plaintiff is not entitled to the alleged priority dates and reserve the right to modify, amend, or supplement their invalidity contentions with additional prior art references if any Asserted Claim is shown to not be entitled to the respective alleged priority date or if Plaintiff alleges any other priority date for any of the Asserted Claims. Notwithstanding that reservation of rights, Defendants also reserve the right to argue that they have been unduly prejudiced should Plaintiff allege a different priority date for any of the Asserted Claims, and that accordingly Plaintiff should not be allowed to do so.

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Table 1-A: Prior Art Patents and Printed Publications for the ’868 Patent

Patent No. or Title (Primary Inventor/Author)	**Date of Issue/ Publication**	**Filing Date**
US 2003/0208113 (“Mault”) [Ex. A1]	Nov. 6, 2003	July 18, 2001
US 6,067,463 (“Jeng”) [Ex. A2]	May 23, 2000	Jan. 5, 1999
US 5,891,022 (“Pologe”) [Ex. A3]	April 6, 1999	Sept. 25, 1996
US 2002/0198473 (“Kumar”) [Ex. A4]	Dec. 26, 2002	March 28, 2002
US 2004/0002634 (“Nihtila”) [Ex. A5]	Jan. 1, 2004	June 28, 2002
JP 2000-74829 (“Shigeki”) [Ex. A6]	Sept. 2, 1999	March 14, 2000
US 6,168,563 (“Brown”) [Ex. A7]	Jan. 2, 2001	March 17, 1999
US 2002/0049389 (“Abreu”) [Ex. A8]	April 25, 2002	Feb. 23, 2001
US 6,602,191 (“Quy”) [Ex. A9]	Aug. 5, 2003	Dec. 15, 2000
US 5,830,137 (“Scharf”) [Ex. A10]	Nov. 3, 1998	Nov. 18, 1996

Table 2-A: Prior Art Systems and Inventions for the ’868 Patent

Name of System or Invention	**Date of Sale / Offer for Sale / Public Use / Known by Others**
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems, Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	At least as early as 1988
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35 U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-A.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

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Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '868 Patent. Defendants' investigation of such prior art systems is still ongoing, and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether any of the third-party prior art systems anticipate or render obvious the Asserted Claims of the '868 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '868 Patent. Defendants have obtained, and are in the process of obtaining, additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third-party discovery during this lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in

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Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-A and 2-A as evidence of the state of the art as it relates to physiological monitoring devices / systems.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '868 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the Asserted Claims of the '868 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the '868 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

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

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the '533 Patent are provided in attached Exhibits B1 through B8.

Table 1-B: Prior Art Patents and Printed Publications for the '533 Patent

Patent No. or Title (Primary Inventor/Author)	Date of Issue/ Publication	Filing Date
US 2011/0028802 ("Addison") [Ex. B1]	February 3, 2011	July 31, 2009
US 2015/0057511[7] ("Basu") [Ex. B2]	February 26, 2015	March 27, 2013
US 2005/0049468 ("Carslon") [Ex. B3]	March 3, 2005	September 3, 2003
US 2012/0197093 ("LeBoeuf") [Ex. B4]	August 2, 2012	January 25, 2012
US 9,241,676 ("Lisogurski") [Ex. B5]	January 26, 2016	May 31, 2012
US 9,596,990 ("Park") [Ex. B6]	March 21, 2017	November 6, 2013
US 8,923,918 ("Kreger") [Ex. B7]	December 30, 2014	December 18, 2010
US 7,507,207 ("Sakai") [Ex. B8]	March 24, 2009	October 5, 2004

Table 2-B: Prior Art Systems and Inventions for the '533 Patent

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems, Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	At least as early as 1988
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-

[7] Invalidity contentions relying on this reference herein will make reference to the Provisional Application No. 61/616524, which is incorporated by reference into Basu.

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical	At least as early as 2007

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35 U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-B.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and

Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '533 Patent. Defendants' investigation of such prior art systems is still ongoing, and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether any of the third-party prior art systems anticipate or render obvious the Asserted Claims of the '533 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '533 Patent. Defendants have obtained, and are in the process of obtaining, additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third-party discovery during this

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lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-B and 2-B as evidence of the state of the art as it relates to physiological monitoring devices / systems.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '533 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the Asserted Claims of the '533 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the '533 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking

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depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

C. U.S. Patent No. 10,517,484

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the '484 Patent are provided in attached Exhibits C1 through C14.

Table 1-C: Prior Art Patents and Printed Publications for the '484 Patent

Patent No. or Title (Primary Inventor/Author)	**Date of Issue/ Publication**	**Filing Date**
US 9,241,676 ("Lisogurski") [Ex. C1]	Jan. 26, 2016	May 31, 2012
US 2015/0057511 ("Basu") [Ex. C2]	Feb. 26, 2015	Mar. 27, 2013
US 6,616,613 ("Goodman") [Ex. C3]	Sep. 9, 2003	Apr. 29, 2000
WO 2012/099536 ("Kassim") [Ex. C4]	Jul. 26, 2012	Jan. 20, 2011
US 9,095,291 ("Soller") [Ex. C5]	Aug. 4, 2015	Aug. 7, 2009
US 11,638,532 ("Poeze") [Ex. C6]	May 2, 2023	Jul. 1, 2010
US 2012/0150047 ("Terumoto") [Ex. C7]	June 14, 2012	Nov. 14, 2011
US 8,172,761 ("Rulkov") [Ex. C8]	May 8, 2012	Oct. 4, 2011
US 2011/0066050 ("Moon") [Ex. C9]	Mar. 17, 2011	Sep. 15, 2009
US 2005/0049468 ("Carlson") [Ex. C10]	Mar. 3, 2005	Sep. 3, 2003
US 8,108,036 ("Tran") [Ex. C11]	Jan. 31, 2012	Jun. 18, 2009
Plug-and-Play, Single-Chip Photoplethysmography ("Chandrasekar") [Ex. C12]	Sep. 2012	N/A
US 8,923,918 ("Kreger") [Ex. C13]	Dec. 30, 2014	Dec. 18, 2010
US 7,507,207 ("Sakai") [Ex. C14]	Mar. 24, 2009	Oct. 5, 2004

Table 2-C: Prior Art Systems and Inventions for the '484 Patent

Name of System or Invention	**Date of Sale / Offer for Sale / Public Use / Known by Others**
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems,	At least as early as 1988

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35

U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-C.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '484 Patent. Defendants' investigation of such prior art systems is still ongoing, and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether any of the third-party prior art systems anticipate or render obvious the Asserted Claims of the '484 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '484 Patent. Defendants have obtained, and are in the process of obtaining,

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additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third-party discovery during this lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-C and 2-C as evidence of the state of the art as it relates to physiological monitoring devices / systems.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '484 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the Asserted Claims of the '484 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the '484 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such

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reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

D. U.S. Patent No. 10,874,304

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the ’304 Patent are provided in attached Exhibits D1 through D19.

Table 1-D: Prior Art Patents and Printed Publications for the ’304 Patent

Patent No. or Title (Primary Inventor/Author)	**Date of Issue/ Publication**	**Filing Date**
US 2015/0057511A1 (“Basu”) [Ex. D1]	2/26/2015	3/27/2013
US 2005/0049468A1 (“Carlson”) [Ex. D2]	3/3/2005	9/3/2003
US 6,616,613 (“Goodman”) [Ex. D3]	9/9/2003	4/27/2000
US 6,519,037B2 (“Jung”) [Ex. D4]	2/11/2003	6/1/2001
WO 2012/99536 (“Kassim”) [Ex. D5]	7/26/2012	1/20/2011
US 2011/0237911A1 (“Lamego”) [Ex. D6]	9/29/2011	3/28/2011
US 2010/0217102A1 (“LeBoeuf”) [Ex. D7]	8/26/2010	1/21/2010
US 9,241,676 (“Lisogurski”) [Ex. D8]	1/26/2016	5/31/2012
US 5,746,206 (“Mannheimer”) [Ex. D9]	5/5/1998	6/10/1996
US 2003/0208113A1 (“Mault”) [Ex. D10]	11/6/2003	7/18/2001
US 2011/0082711A1 (“Poeze”) [Ex. D11]	4/7/2011	10/5/2010
US 5,891,022 (“Pologe”) [Ex. D12]	4/6/1999	9/25/1996
US 8,108,036 (“Tran”) [Ex. D13]	1/31/2012	6/18/2009
US 2012/0197093A1 (“Valencell”) [Ex. D14]	8/2/2012	1/25/2012

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Patent No. or Title (Primary Inventor/Author)	Date of Issue/ Publication	Filing Date
D. Chandrasekar, et al., "Plug-and-Play, Single-Chip Photoplethysmography" ("Chandrasekar2012") [Ex. D15]	8/28/2012 - 9/1/2012	received 3/29/12
US 7,507,207 ("Sakai") [Ex. D16]	3/24/2009	10/5/2004
US 8,923,918 ("Kreger") [Ex. D17]	12/30/2014	12/18/2010
US 2006/0184040 ("Keller") [Ex. D18]	8/17/2006	12/7/2005
US 7,139,076 ("Marbach") [Ex. D19]	11/21/2006	8/8/2003

Table 2-D: Prior Art Systems and Inventions for the '304 Patent

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems, Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	At least as early as 1988
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35 U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-D.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

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Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '304 Patent. Defendants' investigation of such prior art systems is still ongoing, and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether any of the third-party prior art systems anticipate or render obvious the Asserted Claims of the '304 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '304 Patent. Defendants have obtained, and are in the process of obtaining, additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third-party discovery during this lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in

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Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-D and 2-D as evidence of the state of the art as it relates to physiological monitoring device/system.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '304 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the Asserted Claims of the '304 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the '304 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

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

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the ’455 Patent are provided in attached Exhibits E1 through E18.

Table 1-E: Prior Art Patents and Printed Publications for the ’455 Patent

Patent No. or Title (Primary Inventor/Author)	**Date of Issue/ Publication**	**Filing Date**
US 2015/0057511A1 (“Basu”) [Ex. E1]	2/26/2015	3/27/2013
US 2005/0049468A1 (“Carlson”) [Ex. E2]	3/3/2005	9/3/2003
US 6,616,613 (“Goodman”) [Ex. E3]	9/9/2003	4/27/2000
US 6,519,037B2 ("Jung") [Ex. E4]	2/11/2003	6/1/2001
WO 2012/99536 (“Kassim”) [Ex. E5]	7/26/2012	1/20/2011
US 2011/0237911A1 (“Lamego”) [Ex. E6]	9/29/2011	3/28/2011
US 2010/0217102A1 (“LeBoeuf”) [Ex. E7]	8/26/2010	1/21/2010
US 9,241,676 (“Lisogurski”) [Ex. E8]	1/26/2016	5/31/2012
US 5,746,206 (“Mannheimer”) [Ex. E9]	5/5/1998	6/10/1996
US 2003/0208113A1 (“Mault”) [Ex. E10]	11/6/2003	7/18/2001
US 2011/0082711A1 (“Poeze”) [Ex. E11]	4/7/2011	10/5/2010
US 5,891,022 (“Pologe”) [Ex. E12]	4/6/1999	9/25/1996
US 8,108,036 (“Tran”) [Ex. E13]	1/31/2012	6/18/2009
US 2012/0197093A1 (“Valencell”) [Ex. E14]	8/2/2012	1/25/2012
D. Chandrasekar, et al., “Plug-and-Play, Single-Chip Photoplethysmography” (“Chandrasekar2012”) [Ex. E15]	8/28/2012 - 9/1/2012	received 3/29/12
US 7,507,207 ("Sakai") [Ex. E16]	3/24/2009	10/5/2004
US 8,923,918 ("Kreger") [Ex. E17]	12/30/2014	12/18/2010
US 8,725,226 (“Isaacson”) [Ex. E18]	5/13/2014	11/13/2009

Table 2-E: Prior Art Systems and Inventions for the ’455 Patent

Name of System or Invention	**Date of Sale / Offer for Sale / Public Use / Known by Others**
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems,	At least as early as 1988

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35

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U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-E.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '455 Patent. Defendants' investigation of such prior art systems is still ongoing and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether or not any of the third-party prior art systems anticipate or render obvious the Asserted Claims of the '455 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '455 Patent. Defendants have obtained, and are in the process of obtaining,

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additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-E and 2-E as evidence of the state of the art as it relates to physiological monitoring devices / systems.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '455 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the Asserted Claims of the '455 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the '455 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such

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reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

F. U.S. Patent No. 12,193,790

Invalidity claim charts identifying disclosures in the references identified in the tables below as to the Asserted Claims of the '790 Patent are provided in attached Exhibits F1 through F14.

Table 1-F: Prior Art Patents and Printed Publications for the '790 Patent

Patent No. or Title (Primary Inventor/Author)	**Date of Issue/ Publication**	**Filing Date**
US 9,241,676 ("Lisogurski") [Ex. F1]	Jan. 26, 2016	May 31, 2012
US 2015/0057511 ("Basu") [Ex. F2]	Feb. 26, 2015	Mar. 27, 2013
US 6,616,613 ("Goodman") [Ex. F3]	Sep. 9, 2003	Apr. 29, 2000
WO 2012/099536 ("Kassim") [Ex. F4]	Jul. 26, 2012	Jan. 20, 2011
US 9,095,291 ("Soller") [Ex. F5]	Aug. 4, 2015	Aug. 7, 2009
US 11,638,532 ("Poeze") [Ex. F6]	May 2, 2023	Jul. 1, 2010
US 2012/0150047 ("Terumoto") [Ex. F7]	June 14, 2012	Nov. 14, 2011
US 8,172,761 ("Rulkov") [Ex. F8]	May 8, 2012	Oct. 4, 2011
US 2011/0066050 ("Moon") [Ex. F9]	Mar. 17, 2011	Sep. 15, 2009
US 2005/0049468 ("Carlson") [Ex. F10]	Mar. 3, 2005	Sep. 3, 2003
US 2008/0242958 ("Al-Ali") [Ex. F11]	Oct. 2, 2008	Mar. 26, 2008
Plug-and-Play, Single-Chip Photoplethysmography ("Chandrasekar") [Ex. F12]	September 2012	N/A
US 8,923,918 ("Kreger") [Ex. F13]	Dec. 30, 2014	Dec. 18, 2010
US 7,507,207 ("Sakai") [Ex. F14]	Mar. 24, 2009	Oct. 5, 2004

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Table 2-F: Prior Art Systems and Inventions for the '790 Patent

Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by ChoiceMMed, including but not limited to ChoiceMMed MD300C318T, and its accessories (e.g., sensor probe)	At least as early as 2011-05-20
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Criticare Systems, Inc., including but not limited to Criticare 504, and its accessories (e.g., sensor probe)	At least as early as 1988
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by GE Marquette Medical Systems, Inc., including but not limited to Dash 2000 Patient Monitor, and its accessories (e.g., sensor probe)	At least as early as 1999
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Masimo Corp., including but not limited to Rad-5 and Rad-5v Signal Extraction Pulse Oximeters, Radical, Rad-57™, SET® Pulse Oximetry Devices and Rainbow SET™ Devices, and their accessories (e.g., sensor probe)	At least as early as 2004 (Rad-5/ Rad-5v), 2007 (Radical), 2008 (Rad-57™), 2009 (SET®/Rainbow SET™).
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Mindray DS USA, Inc, including but not limited to Accutorr V, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Covidien AG / Nellcor Puritan Bennett Inc., including but not limited to Nellcor OxiMax Pulse Oximeters, Nellcor N-595 Pulse Oximter, Nellcor OxiMax N-600X Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 2002 (OxiMax Pulse Oximeters and OmniMax N-595), 2011 (OxiMax N-600X)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Nonin Medical, Inc., including but not limited to Onyx, PalmSAT™, and Nonin® Model 7500 Digital Pulse Oximeter, Nonin Onyx® 9500, and their accessories (e.g., sensor probe)	At least as early as 1988 (Onyx), 2007 (PalmSAT™), 2007 (Nonin Onyx® 9500), and 2008 (Nonin® Model 7500)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Novametrix Medical Systems Inc., including but not limited to Novametrix Model 513 and Model 2001, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 513) and 2007 (Model 2001)

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Name of System or Invention	Date of Sale / Offer for Sale / Public Use / Known by Others
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Respironics, Inc., including but not limited to Models 920, 920M and 920M PLUS Pulse Oximeter, and their accessories (e.g., sensor probe)	At least as early as 1999 (Model 920 and 920M) and 2007 (Model 920M PLUS)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Smiths Medical, including but not limited to BCI 3304 Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2008
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Utech Co., Ltd., including but not limited to UT100 Handheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2010
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Welch Allyn, including but not limited to Propaq® CS Vital Signs Monitor and Propaq® Encore Vital Signs Monitor, and their accessories (e.g., sensor probe)	At least as early as 2011 (Propaq® Encore Vital Signs Monitor) and 2012 (Propaq® CS Vital Signs Monitor)
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Philips Medical Systems, including but not limited to M4529A DigitalHandheld Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Palco Labs Inc, including but not limited to Model 120 Mini Pulse Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by BCI Inc., including but not limited to Capnocheck® Sleep Capnograph/Oximeter, and its accessories (e.g., sensor probe)	At least as early as 2007
Pulse oximeters or similar products publicly disclosed, used, sold, or offered for sale by Datex-Ohmeda, including but not limited to TuffSat, and its accessories (e.g., sensor probe)	At least as early as 2007

For each of the prior art devices identified above, Defendants have listed and produced documents as evidence of the relevant features and functionality to the extent that they are presently available and have been located. Defendants have obtained or are in the process of

attempting to obtain the identified devices and will make them available for inspection to the extent they are obtained. To the extent that one or more documents (*e.g.*, user manual) may be used to describe aspects of a particular device, that device is a single reference for prior art purposes under 35 U.S.C. § 102. Some or all of the corroborating references may also separately qualify as prior art publications under 35 U.S.C. § 102 and may be used as invalidating references under 35 U.S.C. §§ 102 and/or 103.

Further, Defendants are actively searching for information regarding at least the systems, devices, and/or inventions listed above in Table 2-F.

Discovery is ongoing, and Defendants may serve third parties with document subpoenas. One or more of these devices, along with related documentation, may be invalidating, and Defendants reserve the right to supplement these contentions accordingly. Defendants continue to investigate each of the identified devices, including through potential discovery needed to be obtained via third party subpoenas, and reserve the right to supplement these contentions and accompanying claim charts after further investigation.

Defendants' reference to a particular product, device, or software program in these contentions should be interpreted as a reference to the system itself as well as to any corresponding patents, publications, or product literature relating to the cited system. Upon information and belief, the systems were publicly disclosed, used, sold, or offered for sale in the United States before the alleged priority date of the Asserted Claims of the '790 Patent. Defendants' investigation of such prior art systems is still ongoing, and discovery has not yet been received from third parties who may have information concerning such prior art systems. Accordingly, subsequent discovery may reveal information that affects the disclosures and contentions herein. For example, subsequent discovery may provide additional information regarding whether any of the third-party

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prior art systems anticipate or render obvious the Asserted Claims of the '790 Patent. As such, Defendants reserve all rights to supplement their invalidity contentions.

Many of the inventive, research, design, and development activities concerning these systems and technologies occurred in the United States before the alleged priority date of the Asserted Claims of the '790 Patent. Defendants have obtained, and are in the process of obtaining, additional information regarding the dates by which the cited products and services were publicly disclosed, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the individuals involved in such activities through publicly available patents, publications, and product literature. The actual dates, circumstances, and identities of individuals will be the subject of third-party discovery during this lawsuit, which Defendants reserve the right to rely upon to corroborate the prior art status of the prior art identified herein. Defendants reserve the right to modify, amend, or supplement these contentions if additional information becomes available during the course of this lawsuit. Furthermore, Defendants will make all such devices, software programs, or other products in Defendants' possession, custody, or control available for inspection by Plaintiff.

Consequently, Defendants reserve the right to amend, modify, or supplement these Invalidity Contentions should additional information become available to them through discovery.

In addition, Defendants identify, responsive to Plaintiff's Infringement Contentions, the patents, publications, and/or systems listed in Tables 1-F and 2-F as evidence of the state of the art as it relates to physiological monitoring devices / systems.

Each of these references show that the concept of "physiological monitoring" is not novel and was well-known for many years before the alleged priority date of the '790 Patent, as discussed in more detail in Section IV.B (obviousness). In light of the references discussed herein, the

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Asserted Claims of the ’790 Patent cannot be valid.

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before either the earliest claimed priority date of the ’790 Patent to which it is applied for invalidity, and none appears to have been abandoned, suppressed, or concealed, so each such reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Defendants have not yet completed discovery in this case, including taking depositions of the named inventors, and otherwise obtaining discovery from Plaintiff and third parties, Defendants reserve the right to supplement these contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

G. State of the Art

Defendants identify, responsive to Plaintiff’s infringement contentions, the references listed in Tables 1-A through 1-F, Tables 2-A through 2-F, and the following patents, publications, and systems as evidence of the state of the art as it relates to each of the Asserted Patents:

- U.S. Patent No. 3,514,538
- U.S. Patent No. 3,789,601
- U.S. Patent No. 4,015,595
- U.S. Patent No. 4,589,078
- U.S. Patent No. 4,591,659
- U.S. Patent No. 4,941,236
- U.S. Patent No. 5,028,787
- U.S. Patent No. 5,222,496,
- U.S. Patent No. 5,254,388
- U.S. Patent No. 5,259,381
- U.S. Patent No. 5,267,152
- U.S. Patent No. 5,334,916

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- U.S. Patent No. 5,348,002
- U.S. Patent No. 5,370,114
- U.S. Patent No. 5,527,261
- U.S. Patent No. 5,555,882
- U.S. Patent No. 5,590,652
- U.S. Patent No. 5,632,272
- U.S. Patent No. 5,638,818
- U.S. Patent No. 5,687,721
- U.S. Patent No. 5,746,206
- U.S. Patent No. 5,795,300
- U.S. Patent No. 5,807,261
- U.S. Patent No. 5,830,137
- U.S. Patent No. 5,879,294
- U.S. Patent No. 5,924,069
- U.S. Patent No. 6,018,673
- U.S. Patent No. 6,064,898
- U.S. Patent No. 6,067,463
- U.S. Patent No. 6,081,782
- U.S. Patent No. 6,108,634
- U.S. Patent No. 6,120,460
- U.S. Patent No. 6,126,595
- U.S. Patent No. 6,152,876
- U.S. Patent No. 6,158,245
- U.S. Patent No. 6,168,563
- U.S. Patent No. 6,171,237
- U.S. Patent No. 6,172,743
- U.S. Patent No. 6,174,291
- U.S. Patent No. 6,178,343
- U.S. Patent No. 6,278,975
- U.S. Patent No. 6,285,454
- U.S. Patent No. 6,293,915
- U.S. Patent No. 6,336,900
- U.S. Patent No. 6,343,223
- U.S. Patent No. 6,393,311
- U.S. Patent No. 6,483,976
- U.S. Patent No. 6,505,133
- U.S. Patent No. 6,553,242
- U.S. Patent No. 6,584,336
- U.S. Patent No. 6,591,239
- U.S. Patent No. 6,591,239
- U.S. Patent No. 6,602,191
- U.S. Patent No. 6,605,038
- U.S. Patent No. 6,608,562
- U.S. Patent No. 6,648,820

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- U.S. Patent No. 6,705,990
- U.S. Patent No. 6,705,991
- U.S. Patent No. 6,801,799
- U.S. Patent No. 6,816,266
- U.S. Patent No. 6,886,964
- U.S. Patent No. 6,912,413
- U.S. Patent No. 6,937,885
- U.S. Patent No. 6,961,599
- U.S. Patent No. 6,990,365
- U.S. Patent No. 7,031,728
- U.S. Patent No. 7,236,811
- U.S. Patent No. 7,346,174
- U.S. Patent No. 7,403,804
- U.S. Patent No. 7,507,207
- U.S. Patent No. 7,624,028
- U.S. Patent No. 7,658,613
- U.S. Patent No. 7,899,506
- U.S. Patent No. 8,095,195
- U.S. Patent No. 8,108,036
- U.S. Patent No. 8,125,331
- U.S. Patent No. 8,172,761
- U.S. Patent No. 8,326,390
- U.S. Patent No. 8,537,343
- U.S. Patent No. 8,670,819
- U.S. Patent No. 8,725,226
- U.S. Patent No. 8,764,651
- U.S. Patent No. 8,923,918
- U.S. Patent No. 9,055,868
- U.S. Patent No. 9,241,676
- U.S. Patent No. 9,392,946
- U.S. Patent No. 9,596,990
- U.S. Patent No. 9,651,633
- U.S. Patent No. 9,820,658
- U.S. Patent No. 10,517,484
- U.S. Patent No. 10,729,335
- U.S. Patent No. 10,729,335
- U.S. Patent No. 10,874,304
- U.S. Patent No. 11,160,455
- U.S. Patent No. 11,242,072
- U.S. Patent No. 11,330,993
- U.S. Patent No. 11,342,072
- U.S. Patent No. 12,193,790
- “Plug-and-Play, Single-Chip Photoplethysmography”, by D. Chandrasekar, B. Arnetz, P. Levy, A. Basu

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- "Supercontinuum generation from ~1.9 to 4:5 μm in ZBLAN fiber with high average power generation beyond 3:8 μm using a thulium-doped fiber amplifier" by O. Kulkarni, V. Alexander, M. Kumar, M.Freeman, M. N. Islam, F. Terry, Jr., M. Neelakandan, and A. Chan
- "Supercontinuum Generation in Silica Fibers by Amplified Nanosecond Laser Diode Pulses" by C. Xia, M. Kumar, M. Cheng, O. Kulkarni, M. Islam, A. Galvanauskas, F. Terry, Jr., M. Freeman, D. Nolan, and W. Wood
- "Towards a Wearable Non-invasive Blood Glucose Monitoring Device" by J. Anders, J. Solanki, O. Choudhary, S. Chouksey, N. Malvia, P. Chaturvedi, and P. Sen
- "Open Data Kit Sensors: Mobile Data Collection with Wired and Wireless Sensors" by R. Chaudhri, W. Brunette, M. Goel, R. Sodt, J. VanORden, M. Falcone, G. Borriello
- "Android Based Body Area Network for the Evaluation of Medical Parameters" by M. Wagner, B. Kuch, C. Cabrera, P. Enoksson, A. Sieber
- "Noninvasice Cardiac Output Estimation Using a Novel Photoplethsymogram Index" by L. Wang, E. Pickwell-MacPherson, Y.P. Liang, Y.T. Zhang
- "Towards a Wearable Non-invasive Blood Glucose Monitoring Device" by J. Andrews, J. Solanki, O. Choudhary, S. Chouksey, N. Malvia, P. Chaturvedi, P. Sen

IV. P. R. 3-3(b) – Invalidity Grounds

Pursuant to P.R. 3-3(b), Defendants contend that certain prior art references below anticipate one or more Asserted Claims and that to the extent the identified prior art references do not anticipate the Asserted Claims, those claims are invalid as obvious under 35 U.S.C. §103. Each anticipatory prior art reference, either alone or in combination with other prior art, also renders the Asserted Claims invalid as obvious. In particular, each anticipatory prior art reference may be combined with (1) information generally known to persons skilled in the art at the time of the alleged invention, and/or (2) any of the other identified prior art references. To the extent that Plaintiff contends that any of the anticipatory prior art fails to disclose one or more limitations of the Asserted Claims, Defendants contend that any difference between the reference and the corresponding patent claims would have been obvious to one of ordinary skill in the art. Thus, all anticipation charts should be interpreted as both reflecting anticipation by the reference as well as invalidity due to single reference obviousness, to the extent that Plaintiff contends that any limitation is missing.

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A. Anticipation

As stated above, Defendants incorporate by reference all other invalidity contentions related to the Asserted Patents served on or otherwise provided to Plaintiff, whether past or future. In accordance with P.R. 3-3(a), prior art references anticipating the Asserted Claims are provided below. The prior art listed below anticipates the Asserted Claims under the proper construction of the claims and/or under Plaintiff's apparent interpretation of the claims reflected by Plaintiff's Complaint and Infringement Contentions.

1. U.S. Patent No. 9,055,868

The Asserted Claims of the '868 Patent are anticipated and/or rendered obvious by prior art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the '868 Patent Asserted Claims in the claim charts of Exhibits A1 through A10 (collectively "Appendix A") which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix A show how these prior art references teach or suggest each and every element of the '868 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the '868 Patent Asserted Claims are invalid in view of the prior art references cited in the claim charts of Appendix A, Defendants further contend that the '868 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the '868 Patent Asserted Claims are invalid in view of the

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explicit disclosures of the prior art references cited in the claim charts of Appendix A, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants' reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix A should be interpreted alternatively as both as a reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix A that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software program(s), device(s) or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '868 Patent, all prior art cited during reexamination proceedings of the '868 Patent, all prior art as described in any future *inter partes* review proceedings of the '868 Patent, and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '868 Patent, its foreign counterparts, or any parent or child patent of the '868 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence

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the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants' citations to specific statements, figures, or disclosures in a prior art reference are sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of

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the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix A.

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

The Asserted Claims of the '533 Patent are anticipated and/or rendered obvious by prior art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the '533 Patent Asserted Claims in the claim charts of Exhibits B1 through B8 (collectively "Appendix B") which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix B show how these prior art references teach or suggest each and every element of the '533 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the '533 Patent Asserted Claims are invalid in view of the prior art references cited in the claim charts of Appendix B, Defendants further contend that the '533 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the '533 Patent Asserted Claims are invalid in view of the explicit disclosures of the prior art references cited in the claim charts of Appendix B, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan

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reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants' reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix B should be interpreted alternatively as both as a reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix B that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software program(s), device(s) or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '533 Patent, all prior art cited during reexamination proceedings of the '533 Patent, all prior art as described in any future *inter partes* review proceedings of the '533 Patent, and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '533 Patent, its foreign counterparts, or any parent or child patent of the '533 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text

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relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants' citations to specific statements, figures, or disclosures in a prior art reference are sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix B.

3. U.S. Patent No. 10,517,484

The Asserted Claims of the '484 Patent are anticipated and/or rendered obvious by prior

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art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the '484 Patent Asserted Claims in the claim charts of Exhibits C1 through C14 (collectively "Appendix C") which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix C show how these prior art references teach or suggest each and every element of the '484 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the '484 Patent Asserted Claims are invalid in view of the prior art references cited in the claim charts of Appendix C, Defendants further contend that the '484 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the '484 Patent Asserted Claims are invalid in view of the explicit disclosures of the prior art references cited in the claim charts of Appendix C, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants' reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix C should be interpreted alternatively as both as a

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reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix C that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software program(s), device(s) or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '484 Patent, all prior art cited during reexamination proceedings of the '484 Patent, all prior art as described in any future *inter partes* review proceedings of the '484 Patent, and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '484 Patent, its foreign counterparts, or any parent or child patent of the '484 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants' citations to specific statements, figures, or disclosures in a prior art reference are

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sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix C.

4. U.S. Patent No. 10,874,304

The Asserted Claims of the ’304 Patent are anticipated and/or rendered obvious by prior art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the ’304 Patent Asserted Claims in the claim charts of Exhibits D1 through D19 (collectively “Appendix D”) which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix D show how these prior art references teach or suggest each and

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every element of the ’304 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the ’304 Patent Asserted Claims are invalid in view of the prior art references cited in the claim charts of Appendix D, Defendants further contend that the ’304 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the ’304 Patent Asserted Claims are invalid in view of the explicit disclosures of the prior art references cited in the claim charts of Appendix D, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants’ reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix D should be interpreted alternatively as both as a reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix D that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software

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program(s), device(s), or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '304 Patent, all prior art cited during reexamination proceedings of the '304 Patent, all prior art as described in any *inter partes* review proceedings of the '304 Patent, and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '304 Patent, its foreign counterparts, or any parent or child patent of the '304 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants' citations to specific statements, figures, or disclosures in a prior art reference are sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior

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art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix D.

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

The Asserted Claims of the ’455 Patent are anticipated and/or rendered obvious by prior art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the ’455 Patent Asserted Claims in the claim charts of Exhibits E1 through E18 (collectively “Appendix E”) which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix E show how these prior art references teach or suggest each and every element of the ’455 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the ’455 Patent Asserted Claims are invalid in view of the

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prior art references cited in the claim charts of Appendix E, Defendants further contend that the '455 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the '455 Patent Asserted Claims are invalid in view of the explicit disclosures of the prior art references cited in the claim charts of Appendix E, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants' reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix E should be interpreted alternatively as both as a reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix E that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software program(s), device(s) or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '455 Patent, all prior art cited during reexamination proceedings of the '455 Patent, all prior art as described in any future *inter partes* review proceedings of the '455 Patent,

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and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '455 Patent, its foreign counterparts, or any parent or child patent of the '455 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants' citations to specific statements, figures, or disclosures in a prior art reference are sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the

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identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix E.

6. U.S. Patent No. 12,193,790

The Asserted Claims of the ’790 Patent are anticipated and/or rendered obvious by prior art. Pursuant to P.R. 3-3(a), Defendants identify the prior art references that anticipate or render obvious the ’790 Patent Asserted Claims in the claim charts of Exhibits F1 through F14 (collectively “Appendix F”) which are hereby incorporated by reference as if fully set forth herein. The claim charts of Appendix F show how these prior art references teach or suggest each and every element of the ’790 Patent Asserted Claims. For each reference or combination of references suggested by each chart and/or herein, Defendants indicate whether the prior art renders the claim anticipated and/or obvious pursuant to P.R. 3-3(b).

In addition to contending that the ’790 Patent Asserted Claims are invalid in view of the prior art references cited in the claim charts of Appendix F, Defendants further contend that the ’790 Patent Asserted Claims are invalid as anticipated and/or obvious under U.S.C. §§ 102(a), 102(b), and/or 103 in view of public knowledge and uses and/or offers for sale of products and services related to the subject matter of the cited references. As discovery is ongoing, Defendants

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continue to investigate these items and to reserve the right to amend or supplement these contentions to include additional information or documents regarding such products and/or systems. In addition to contending that the '790 Patent Asserted Claims are invalid in view of the explicit disclosures of the prior art references cited in the claim charts of Appendix F, Defendants further contend that the knowledge of skill evidenced by those references render those claims invalid. Defendants further contend that, even if a prior art reference does not expressly disclose all limitations as arranged or combined in the same manner as an asserted claim, a skilled artisan reading the reference would at once envisage the claimed arrangement or combination. *See, e.g.*, *Kennametal Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015).

Defendants' reference to particular components, circuits, software programs, devices, or products in the claim charts of Appendix F should be interpreted alternatively as both as a reference to the product itself and to any corresponding patents, publications, or product literature cited in Appendix F that relates to the cited component, circuit, software program, device, or product. In addition, Defendants may rely on other documents or things that have not yet been located to support its contentions regarding such prior art component(s), circuit(s), software program(s), device(s) or product(s) that are referenced in the charts.

Defendants incorporate by reference, as if set forth fully herein, all prior art cited during the prosecution of the '790 Patent, all prior art cited during reexamination proceedings of the '790 Patent, all prior art as described in any future *inter partes* review proceedings of the '790 Patent, and all prior art disclosed during previous litigation proceedings.

Defendants further identify and hereby incorporate by reference as if set forth fully herein the prior art references and invalidity contentions as described in any Other Omni Proceedings wherein invalidity contentions have been, or will be, provided regarding the '790 Patent, its foreign

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counterparts, or any parent or child patent of the ’790 Patent. Defendants reserve the right to use any and all portions of the publication, related publications, commercial embodiments of the publication, and other evidence that is discovered in these lawsuits to demonstrate and/or evidence the components, functionality, and capabilities of the devices and systems disclosed in the references charted.

Where Defendants identify a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure, as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure, embodiment, or other material, the identification should be understood to include the referenced figure, embodiment, or other material as well. Consistent with P.R. 3-3(c), Defendants’ citations to specific statements, figures, or disclosures in a prior art reference are sufficient to put Plaintiff on notice where each element of each asserted claim is found in the prior art. However, it should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Defendants therefore reserve the right to rely upon other unidentified portions of the prior art references and on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions.

Defendants also reserve the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including the basis of modifying or combining

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certain cited references. To the extent any limitation is deemed not to be exactly met by an item of prior art, then any purported differences are such that the claimed subject matter as a whole would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art. To the extent that an element of an Asserted Claim is not anticipated, the claim is rendered obvious by combination with one or more other prior art references identified in Appendix F.

B. Obviousness

As stated above, Defendants incorporate by reference all other invalidity contentions related to the Asserted Patents served on or otherwise provided to Plaintiff, whether past or in the future. In addition to certain claims being anticipated at least under Plaintiff's apparent claim constructions as indicated above, the Asserted Claims are also invalid as obvious over the same teachings identified for anticipation. Further, the Asserted Claims are obvious over various combinations of the references shown in the claim charts accompanying or incorporated by reference into this disclosure. No Asserted Claim goes beyond combining known elements to achieve predictable results or does more than choose between clear alternatives known to those of skill in the art. Thus, to the extent that an Asserted Claim is not anticipated, it is nevertheless invalid as obvious. Specifically, Defendants assert that any charted or incorporated reference in combination with one or more other charted or incorporated references renders the Asserted Claims obvious.

In *KSR International Co. v. Teleflex, Inc.*, the United States Supreme Court held that, among other things, "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." 550 U.S. 398, 416 (2007); *see also id.* at 417 ("[A] court must ask whether the improvement is more than the predictable use of

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prior art elements according to their established functions."). A patent is obvious where "the content of the prior art, the scope of the patent claim, and the level of ordinary skill are not in material dispute, and the obviousness of the claim is apparent in light of these factors." *Id.* at 427. The Supreme Court found that "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *Id.* at 417.

Moreover, the Supreme Court recognizes that market pressures will motivate a person of ordinary skill to survey known art for solutions to problems. *Id.* at 421 ("When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp."). When a person of ordinary skill uses an identified, predictable solution to solve a problem, "it is likely the product not of innovation but of ordinary skill and common sense." *Id.* In addition, when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. *Id.* at 417. If a person of ordinary skill can implement a predictable variation, U.S.C. § 103 bars its patentability. *Id.*

"'[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.'" *Intel Corp. v. PACT XPP Schweiz AG,* 61 F.4th 1373, 1379 (Fed. Cir. 2023) (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 420 (2007)). "Additionally, 'universal' motivations known in a particular field to improve technology provide 'a motivation to combine prior art references ***even absent any hint of suggestion*** in the references themselves.'" *Id.* (quoting *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 797-99 (Fed. Cir. 2021)) (original emphasis). Thus, motivations to

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combine, as well as the general state of the art, may be found in a variety of places including, but not limited to, in the references defined above, and the specification of the Asserted Patents. For example, each piece of prior art relates to systems and methods for physiological monitoring devices / systems. A person of ordinary skill in the art at the time of the alleged invention would have been motivated to combine any one piece of identified prior art with any other identified piece of prior art. For at least this reason, it would have been obvious to a person of skill in the art at the time of the alleged invention of the Asserted Claims to combine the various references cited herein so as to practice the Asserted Claims and there is a motivation in the art to make such a combination. Further reasons to combine the references identified in these charts include the nature of the problem being solved, the express, implied, and/or inherent teachings of the prior art, the knowledge of persons of ordinary skill in the art, the fact that the prior art is generally directed towards methods and systems for physiological monitoring, that such combinations would have yielded predictable results, and that such combinations would have represented known alternatives to a person of ordinary skill in the art.

The law does not require evidence of a specific motivation to combine prior art where the combiation would yield expected results and at most simply represents a known alternative or design choice to one of skill in the art. *See Apple Inc. v. Samsung Elecs. Co*., 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co*., 869 F.3d 1336, 1344 (Fed. Cir. 2017); *KSR Int'l Co. v. Teleflex, Inc*., 127 S. Ct. 1727, 1739-40 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, and instead applying an "expansive and flexible" approach). Indeed, the Supreme Court held that a POSITA is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of

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a puzzle." *KSR*, 550 U.S. at 420-21.

Nevertheless, in addition to the information contained immediately above and elsewhere in these contentions, Defendants identify additional motivations and reasons to combine. For example, in addition to the specific motivations identified herein, motivation to modify a particular reference or to combine any two or more of the identified references comes from (a) the nature of the problem being solved, (b) the teachings of the prior art, (c) the knowledge of persons of ordinary skill in the art, (d) the fact that all of the references teach systems, apparatuses, and methods related to the subject matter and address the same technical issues described in the Asserted Patents, and (e) one would be motivated by considerations of efficiency, effectiveness, convenience, cost-savings, and accessibility, to combine the various teachings of the references. Additionally, one would be motivated to address the alleged problems or achieve the purported objectives identified in the Background sections of the Asserted Patents, of the references cited on the face of the Asserted Patents, and of the other references cited herein.

In sum, motivations to modify or combine the identified references including the references listed above can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, certain prior art references explicitly or implicitly reference other prior art references, share common authors or inventors, were published in the same journals, were compiled by a common author of a compilation or reference book, were presented at the same conferences, and/or were developed at common companies, schools, or organizations, which

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would motivate one of ordinary skill in the art to combine them. These references are within the field of the Asserted Patents and are directed to similar subject matter within the field. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. These disclosures were provided without prejudice to any arguments or objections concerning the relevance of motivation to combine in connection with any invalidity contentions.

Defendants reserve the right to further specify the motivations to combine the prior art in response to positions that Plaintiff may take later in this case and as discovery, including third party discovery, proceeds. Defendants may rely on any and all portions of the prior art, other documents, and expert testimony to establish that a person of ordinary skill in the art would have been motivated to modify or combine the prior art so as to render the claims invalid as obvious. Moreover, Defendants reserve the right to rely on later identified sources of information, including but not limited to witness testimony and other discovery, to establish the state of the art in the relevant time frame pertaining to the Asserted Patents.

Additionally, Defendants note that Plaintiff has neither provided any contention that secondary considerations of non-obviousness exist for any Asserted Patent nor provided any evidence of such secondary considerations. Defendants are not aware of any evidence supporting the existence of any such secondary considerations. This lack of evidence further renders the Asserted Claims obvious. Proving any such secondary considerations is Omni's burden. *See, e.g.*, *ZUP, LLC v. Nach Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018) ("[A] patentee bears the burden of production with respect to evidence of secondary considerations of nonobviousness."). To the extent Omni is permitted to introduce contentions and/or evidence concerning secondary considerations in the future, Defendants reserve all rights to rebut those contentions if and when

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Omni identifies them. In the meantime, Defendants note the complete lack of any such evidence in the record. Moreover, Defendants further contend that, in any event, the evidence of obviousness for each asserted claim is so overwhelming that secondary considerations are necessarily insufficient to rebut Defendants' showing. *See, e.g.*, *Ohio Willow Wood Co. v. Alps South, LLC*, 735 F.3d 1333, 1344 (Fed. Cir. 2013) ("[W]here a claimed invention represents no more than the predictable use of prior art elements according to established functions, as here, evidence of secondary indicia are frequently deemed inadequate to establish non-obviousness.").

While Defendants reserve the right to rely on any combination of the references reflected in their charts or incorporated herein by reference, Defendants provide the following exemplary and non-exhaustive references and/or combinations evidencing invalidity of the claims of the Asserted Patents. The combinations of prior art listed below render obvious the Asserted Claims under the proper construction of the claims and/or under Plaintiff's apparent interpretation of the claims as set forth by Plaintiff in its Complaint and Infringement Contentions.

1. U.S. Patent No. 9,055,868

Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix A the prior art references that render obvious the Asserted Claims of the '868 Patent and include below exemplary combinations showing the obviousness of the '868 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix A, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the '868 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix A, such reference may be combined with any other references listed in Appendix A for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the '868 Patent

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Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the '868 Patent Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix A along with the knowledge of one of ordinary skill in the art to meet the limitations of the '868 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the '868 Patent obvious when the references are read in combination with each other, and/or when read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix A, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art. As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating

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combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the extent not anticipated, the '868 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017). Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420-21. Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix A would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were

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only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix A would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '868 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix A is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8) the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

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Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix A because all of these references relate to the same area of technology and/or are from analogous art. The '868 Patent Asserted Claims are directed to a diagnostic system comprising a light source, a software application capable of operating on a control system, and a host. '868 Patent at Abstract. The '868 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the '868 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer to or discuss other prior art, illustrating the close technical relationship among the prior art. For the '868 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references relating to wirelessly collecting and processing physiological information using a light source and related features.

Demand and Market Forces: For example, market forces suggested a demand for wirelessly collecting and processing physiological information using a light source, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions

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of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the '868 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the '868 Patent, there are a finite number of approaches for wirelessly collecting and processing physiological information using a light source. For example, as of the priority date of the '868 Patent, a POSITA would have been very familiar with basic elements of the '868 Patent's claims such as devices using light passing through a user's body, including blood, to measure physiological information; semiconductor diodes; software; the wireless transmission of data, including via mobile phones and the internet; tracking location of a remote device; differing inputs to a computing system, including voice commands, touchscreens, keypads, etc. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the '868 Patent's claims does not render them novel or non-obvious.

There are significant similarities in subject matter and objectives for each of many references used in these contentions for the '868 Patent.

Wireless Physiological Monitoring References: For example, charted reference Mault, as well as numerous other references such as Kumar, Nihtila, Brown, and Quy all include teachings related to wirelessly collecting and analyzing physiological data, including data known to be collected using spectroscopy. These references provide numerous methods for collecting physiological data, as well as different methods for wirelessly transmitting and processing the data.

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For example, Mault teaches "a system embodiment comprising an electronic device 10, a blood glucose sensor 12, a physical activity monitor 14, an insulin pump 16, a communications network 20, and a remote computer system 22." Mault at [0069]. Mault further teaches that "[e]lectronic device 10 can be carried by the person, for example a portable computer, personal digital assistant (PDA), wireless phone with computational functionality, visor-mounted device, or other device" and "[s]ensor 12 can be carried by the person and provides blood glucose measurements at intervals." Mault at [0069]-[0070]. Mault teaches that "using a non-invasive spectroscopic technique, the PDA/module combination may be placed against part of the body to obtain a blood glucose reading." Mault at [0073]. Kumar teaches "system architecture 100 for network-based monitoring of data from a patient-side physiological collecting device . . . includ[ing] one or more patient-side devices 102 for collecting data from a patient/client, one or more provider-side devices 104, and an engine implemented on a central server 106." Kumar at [0067]. Kumar further teaches that "[t]he system may be adapted to include web-enabled spirometers and oximeters, allowing healthcare practitioners to perform remote spirometry and oximetry tests." Kumar at [0072]. Kumar also teaches that "[t]he patient-side device may then be connected via a computing device 110, such as a computer, handheld devices such as personal digital assistants (PDAs) and pocket PCs . . . ." Kumar at [0072]. Nihtila teaches "a system for acquiring physiological data from a user and communicating the physiological data via a mobile terminal to a network server for integration into a virtual physiological model established for the user in accordance with an embodiment of the present invention." Nihtila at [0035]. Nihtila further teaches that "[t]he physiological data communicated from the mobile terminal 122 to the network 124 is routed to a server 126 which is configured to accept and process this data. . . . and executes processing software that, in general, operates on the physiological data received from each of a number of users." Nihtila at [0038].

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Brown teaches "blood glucose monitor 16 operates in conjunction with data management unit 10 and handheld microprocessor unit 12 to: (a) perform a test or calibration sequence in which tests are performed to confirm that the system is operating properly; and, (b) perform the blood glucose test sequence in which blood glucose meter 16 senses the user's blood glucose level. Brown at 20:28-67. Brown further teaches that "each apparatus may be placed in communication with server 2018 via wireless communication networks, cellular networks, telephone networks, or any other network which allows each apparatus to exchange data with server 2018." Brown at 25:12-25. Quy is titled "Method and Apparatus for Health and Disease Management Combining Patient Data Monitoring with Wireless Internet Connectivity." Quy at Title. Quy teaches "[t]he system includes a wireless health-monitoring apparatus ('WHMA') 10 . . . [which] is linked in a wireless fashion to a wireless connection point of presence ("POP") 19, the same including at least a base station antenna 15 coupled to a server 17." Quy at 6:29-32. Quy teaches "[s]erver 17 is in turn connected to the wired, or even a wireless (not shown) Internet 21, which may include the World Wide Web." Quy at 6:33-35.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that collect and transmit physiological data. These methods are known to be effective in collecting and transmitting data. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of collecting and transmitting physiological data.

Physiological Monitoring Using Spectroscopy References: For example, charted

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reference Mault, as well as numerous other references such as Jeng[8], Pologe, Shigeki, Kumar, Nihtila, Quy, Abreu, and Scharf. all include teachings related to physiological monitoring using spectroscopy. These references provide numerous methods for measuring physiological information, such as blood glucose levels and blood oxygenation, using measurements of light. For example, Mault teaches "sensor 12 may use spectroscopic detection of a glucose oxidase reaction . . . and may also use in-vivo spectroscopy techniques to measure blood glucose." Mault at [0073]. Jeng discloses "a method and apparatus for measuring the concentration of an analyte of interest, e.g. glucose, in blood non-invasively, i.e., without penetrating the skin or obtaining a biological sample from the body of a patient." Jeng at 4:28-39. Jeng further discloses that "[l]ight passing through the body part 'B' is transmitted through an aperture 49 and then through a lens system 50 to deliver light to a dispersive element 52." Jeng at 6:57-7:4. Pologe discloses "a system for performing photoplethysmographic measurements using wavelength division multiplexing." Pologe at 4:20-32. Pologe further discloses that "[t]he received light pulses may then be delivered back to the main test unit 12, via probe cable 16, where they are processed to determine the level of one or more blood analytes in the person's arterial blood." Pologe at 4:33-54. Shigeki discloses a "glucose sensor" that "measures the blood glucose concentration of blood flowing through the microvessels in the earlobe 4 of the human body." Shigeki at [0009]. Shigeki further discloses that "[t]he volume of blood flow is measured using the Doppler effect, so infrared light, which has good transmissibility through biological tissue, is used to minimize the attenuation of light reflected by hemoglobin." Shigeki at [0009]. Kumar discloses that "[t]he patient-side device is located with a patient and can be any device that gathers physiological data from the patient."

[8] Mault incorporates Jeng by reference (*see* Mault at [0011], [0073]), thus, references to Jeng should be understood to be references to Mault and/or Jeng.

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Kumar at [0071]. Kumar further discloses that "[t]he system may be adapted to include web-enabled spirometers and oximeters, allowing healthcare practitioners to perform remote spirometry and oximetry tests." Kumar at [0203]. Nihtila discloses "systems and methods for using mobile communication techniques to enhance an understanding of the physiological state of an individual based on physiological information acquired from the individual in real-time." Nihtila at [0024]. Nihtila firther discloses that "a physiological data acquisition system of the present invention can include a blood sensing device 211 . . . [which] can be used to measure a number of blood related parameters," including "oxygen saturation, oxygen consumption, blood chemistry, and blood pressure, for example." Nihtila at [0054]. Quy teaches "while various types of medical devices have been mentioned, numerous other types may also be used in the embodiments of the invention, including pulse oximeters, syringe drivers, infusion pumps, spirometers, ventilators, anesthesia monitors, and so on." Quy at 12:51-13:22. Abreu teaches "FIG. 100(C) shows a schematic block diagram of one preferred far-infrared spectroscopy measuring apparatus of the present invention." Abreu at [1159]. Abreu further teaches "[b]esides near-infrared spectroscopy, the present invention provides superior results and higher signal to noise ratio when using any other form of electromagnetic radiation such as for example mid-infrared radiation, radio wave impedance, photoacoustic spectroscopy, Raman spectroscopy, visible spectroscopy, ultraviolet spectroscopy, fluorescent spectroscopy, scattering spectroscopy, and optical rotation of polarized light as well as other techniques such as fluorescent (including Maillard reaction, light induced fluorescence, and induction of glucose fluorescence by ultraviolet light), colorimetric, refractive index, light reflection, thermal gradient, Attenuated Total Internal Reflection, molecular imprinting, and the like. Abreu at [0276]. Scharf teaches "[a] reflectance pulse oximeter that determines oxygen saturation of hemoglobin using two sources of electromagnetic radiation in the green optical

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region, which provides the maximum reflectance pulsation spectrum." Scharf at Abstract. Scharf further teaches "[t]he oximeter 10 of the present invention comprises two emitters of green light 12, 14 that illuminate a volume of intravascular blood 4." Scharf at 4:8-22.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that measure physiological information, such as blood glucose levels and blood oxygenation, using measurements of light. These methods use light to measure physiological information. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological information, such as blood glucose levels and blood oxygenation, using measurements of light.

Physiological Monitoring with Lenses References: For example, charted reference Jeng, as well as numerous other references such as Pologe, Shigeki, and Scharf all include teachings related to using light with lens systems to collect physiological data. These references provide numerous methods for collecting physiological data using spectroscopy, including using systems with lenses. For example, Jeng teaches that "[t]he body part, e.g., a finger, earlobe, is positioned at the place where the beam from the source of light is focused. Light passing through the body part is transmitted through an aperture 24 and then through a lens system 25 to deliver light to the detector 20." Jeng at 6:31-44. Jeng further discloses that "Light passing through the body part 'B' is transmitted through an aperture 49 and then through a lens system 50 to deliver light to a dispersive element 52." Jeng at 6:57-7:4. Pologue discloses that "the WDM coupler can include any of a number of coupler types, such as those using lenses, prisms, interference filters, diffraction gratings, or butt coupling." Pologe at 3:43-55. Shigeki discloses that "[t]he wavelength of the light

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outputted from the first semiconductor laser 1 is 1.55 μm, which is within the glucose absorption wavelength band." Shigeki at [0009]. Shigeki further discloses that the light "passes through the earlobe 4 and is received by the first photodetector 20." Shigeki at [0009]. Abreu teaches "[t]he light radiation 2302 can be directly emitted from a light source 2300 and directly collected by a photodetector 2318, or the light radiation 2302 can be delivered and collected using optic fiber cables." Abreu at [1086]. Abreu further teaches "[a]n interface lens system can be used to convert the rays to spatial parallel rays, such as from an incident divergent beam to a spatially parallel beam." Abreu at [1086]. Scharf teaches "[s]uitable optical filters include custom-made molded acrylic aspheric lens/filters having peak wavelengths of 560 nm and 580 nm, respectively, and which have bandwidths of less than 5 nm, which are available from Innovations In Optics, Inc., address 38 Montvale Avenue, Suite 215, Storeham, Mass. 02180, (716) 279-0806." Scharf at 4:22-37. Scharf further teaches "Although shown as flat surfaces, face pieces 16, 18, and 91 can alternatively be shaped to form discrete lenses (not shown) to focus the radiant energy from the LEDs 13a-13d and 15a-15d onto the skin 2 and into the blood 4 and from the skin 2 onto the photodiode 26, 62." Scharf at 8:59-65.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that measure physiological information using light with a lens system. These methods use light with a lens system to measure physiological information. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological information using light with a lens system.

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Wavelength Division Multiplexing References: For example, charted reference Pologe, as well as numerous other references such as Jeng, Abreu, and Scharf all include teachings related to using wavelength division multiplexing to measure physiological information. These references provide numerous methods for using wavelength division multiplexing to measure physiological information, particularly relating to blood measurements. For example, Pologe teaches "the present invention relates to a system for performing photoplethysmographic measurements using wavelength division multiplexing." Pologe at 4:20-32. Pologe further discloses "the WDM coupler is capable of producing a wavelength multiplexed pulse on the single light guide that includes the spectral contents of all of the multiple light pulses. In this regard, the WDM coupler can include any of a number of coupler types, such as those using lenses, prisms, interference filters, diffraction gratings, or butt coupling. In addition, active WDM couplers can also be used." Pologe at 3:43-55. Jeng discloses that "[t]he band-pass filter set 14 selects one desired wavelength at a time by rotating the set to place a given filter in the path of the beam." Jeng at 6:11-30. Jeng further discloses that "[a] lens system 47 is used to focus the light from the beam splitter onto the detector 48." Jeng at 6:45-56. Jeng discloses that "[l]ight passing through the body part 'B' is transmitted through an aperture 49 and then through a lens system 50 to deliver light to a dispersive element 52." Jeng at 6:57-7:4. Abreu teaches "[a] variety of radiation sources 2300 can be used in the present invention including LEDs with or without a spectral filter, a variety of lasers including diode lasers, halogen lights and white light sources having maximum output power in the near infrared region with or without a filter, and the like . . . ." Abreu at [1085]. Abreu further teaches "[t]he contact device filter system allowed passage of the glucose band which is used as a reference measuring point while simultaneously measuring thermal energy absorption outside the glucose band." Abreu at [1166]. Scharf teaches "[d]epending on the particular green light sources chosen, green optical

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filters 16, 18 might be needed. For example, if the Toshiba Ltd. part nos. TLGA183P and TLPGA-183P are used as green LEDs 13, 15 then narrow-band optical filters 16, 18 need to be used." Scharf at 4:22-37.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that use wavelength division multiplexing to measure physiological information. These methods use principles of wavelength division multiplexing to measure physiological information. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of using wavelength division multiplexing to measure physiological information.

Semiconductor Diode References: For example, charted reference Jeng, as well as numerous other references such as Pologe, Shigeki, Abreu, and Scharf all include teachings related to using semiconductor diodes to measure physiological information. These references provide numerous methods for using semiconductor diodes to measure physiological information, particularly information related to a subject's blood. For example, Jeng teaches that "[t]he light sources are either laser diodes or light emitting diodes." Jeng at 15:1-27. Pologe teaches that "[t]he plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes." Pologe at 3:1-17. Shigeki teaches that "[t]he wavelength of the light outputted from the first semiconductor laser 1 is 1.55 μm, which is within the glucose absorption wavelength band" Shigeki at [0009]. Abreu teaches "[a] variety of radiation sources 2300 can be used in the present invention including LEDs with or without a spectral filter, a variety of lasers including diode lasers, halogen lights and white light sources having maximum output power in

the near infrared region with or without a filter, and the like . . . ." Abreu at [1085]. Scharf teaches "The green light sources 12, 14 are shown schematically as including light emitting diodes (LEDs) 13, 15 in FIG. 1; however, other green light sources can be used, such as laser diodes, filtered white light sources, filtered broad-band LEDs, etc. Suitable LEDs 13, 15 include part. nos. TLGA-183P (peak wavelength 574 nm) and TLPGA-183P (peak wavelength 562 nm) from Toshiba Ltd. through various sources, such as Marktech International, 5 Hemlock Street, Latham, N.Y. 12110, (518) 786-6591." Scharf at 4:8-22.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that use semiconductor diodes to measure physiological information. These methods use semiconductor diodes to measure physiological information. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological information.

Software Application References: For example, charted reference Mault, as well as numerous other references such as Jeng, Pologe, Shigeki, Kumar, Nihtila, Brown, Quy, Abreu, and Scharf all include teachings related to using software to analyze the collected physiological data. These references provide numerous methods for using software to analyze the collected physiological data, including generating a status of a user based on the physiological data. For example, Mault teaches that "FIG. 19 shows a flowchart representing a software program running on a computing device." Mault at [0187]. Mault further teaches that "Box 516 corresponds to performing a blood test at intervals, and providing the data to a glycemic response algorithm." Mault at [0187]. Mault teaches that "[t]he PDA has a software program, such as a calorie

management program, having a glycemic response algorithm for the subject." Mault at [0109]. Jeng teaches that "[t]he computer controls the software operation for collecting data and storing measurement readings as a data file." Jeng at 6:31-44. Pologe teaches that "The received light pulses may then be delivered back to the main test unit 12, via probe cable 16, where they are processed to determine the level of one or more blood analytes in the person's arterial blood." Pologe at 4:33-54. Pologe further teaches that "[p]rocessing methods to determine the blood analyte levels are known and, therefore, will not be discussed further." Pologe at 4:33-54. Shigeki teaches that "[i]n the arithmetic control circuit 8, calculations are performed to calculate the amount of glucose using the relationship between glucose concentration values previously written to the EEPROM and the photodetector output values, and the relationship between glucose solution temperatures and the photodetector output values." Shigeki at [0012]. Kumar teaches that "[t]he present invention may be implemented on a program or code that can be stored in a computer-readable (or electronically-readable) medium." Kumar at [0087]. Kumar further teaches that "[t]he data interpretation and analysis module 114 is used to interpret the data stream from the client-side device, perform mathematical analysis on the data using FFT, DFT, etc., and generate statistics." Kumar at [0075]. Nihtila teaches that "The processing software integrates currently or recently acquired physiological data into the user's virtual physiological model (i.e., avatar)." Nihtila at [0038]. Nihtila further teaches that "The processing software further computes fitness data (FD) of various types, including, textual, graphical, animation, audio, video, or other form of fitness data." Nihtila at [0040]. Brown teaches that "[w]hen inserted in the handheld microprocessor unit, the program cartridge provides the software necessary (program instructions) to program the handheld microprocessor unit for operation with the microprocessor-based data management unit." Brown at 6:18-45. Brown further teaches that "Remotely Programmable

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Patient Apparatus 320 comprises a Patient Interaction Unit 322, which is connected through a patient communication network 324 to a Patient Data Management Unit 326." Brown at 35:50-36:8. Quy teaches "[a]pplication 62 may include an algorithm 63 for analyzing data from the HMD, and either application 62 or algorithm 63 may optionally access data from an external data source 74 and may further consult an artificial intelligence system 76." Quy at 8:9-14. Quy further teaches "wireless application 70 may correspondingly send a large amount of health data to server application 62." Quy at 8:47-62. Abreu teaches "[s]uitable analyzers include modified Fourier Transform Infrared (FTIR) spectrometers with chemometric software packages. Those are available from the PerkinElmer Corporation (Wellesley, Mass.) and Thermo Nicolet Company (Madison, Wis.)." Abreu at [1103]. Abreu further teaches "[p]rocessor 2324 can contain or be connected to a memory unit 2326 which can store data related to calibration, patient's measurement data, reference data, suitable algorithms, and the like." Abreu at [1083]. Scharf teaches "[a] reflectance pulse oximeter that determines oxygen saturation of hemoglobin using two sources of electromagnetic radiation in the green optical region, which provides the maximum reflectance pulsation spectrum." Scharf at Abstract. Scharf further teaches "the processor 30 collects data in the form of a digitized signal, calculates a coefficient for the oxygen saturation value from the digitized signal, determines the final saturation value by reading the saturation value for the calculated coefficient from a look-up table stored in memory, and then causes the display(s) 38, 40 to display a visual image corresponding to the final saturation value or other oximetry data." Scharf at 11:5-14.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that use software to analyze the collected physiological data. These methods use software to analyze the collected physiological data,

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including generating a status of a user based on the physiological data. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of using software to analyze the collected physiological data.

Touch Screen, Voice, and Manual Inputs References: For example, charted reference Mault as well as numerous other references such as Pologe, Kumar, Nihtila, Brown, and Quy all include teachings related to receiving touch screen, voice, or manual input to the system for measuring physiological data. These references provide numerous methods for receiving various inputs to systems that measure physiological data. For example, Mault teaches that "Other data entry mechanisms can be used, such as a stylus, touch pad, tracker device, biofeedback system, roller-jog dial, voice recognition, and the like." Mault at [0109]. Mault also teaches that "[t]he computer [which can be a PDA] can have a display, a microprocessor, memory (in the form of RAM, ROM, and a data storage device), and data entry mechanisms such as a keyboard, buttons, stylus, voice entry, roller-jog dial, track ball, finger tracking device, and the like." Mault at [0121]. Pologe discloses that "[t]he main test unit 12 includes: . . . and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28." Pologe at 4:63, 5:9. Kumar teaches that "the system allows for the real-time streaming of raw, interpreted, and processed physiological data as well as textual/audio/video data from a patient/client to a health care provider." Kumar at [0010]. Nihtila teaches that "the user can input weight, height, age, gender, and other physical and personal information to the user's virtual physiological model via the mobile terminal's user interface 216." Nihtila at [0046]. Brown teaches that "the user input buttons may be replaced by switches, keys, a touch sensitive display screen, or

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any other data input device." Brown at 26:1-8. Brown further teaches "the patient interaction unit is a palm-top computer, the display means being provided by a display screen of the palm top computer, and the patient interaction unit input device is a palm-top computer input device such as a touch screen." Brown at claim 2. Brown teaches "the user interface includes a speech synthesizer for audibly communicating the queries and a speech recognizer for receiving spoken responses to the queries." Brown at 9:47-52. Quy teaches "[t]he deployment of voice processing technology may be used to enable an even more convenient user interface: i.e., one to which patients can talk." Quy at 4:62-65. Quy further teaches "[t]hese applications may accept as inputs data from a sensor 24 as well as from a manual input 36." Quy at 7:61-8:8.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that receiving touch screen, voice, or manual input to the system for measuring physiological data. These methods allow the systems to receive touch screen, voice, or manual input to the system. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of receiving touch screen, voice, or manual input to the system for measuring physiological data.

Remote Server with Storage References: For example, charted reference Mault as well as numerous other references such as Kumar, Nihtila, Brown, Quy, Abreu, and Scharf all include teachings related to using remote systems, such as servers, to store and/or process physiological information. These references provide numerous methods for using remote systems, such as servers, to store and/or process physiological information. For example, Mault teaches "[t]he portable computing device 30 is in linked to a communications network 52, allowing

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communication a remote computer system 54, which may be located at the person's home, doctor's office, or other remote location." Mault at [0079]. Mault teaches that "[a] remote server system 56 is also accessible through the communications network 52, and can be used to store a database of physiological parameters, activity, and diet relating to the person, for medical, nutritional, or computer expert system analysis." Mault at [0079]. Mault teaches that "[a] global positioning system (GPS) may also be added to the PDA, to facilitate medical rescue in an emergency." Mault at [0077]. Kumar teaches "the system includes one or more patient-side devices 102 for collecting data from a patient/client, one or more provider-side devices 104, and an engine implemented on a central server 106." Kumar at [0067]. Kumar teaches "the data may be stored in a secured storage device at the central server for later access, replay, and/or analysis." Kumar at [0083]. Nihtila teaches that "there is illustrated a system for acquiring physiological data from a user and communicating the physiological data via a mobile terminal to a network server for integration into a virtual physiological model established for the user in accordance with an embodiment of the present invention." Nihtila at [0035]. Nihtila teaches "the mobile terminal 122 operates effectively as a modem to facilitated the transfer of acquired physiological data between the physiological sensor device, mobile terminal 122, network 124, and server 126 in real-time." Nihtila at [0044]. Brown teaches "[m]onitoring application 2048 is a controlling software application executed by server 2018 to perform the various functions described below." Brown at 27:11-14. Quy teaches "[s]erver 22 has a base server application 62 with which the same calculates or provides a response based at least in part on data from WHMA 10." Quy at 8:9-14. Quy further teaches "[i]t should also be noted that each of application 62, algorithm 63, external data source 74, or AI system 76, may physically reside on more than one server, e.g., on an array of servers for, e.g., storage or multiple processing purposes." Quy at 8:40-46. Abreu teaches "[t]he signal can

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be communicated by wires or radio telemetered to an externally placed receiver. The signal can then be processed, analyzed and stored." Abreu at Abstract; *see also* Abreu at [0099]. Scharf teaches "[t]he processor 30 and the remote display 40 are placed in circuit communication via a transmitter 42 and receiver 44." Scharf at 7:48-67. Scharf further teaches "the processor 30 is also in circuit communication with a remote display 40 to display a second visual image corresponding to the oximetry data." Scharf at 7:38-47.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that use remote systems, such as servers, to store and/or process physiological information. These methods use remote systems, such as servers, to store and/or process physiological information Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of using remote systems, such as servers, to store and/or process physiological information.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix A with any other reference or references listed in Appendix A along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the '868 Patent.

For example, and without limitation, the Asserted Claims of the '868 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) <u>Mault Combined with Jeng, Pologe, Shigeki, Abreu and/or Scharf</u>

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A POSITA would have had reason to combine Mault with any one of Jeng, Pologe, Shigeki, Abreu and/or Scharf all of which relate to systems and methods for obtaining physiological measurements of a user. Each of Mault, Jeng, Pologe, Shigeki, Abreu, and Scharf relate to obtaining physiological measurements of a user, including blood measurements obtained by using light. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Jeng, Pologe, Shigeki, Abreu, and Scharf provide means—not necessarily expressly present in all other references—for measuring physiological data of a user using light. A POSITA would have understood that the systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf provide improvements such as advances in measuring physiological data of a user using light. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological data of a user using light would commonly be combined with a wireless, wearable system, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for measuring physiological data of a user using light, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Kumar Combined with Jeng, Pologe, Shigeki, Abreu, and/or Scharf

A POSITA would have had reason to combine Kumar with any one of Jeng, Pologe, Shigeki, Abreu and/or Scharf all of which relate to systems and methods for obtaining

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physiological measurements of a user. Each of Kumar, Jeng, Pologe, Shigeki, Abreu, and Scharf relate to obtaining physiological measurements of a user, including blood measurements obtained by using light. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Jeng, Pologe, Shigeki, Abreu, and Scharf provide means—not necessarily expressly present in all other references—for measuring physiological data of a user using light. A POSITA would have understood that the systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf provide improvements such as advances in measuring physiological data of a user using light. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological data of a user using light would commonly be combined with a wireless, wearable system, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for measuring physiological data of a user using light, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Nihtila Combined with Jeng, Pologe, Shigeki, Abreu, and/or Scharf

A POSITA would have had reason to combine Nihtila with any one of Jeng, Pologe, Shigeki, Abreu and/or Scharf all of which relate to systems and methods for obtaining physiological measurements of a user. Each of Nihtila, Jeng, Pologe, Shigeki, Abreu, and Scharf relate to obtaining physiological measurements of a user, including blood measurements

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obtained by using light. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Jeng, Pologe, Shigeki, Abreu, and Scharf provide means—not necessarily expressly present in all other references—for measuring physiological data of a user using light. A POSITA would have understood that the systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for Jeng, Pologe, Shigeki, Abreu, and Scharf provide improvements such as advances in measuring physiological data of a user using light. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological data of a user using light would commonly be combined with a wireless, wearable system, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for measuring physiological data of a user using light, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iv) Mault, Kumar, Nihtila, Brown, and/or Quy, Combined with any of the References Disclosing Remaining Features

A POSITA would have had reason to combine references Mault, Kumar, Nihtila, Brown, and/or Quy with any one of the references disclosing physiological monitoring using spectroscopy; physiological monitoring with lenses; wavelength division multiplexing; the use of semiconductor diodes; software applications; touch screen, voice, and manual inputs; and remote servers with storage (collectively, the "remaining features") all of which relate to systems and methods for obtaining physiological measurements of a user, including blood measurements.

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Each of the references teaching the remaining features relate to obtaining physiological measurements of a user, including blood measurements, using light. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the references teaching the remaining features provide means—not necessarily expressly present in all other references—for obtaining physiological measurements of a user, including blood measurements, using light. A POSITA would have understood that the systems and methods for the references teaching the remaining features were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for the references teaching the remaining features provide improvements such as specific methods and systems for obtaining physiological measurements using light. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for a wireless system for collecting and processing physiological data would commonly be combined with obtaining physiological measurements (for example, blood glucose levels and blood oxygenation) using light, and thus a POSITA would have been motivated to combine the teachings of these references. Two non-limiting examples of such combinations, which are provided for illustrative purposes only, include Brown in view of Jeng, Pologe, Shigeki, Abreu, and/or Scharf and Quy in view of Jeng, Pologe, Shigeki, Abreu, and/or Scharf. The combinations would apply known techniques for obtaining physiological measurements using light, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combinations would further be "obvious to try," because they would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

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Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits A1 through A10 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-A, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the wireless physiological monitoring references; the physiological monitoring using spectroscopy references; the physiological monitoring with lenses references; the wavelength division multiplexing references; the semiconductor diode references; the software application references; the touch screen, voice, and manual inputs references; the remote server with storage references, for the reasons discussed above.

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

Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix B the prior art references that render obvious the Asserted Claims of the '533 Patent and include below exemplary combinations showing the obviousness of the '533 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix B, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the '533 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix B, such reference may be combined with any other references listed in Appendix B for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the '533 Patent Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the '533 Patent

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Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix B along with the knowledge of one of ordinary skill in the art to meet the limitations of the '533 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the '533 Patent obvious when the references are read in combination with each other, and/or when read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix B, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art. As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the

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extent not anticipated, the ’533 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit’s “rigid” application of the teaching, suggestion, or motivation to combine test, instead espousing an “expansive and flexible” approach); *Apple Inc. v. Samsung Elecs. Co*., 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co*., 869 F.3d 1336, 1344 (Fed. Cir. 2017). Indeed, the Supreme Court held that a person of ordinary skill in the art is “a person of ordinary creativity, not an automaton” and “in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *Id.* at 420-21. Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix B would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix

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B would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '533 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix B is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8) the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix B because all of these references relate to the same area of technology and/or are from analogous art. The '533 Patent

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Asserted Claims are directed to an optical measurement system with a personal device and a remote device. '533 Patent at Claim 5. The '533 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the '533 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer to or discuss other prior art, illustrating the close technical relationship among the prior art. For the '533 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references concerning features related to known techniques for increasing the signal-to-noise ratio and known components and functionalities of personal devices and remote devices.

Demand and Market Forces: For example, market forces suggested a demand for improving signal-to-noise ratio and wirelessly transmitting information from optical measurement systems to devices such as personal devices and remote devices, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already

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known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the ’533 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the ’533 Patent, there are a finite number of approaches for increasing signal-to-noise ratio and communicating information to other devices. For example, as of the priority date of the ’533 Patent, a POSITA would have been very familiar with basic elements of the ’533 Patent’s claims such as increasing a light intensity, increasing a pulse rate, using a plurality of lenses to direct an output optical beam, and communicating information with a personal device and a remote device. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the ’533 Patent’s claims does not render them novel or non-obvious.

There are significant similarities in subject matter and objectives for each of many references used in these contentions for the ’533 Patent.

References disclosing techniques for increasing signal-to-noise ratio: For example, charted reference Basu, as well as numerous other references such as Lisogurski, Carlson, LeBoeuf, and Park all include teachings related to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. These references provide numerous methods for increasing a light intensity and increasing a pulse rate of an LED. For example, Basu teaches that “[t]o maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector. In the OPS 10, the LED intensity and modulation frequencies are programmable through the serial interface. In the case of the Vishay VCNL4000, the intensity is programmable

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from 10-200 mA in 10 mA increments." Basu at [0048]. Lisogurski teaches "that modulation of the light drive signal . . . may include modulation of parameters including drive current or light brightness, duty cycle, firing rate, modulation parameters, other suitable parameters, or any combination thereof" and that "[t]he system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio." Lisogurski at 27:44-55, 9:46-60. Carlson teaches that the "frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which, according to FIG. 7 b, is in the range of above approximately 1000 Hz. Thus, the pulsoximeter signals are readily discriminated from electronic and parasitic contributions of environmental optical radiation outside the frequency fc+/−5 Hz increasing significantly the Signal-to-Noise and Signal-to-Background ratio." Carlson at [0069]. LeBoeuf teaches that "the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight" and that "it is important to consider the emitter pulsing frequency and sampling approach" because "choosing a frequency that is too low may result in unsatisfactory subtraction." LeBoeuf at [0123], [0139]. Park teaches that "the light source intensity may be increased to maintain the output signal from the light detector within a desired range of output values." Park at 16:8-20.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with improving signal-to-noise ratio in optical measurement systems. These methods are known to be effective in improving the signal-to-noise ratio for such systems, and merely modulate the functioning of the existing LEDs in each system. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other

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references in order to better achieve their common goals of improving signal-to-noise ratio.

References disclosing lenses: For example, charted reference Basu, as well as numerous other references such as Carlson, LeBoeuf, Park, and Sakai all include teachings related to using a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample. These references provide numerous methods for using lenses to direct an optical output beam. For example, Basu teaches that "[e]ach of the LEDs is separated from the photo detector by an optical barrier." Basu at [0087]. Carlson teaches "a beam-shaping element, such as e.g. diffractive or refractive lenses, to direct the emitted optical radiation of, e.g., the LED light source into the human or animal tissue and the photon detecting element in order to increase the optical signal power, detected by the pulsoximeter sensor, and thus increasing the Signal/Noise—and signal/Background ratio" Carlson at [0014]. LeBoeuf teaches that "the at least one sensor module include a lens positioned above at least one of the optical emitter and filter. The lens may include respective first and second portions configured to matingly engage respective first and second apertures in the light-opaque material." LeBoeuf at [0022]. Park teaches that "the transmissive structures may employ a material and/or optical design to facilitate low light loss (for example, a lens) thereby improving SNR of the photo detector and/or reducing power consumption of the light emitter(s) and/or light detector(s)." Park at 11:32-57. Sakai teaches that "[i]nfrared light or green light is emitted to the human body via a light transmitting plate 2029." Sakai at 28:01-32.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with using lenses to direct an optical output beam. These methods are known to be effective in directing an optical output beam using known lens structures. Moreover, to the extent that any of these references includes a feature

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not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of directing an optical output beam.

References disclosing a personal device: For example, charted reference Basu, as well as numerous other references such as Addison, LeBoeuf, Park, and Kreger all include teachings related to a personal device. These references provide numerous methods for incorporating a personal device into an optical measurement system. For example, Basu teaches "a wireless ring which combines the sensor with a Bluetooth transmitter linked to an Android application running on the user's cell phone." Basu at [0057]. Addison teaches that "[o]utput 414 may be any suitable output device such as, for example, . . . one or more display devices (e.g., monitor, PDA, mobile phone, any other suitable display device, or any combination thereof), one or more audio devices, . . . or any combination thereof." Addison at [0069]. LeBoeuf teaches that "headsets configured to monitor an individual's physiology and/or environment may be wired to a device that stores and/or processes data or there may be a combination of wired and wireless communications." LeBoeuf at [0106]. Park teaches that a "secondary device may be equipped with a display to output data obtained by the secondary device or data transferred to it by the biometric monitoring device, the external service, or a combination of data from the biometric monitoring device, the secondary device, and/or the external service." Park at 9:17-40. Kreger teaches "sensor data and measurements may be transmitted to remote medical personnel, internet servers, and others using WiFi transceiver 68, Bluetooth transceiver 72 or other RF transmitter such as for a cellular phone network. As well, the signals and measurements on the mobile 12 may be transferred via a cable connected to USB connector 28 c or docking connector 28 b to another computer storage device, over a computer network, to a personal computer, and so forth." Kreger at 7:39-46.

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A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with incorporating a personal device into optical measurement systems. These methods are known to be effective in incorporating a personal device into such systems. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of communicating with a personal device.

References disclosing a remote device: For example, charted reference Basu, as well as numerous other references such as Addison, LeBoeuf, Park, and Kreger all include teachings related to a remote device. These references provide numerous methods for incorporating a remote device into an optical measurement system. For example, Basu teaches that "[a] 'cloud-based' RPM infrastructure can actively manage cardiovascular health (Fig. 1). Using OPS technology, cardiovascular parameters can be monitored on a 24-hour ambulatory basis using wearable biosensors, with wireless transmission of relevant data to the patient's electronic medical record." Basu at [0055]. Carlson teaches that "health problems could be detected and an alarm signal could be generated which can be transmitted to a respective person, to a medical doctor, to a hospital, etc. so that help can be organised." Carlson at [0078]. LeBoeuf teaches that "the processed energy response signal is transmitted to a remote device, for example wirelessly transmitted." LeBoeuf at [0035]. Park teaches that "the secondary device may communicate with an external service such as www.fitbit.com or server (e.g., personal computer). Communication may be achieved through wired (e.g., Ethernet, USB) or wireless (e.g., WLAN, Bluetooth, RFID, NFC, cellular) circuitry and protocols to transfer data to and/or from the secondary device." Park at 8:53-9:16. Kreger

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teaches “sensor data and measurements may be transmitted to remote medical personnel, internet servers, and others using WiFi transceiver 68, Bluetooth transceiver 72 or other RF transmitter such as for a cellular phone network. As well, the signals and measurements on the mobile 12 may be transferred via a cable connected to USB connector 28 c or docking connector 28 b to another computer storage device, over a computer network, to a personal computer, and so forth.” Kreger at 7:39-46.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with incorporating a remote device into optical measurement systems. These methods are known to be effective in incorporating a remote device into such systems. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of communicating with a remote device.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix B with any other reference or references listed in Appendix B along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the ’533 Patent.

For example, and without limitation, the Asserted Claims of the ’533 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) Basu Combined with Lisogurski, Carlson, LeBoeuf, Park, Kreger, and/or Sakai

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A POSITA would have had reason to combine Basu with any one of Lisogurski, Carlson, LeBoeuf, and Park all of which relate to systems and methods for optical measurement. Each of Lisogurski, Carlson, LeBoeuf, and Park relate to increasing signal-to-noise ratio in optical measurement systems. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Lisogurski, Carlson, LeBoeuf, and Park provide means—not necessarily expressly present in all other references—for increasing signal-to-noise ratio. A POSITA would have understood that the systems and methods for increasing signal-to-noise ratio were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for increasing intensity and pulse rate, and those using filters, provide improvements such as increasing signal-to-noise ratio. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for increasing signal-to-noise ratio would commonly be combined with increasing intensity and pulse rate, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for increasing signal-to-noise ratio, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Basu Combined with Addison and/or Kreger

A POSITA would have had reason to combine Basu with Addison, which relates to systems and methods for optical measurement. Addison and Kreger relate to incorporating personal and remote devices into systems for optical measurement. Indeed, such components and/or processes were conventional as of the time these references were known. Addison and Kreger provide means—not necessarily expressly present in all other references—for incorporating personal and

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remote devices into systems for optical measurement. A POSITA would have understood that the systems and methods for incorporating personal and remote devices into systems for optical measurement were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for incorporating personal and remote devices into systems for optical measurement provide improvements such as improved mobility and remote medical monitoring. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement would commonly be combined with personal and remote devices, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for incorporating personal and remote devices into systems for optical measurement, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Addison, Carslon, LeBoeuf, Lisogurski, Park, Kreger, Sakai, Combined with any of the References Disclosing Remaining Features

A POSITA would have had reason to combine references Addison, Carslon, LeBoeuf, Lisogurski, Park, Kreger, or Sakai with any one of the references disclosing increasing signal-to-noise ratio, lenses, a personal device, a remote device (collectively, the "remaining features") all of which relate to systems and methods for obtaining and processing physiological measurements of a user. Each of the references teaching the remaining features relate to obtaining and processing physiological measurements of a user using light. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the references teaching the remaining features provide means—not necessarily expressly present in all other references—for obtaining and processing physiological measurements of a user. A POSITA would have

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understood that the systems and methods for the references teaching the remaining features were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for the references teaching the remaining features provide improvements such as specific methods and systems for obtaining and processing physiological measurements using light. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for a wireless system for collecting and processing physiological data would commonly be combined with obtaining physiological measurements (for example, blood glucose levels and blood oxygenation) using light, and thus a POSITA would have been motivated to combine the teachings of these references. The combinations would apply known techniques for obtaining physiological measurements using light, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combinations would further be "obvious to try," because they would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits B1 through B8 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-B, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the References disclosing techniques for increasing signal-to-noise ratio, References disclosing lenses, References disclosing a personal device, and References disclosing a remote device, for the reasons discussed above.

3. U.S. Patent No. 10,517,484

Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix C the prior art references that render obvious the Asserted Claims of the '484 Patent and include below exemplary

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combinations showing the obviousness of the ’484 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix C, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the ’484 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix C, such reference may be combined with any other references listed in Appendix C for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the ’484 Patent Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the ’484 Patent Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix C along with the knowledge of one of ordinary skill in the art to meet the limitations of the ’484 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the ’484 Patent obvious when the references are read in combination with each other, and/or when read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any

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of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix C, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art. As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the extent not anticipated, the '484 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017). Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420-21.

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Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix C would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix C would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '484 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix C is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the

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prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8) the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix C because all of these references relate to the same area of technology and/or are from analogous art. The '484 Patent Asserted Claims are directed to "A wearable device includes a measurement device to measure a physiological parameter adapted to be placed on a wrist or an ear of a user." '484 Patent at Abstract. The '484 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the '484 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer

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to or discuss other prior art, illustrating the close technical relationship among the prior art. For the ’484 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references relating to wearable devices measuring physiological parameters.

Demand and Market Forces: For example, market forces suggested a demand for wearable devices for measuring physiological parameters, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the ’484 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the ’484 Patent, there are a finite number of approaches for providing a wearable device for measuring physiological parameters. For example, as of the priority date of the ’484 Patent, a POSITA would have been very familiar with basic elements of the ’484 Patent’s claims such as semiconductors, optical wavelengths, lenses, signal-to-noise ratio, detectors, analog to digital convertors, smart phones, tablets, cloud, and artificial intelligence. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the ’484 Patent’s claims does not render them novel or non-obvious.

There are significant similarities in subject matter and objectives for each of many references used in these contentions for the ’484 Patent.

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References disclosing smart phone or tablet: For example, charted reference Basu, Rulkov, Goodman, Kassim, Poeze, Terumoto, Moon, Tran, and Kreger, as well as other references such as Mault, all include teachings related to incorporating a smart phone or tablet into an optical measurement system. For example, Rulkov discloses "a device such as a personal digital assistant, laptop computer, mobile telephone, exercise equipment, or the like for display and even processing of the user's real-time vital signs information." Rulkov at 5:48-64. Basu discloses that "[i]n smart phones, for example, OPS detect when a phone is placed in a pocket, triggering touch-screen locking." Basu at [0035]. Goodman discloses "FIG. 5 shows another possible configuration of system 10 wherein processing device 14 is a PDA (e.g. Palm Pilot™) having PPG sensor 12 interfaced therein." Goodman at 13:26-42. Kassim discloses "the feedback unit may be a portable device, such as a mobile phone, smartphone, personal digital assistant (PDA), tablet, netbook or laptop, although this list is not exhaustive by any means." Kassim at 12:12-19. Poeze discloses "the patient monitor may include a display device, a network interface communicating with any one or combination of a computer network, a handheld computing device, a mobile phone, the Internet, or the like." Poeze at 2:47-60. Terumoto discloses "the wireless communication circuit 33 transmits the measurement data acquired at the measurement unit 10 (i.e., the raw data provided from the amplifier circuit 14, the processed data various processes has performed provided from the processing circuit 15, or the stored data provided from the memory 32) to the external personal computer or a cell phone." Terumoto at [0130]. Moon discloses, "FIG. 14 indicates how the wrist-worn transceiver 72 can communicate wirelessly with either a networked computer 198 (e.g. a tablet computer located at a central nursing station) or a hand-held computer 199 (e.g. a cell phone or PDA, typically carried by the medical professional)." Moon at [0107]. Tran teaches that while a patient with a wearable device is outside a mesh network range, "the wearable appliance

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communicates with the cell phone and provides information to the server 200 using the cellular connection." Tran, 34:4-30. Kreger discloses "In other embodiments, the mobile communications device can be any of a number of mobile phones such as an iPhone® or an Android® phone, a personal digital assistant (PDA) such as a Blackberry®, a portable audio playback device such as an MP3 player, a portable media playback device such as an iPod®, or a handheld tablet such as an iPad®." Kreger at 5:48-53. Mault teaches a blood glucose monitoring system including an electronic device that "can be a portable electronic device or system carried by the person, or a device or system combining multiple functionalities, such as:…a portable computer; any portable Internet access device; [or] a wireless phone…." Mault [0069]-[0070].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with incorporating a smart phone or tablet into optical measurement systems. These methods are known to be effective in incorporating a smart phone or tablet into such systems. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of communicating with a smart phone or tablet.

References disclosing lenses: For example, charted reference Carlson, Poeze, and Soller, as well as numerous other references such as LeBoeuf and Park, all include teachings related to using one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue. These references provide numerous methods for using lenses to direct an optical output beam. For example, Carlson teaches "us[ing] a beam-shaping element, such as e.g. diffractive or refractive lenses, to direct the emitted optical radiation of, e.g.,

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the LED light source into the human or animal tissue and the photon detecting element in order to increase the optical signal power, detected by the pulsoximeter sensor, and thus increasing the Signal/Noise—and signal/Background ratio. The increase of the S/B ratio is estimated e.g. to a factor 5." Carlson at [0014]. Poeze teaches "[using] a lens which collects attenuated light exiting the measurement site and focuses onto one or more detectors. The protrusion can advantageously include plastic, including a hard opaque plastic, such as a black or other colored plastic, helpful in reducing light noise." Poeze at 7:52-8:7. Soller teaches "a variety of different collimating elements 56 can be used in sensor 10. Exemplary collimating elements include fiber faceplates (e.g., fiber optic windows), collimating hole devices, gradient index (GRIN) lenses, fiber bundles, lens arrays, optical windows (including shaped optical windows), and other similar devices." Soller at 18:37-56.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with using lenses to direct an optical output beam. These methods are known to be effective in directing an optical output beam using known lens structures. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of directing an optical output beam.

References disclosing techniques for increasing signal-to-noise ratio: For example, charted reference Basu, Lisogurski, and Carlson, as well as numerous other references such as LeBoeuf and Park, all include teachings related to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. These references provide numerous methods for increasing a light intensity and increasing a pulse rate

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of an LED. For example, Basu teaches that "[t]o maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector. In the OPS 10, the LED intensity and modulation frequencies are programmable through the serial interface. In the case of the Vishay VCNL4000, the intensity is programmable from 10-200 mA in 10 mA increments." Basu at [0058]. Lisogurski teaches "that modulation of the light drive signal . . . may include modulation of parameters including drive current or light brightness, duty cycle, firing rate, modulation parameters, other suitable parameters, or any combination thereof" and that "[t]he system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio." Lisogurski at 27:44-55, 9:46-60. Carlson teaches that the "frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which, according to FIG. 7b, is in the range of above approximately 1000 Hz. Thus, the pulsoximeter signals are readily discriminated from electronic and parasitic contributions of environmental optical radiation outside the frequency fc+/−5 Hz increasing significantly the Signal-to-Noise and Signal-to-Background ratio." Carlson at [0069]. LeBoeuf teaches that "the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight" and that "it is important to consider the emitter pulsing frequency and sampling approach" because "choosing a frequency that is too low may result in unsatisfactory subtraction." LeBoeuf at [0123], [0139]. Park teaches that "the light source intensity may be increased to maintain the output signal from the light detector within a desired range of output values." Park at 16:8-20.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with improving signal-to-noise ratio in optical measurement systems. These methods are known to be effective in improving the

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signal-to-noise ratio for such systems, and merely modulate the functioning of the existing LEDs in each system. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of improving signal-to-noise ratio.

References disclosing an analog to digital converter: For example, charted reference Basu, Goodman, Lisogurski, Rulkov, Moon, Poeze, Chandrasekar, Kreger, and Sakai all include teachings related to an analog to digital converter. These references provide numerous methods for using an analog to digital converter coupled to a detector. For example, Basu discloses "a digital interface for communication with a microcontroller." Basu at [0007]. Goodman discloses "On board analog-to-digital converter A/D 44 (10 bit, 5 channel input) is used to convert the conditioned PPG signals at B and B′ into time sampled digital signals which are then provided to processing device 14. Goodman at 11:66-12:21. Lisogurski discloses a "[f]ront end processing circuitry 150 may perform various analog and digital processing of the detector signal." Lisogurski at 12:42-51. Rulkov discloses that "The microprocessor741 has a LED control715 connected to DAC702 for controlling the intensity of the LEDs737. The signal from the photodetector736 is transmitted to a high pass filter (HPF) 703 which sends it to an analog to digital converter704, and the signal from the photodetector737 is also sent directly to a second analog to digital converter704." Rulkov at 11:39-60. Moon discloses that "[a] filter removes any high-frequency noise (e.g. 60 Hz electrical noise) that is not related to the PPG waveform, and yields a preliminary waveform that is digitized with an analog-to-digital converter 176, and processed as described above to generate a DC portion of the PPG." Moon at [0091]. Poeze discloses "[f]ront-end interfaces 108 may be implemented using transimpedance amplifiers that are coupled to analog to

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digital converters in a sigma delta converter." Poeze at 40:15-27. Chandrasekar discloses "In principle, PPGs are considered simple devices; however, in practice, implementation requires a careful design involving optics (multiple paths, alignments, leakage barriers) and mixed signal electronics (transimpedance amplifiers, analog digital conversion, drivers, modulators, filters)." Chandrasekar at 1. Kreger discloses "Biosensor signals may also be received by one or more RF receivers in the dock 246 (not shown) and communicated to the mobile 212 via wired electrical connector 246, for example, to allow the wireless sensor to utilize the features of the wired audio input's anti-alias filters and analog to digital converter as will be explained in detail below." Kreger at 10:14-28. Sakai discloses "A/D converter 2013 d which converts a voltage value of analog signal into 10-bit digital value."

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with incorporating an analog to digital converter into optical measurement systems. These methods are known to be effective in incorporating an analog to digital converter into such systems. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of signal processing.

References disclosing a cloud: For example, charted references Basu and Kassim, as well as numerous other references such as Mault and US2011/0082711A1, include teachings related to using a cloud. These references provide numerous methods for communicating with a cloud. For example, Basu teaches that "a "cloud-based" RPM infrastructure can actively manage cardiovascular health. Using OPS technology, cardiovascular parameters can be monitored on a

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24-hour ambulatory basis using wearable biosensors, with wireless transmission of relevant data to the patient's electronic medical record." Basu at [0064]. Kassim teaches that "[t]he computer platform may further be connected to network resources 2006 which connect to the Internet or other components of a local public or private network. The network resources 2006 may provide instructions and data to the computer platform from a remote location on a network 2007." Kassim, 33:34-34:19. Mault teaches "[t]he PDA can access the communications network, such as the Internet, using a wireless connection. Data can be transferred to the remote system over the communications network 20." Mault, [0077]. US 2011/0082711A1 teaches "the camera is paired with an optical character recognition module so that scanned medical forms can be converted into data that can be uploaded for synchronization at a server in a network (e.g. a cloud computing network) or stored on the personal health organizer device." At [0048].

A person of skill in the art would understand that the functionality taught in this reference could be added to other methods and systems for measuring physiological parameters. These methods provide communication with a cloud which allows for remote storage and computation on the cloud. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological parameters.

References disclosing artificial intelligence: For example, charted reference Tran, as well as other references such as Quy, include teachings related to using artificial inteligence. For example, Tran teaches "Various mathematical techniques and Artificial Intelligence (AI) analyzer can be applied. … AI approaches towards signal recognition include Artificial Neural Networks (ANN), dynamic recurrent neural networks (DRNN), fuzzy logic system, Genetic Algorithm (GA),

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and Hidden Markov Model (HMM)." Tran at 94:49-65. Quy teaches "[a]pplication 62 may include an algorithm 63 for analyzing data from the HMD, and either application 62 or algorithm 63 may optionally access data from an external data source 74 and may further consult an artificial intelligence system 76." Quy at 8:9-14.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for measuring physiological parameters. These methods provide using artificial intelligence. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological parameters.

References disclosing spatially separated detectors: For example, charted references Lisogurski, Poeze, Soller, Terumoto, and Tran, all include teachings related to using detectors that are spatially separated. These references provide numerous methods for using light detectors. For example, Lisogurski teaches that "[o]ne or more detector 318 may also be provided in sensor unit 312 for detecting the light that is reflected by or has traveled through the subject's tissue. Any suitable configuration of light source 316 and detector 318 may be used. In an embodiment, sensor unit 312 may include multiple light sources and detectors, which may be spaced apart." Lisogurski at 17:35-45. Poeze discloses that "multiple detectors are employed and arranged in a spatial geometry. This spatial geometry provides a diversity of path lengths among at least some of the detectors and allows for multiple bulk and pulsatile measurements that are robust." Poeze at 9:18-27. Soller discloses "a plurality of spectral detectors attached to the circuit board, each spectral detector being configured to analyze radiation derived from the radiation source" and depicts the

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detectors as spatially separated. Soller at 3:16-27; Fig. 34. Terumoto discloses "[t]he light sensor portions 101-1 to 101-n are located equally spaced from one another and to go round the armlet type housing 107 same as the fourth to sixth implementations." Terumoto at [0152]. Tran discloses "[t]he electrode array sensor can be a geometric array of discrete electrodes having an equally-spaced geometry of multiple nodes that are capable of functioning as sense and reference electrodes. In a typical tomography application the electrodes are equally-spaced in a circular configuration. Alternatively, the electrodes can have non-equal spacing and/or can be in rectangular or other configurations in one circuit or multiple circuits." Tran at 50:61-51:8.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that detect light. These methods provide using detectors that are spatially separated. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological parameters.

References disclosing detection system is synchronized to the light source: For example, charted reference Lisogurski, Carlson, Poeze, Kreger, and Sakai all include teachings related to detection system is synchronized to the light source. These references provide numerous methods for synchronizing detection system with the light source. For example, Lisogurski discloses "he front end processing circuitry 150 may use the timing control signals to operate synchronously with light drive circuitry 120. For example, front end processing circuitry 150 may synchronize the operation of an analog-to-digital converter and a demultiplexer with the light drive signal based on the timing control signals." Lisogurski at 11:33-49. Carlson discloses "[t]he basic

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idea of using AC-Coupling or Lock-In Amplification (synchronous detection), is to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range where environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent. AC-Coupling or Lock-In Amplification is well known out of the state of the art and is described in literature 3." Carlson at [0065]. Poeze teaches that "[a] control signal can be useful in order to synchronize, minimize, or reduce jitter in the timing of pulses emitted from the emitter 104. Accordingly, this control signal can be useful in order to cause optical radiation pulses emitted from the emitter 104 to follow a precise timing and consistent pattern." Poeze at 15:27-48. Kreger discloses "Thus, it is another object to provide compatible signals to the mobile's electrical connectors which may involve transforming the biosensor signals to match requisite impedance and signal levels, eliminate noise, cancel DC noise and drift, demultiplex or multiplex multiple measurements, provide electrical isolation, serialization, synchronization, and so forth." Kreger at 3:17-23. Sakai discloses "he A/D converter 14 operates in synchronization with the light emission timing of the driver 12, to thereby convert the pulse wave detection signal detected upon light emission from the green LED 11 a and the body motion detection signal detected upon light emission from the infrared LED 11 b into digital data, and provides these digital data, as biological information, to the information processor 20." Sakai at 5:66-6:9.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with measuring physiological parameters. These methods are known to be effective in incorporating synchronizing detection system with the light source. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked

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to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of signal processing.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix C with any other reference or references listed in Appendix C along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the ’484 Patent.

For example, and without limitation, the Asserted Claims of the ’484 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) Carlson, Lisgurski, Chandersekar, Soller, Tran, and Sakai combined with References disclosing smart phone or tablet

A POSITA would have had reason to combine references Carlson, Lisgurski, Moon, Soller, and Sakai with any one of References disclosing smart phone or tablet, all of which relate to systems and methods for incorporating a smart phone or tablet into an optical measurement system. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing smart phone or tablet provide means—not necessarily expressly present in all other references—for incorporating a smart phone or tablet into an optical measurement system. A POSITA would have understood that the systems and methods for References disclosing smart phone or tablet were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using smart phone or tablet into an optical measurement system provide improvements such as the ability to coomunicate with smart phone or tablet and/or increased processing capabilities. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for using smart phone or tablet would commonly be combined with

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optical measurement system, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using smart phone or tablet, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Rulkov, Basu, Goodman, Chandersekar, Kassim, Lisogurski, Moon, Terumoto, Tran, Kreger, and Sakai combined with References disclosing lenses

A POSITA would have had reason to combine references Rulkov, Basu, Goodman, Kassim, Lisogurski, Moon, Terumoto, Tran, Kreger, and Sakai with any one of References disclosing lenses, all of which relate to systems and methods for using lenses to direct an optical output beam. Each of References disclosing lenses relate to using one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing lenses provide means—not necessarily expressly present in all other references—for using lenses to direct an optical output beam. A POSITA would have understood that the systems and methods for References disclosing lenses were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using lenses provide improvements such as disrecting the light to tissue. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for using lenses to direct an optical output beam would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using lenses to direct an optical output beam, to wearable

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measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Kassim, Rulkov, Goodman, Moon, Chandersekar, Poeze, Soller, Terumoto, Tran, Kreger, and Sakai combined with References disclosing techniques for increasing signal-to-noise ratio

A POSITA would have had reason to combine Kassim, Rulkov, Goodman, Moon, Poeze, Soller, Terumoto, Tran, Kreger, and Sakai with any one of References disclosing techniques for increasing signal-to-noise ratio, all of which relate to systems and methods for increasing a light intensity and increasing a pulse rate of an LED. Each of References disclosing techniques for increasing signal-to-noise ratio relate to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing techniques for increasing signal-to-noise ratio provide means—not necessarily expressly present in all other references—for increasing signal-to-noise ratio relate to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. A POSITA would have understood that the systems and methods for References disclosing techniques for increasing signal-to-noise ratio were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for increasing a light intensity and increasing a pulse rate of an LED provide improvements such as increasing signal-to-noise ratio. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for increasing signal-to-noise ratio would commonly be combined with

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optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for increasing signal-to-noise ratio, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iv) Carlson, Kassim, Soller, Chandersekar, Terumoto, and Tran combined with References disclosing an analog to digital converter

A POSITA would have had reason to combine references Carlson, Kassim, Soller, Terumoto, and Tran with any one of References disclosing an analog to digital converter, all of which relate to systems and methods for using an analog to digital converter coupled to a detector. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing an analog to digital converter provide means—not necessarily expressly present in all other references—for using an analog to digital converter coupled to a detector. A POSITA would have understood that the systems and methods for References disclosing an analog to digital converter were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using an analog to digital converter provide improvements such as ability to process a signal digitally. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for using an analog to digital converter would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using an analog to digital converter, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination

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would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(v) Carlson, Rulkov, Chandersekar, Goodman, Kassim, Lisogurski, Moon, Poeze, Soller, Terumoto, Tran, Kreger, and Sakai combined with References disclosing a cloud

A POSITA would have had reason to combine references Carlson, Rulkov, Chandersekar, Goodman, Kassim, Lisogurski, Moon, Poeze, Soller, Terumoto, Tran, Kreger, and Sakai with any one of References disclosing a cloud, all of which relate to systems and methods for using a cloud. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing a cloud provide means—not necessarily expressly present in all other references—for using a cloud. A POSITA would have understood that the systems and methods for using a cloud were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using a cloud provide improvements such as remote storage and computing. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological parameters would commonly be combined with a cloud, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using a cloud, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(vi) Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Lisogurski, Moon, Poeze, Soller, Terumoto, Kreger, and Sakai combined with References disclosing artificial intelligence

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A POSITA would have had reason to combine references Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Lisogurski, Moon, Poeze, Soller, Terumoto, Kreger, and Sakai with any one of References disclosing artificial intelligence, all of which relate to systems and methods for using artificial intelligence. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing artificial intelligence provide means—not necessarily expressly present in all other references—for using artificial intelligence. A POSITA would have understood that the systems and methods for References disclosing artificial intelligence were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using artificial intelligence provide improvements such as automation and improved processing power. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological parameters would commonly be combined with artificial intelligence, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for artificial intelligence, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(vii) Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Kreger, and Sakai combined with References disclosing spatially separated detectors

A POSITA would have had reason to combine references Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Kreger, and Sakai with any one of References disclosing spatially separated detectors all of which relate to systems and methods for using spatially separated detectors. Indeed, such components and/or processes were conventional as of

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the time these references were known. Each of References disclosing spatially separated detectors provide means—not necessarily expressly present in all other references—for using spatially separated detectors. A POSITA would have understood that the systems and methods for References disclosing spatially separated detectors were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for spatially separated detectors provide improvements such as improved detection quality. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological parameters would commonly be combined with spatially separated detectors, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using spatially separated detectors, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(viii) Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Soller, Terumoto, and Tran combined with References disclosing detection system is synchronized to the light source

A POSITA would have had reason to combine references Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Soller, Terumoto, and Tran with any one of References disclosing detection system is synchronized to the light source, all of which relate to systems and methods for synchronizing a detection system with a light source. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing detection system is synchronized to the light source provide means—not necessarily expressly present in all other references—for synchronizing a detection system with a light

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source. A POSITA would have understood that the systems and methods for References disclosing detection system is synchronized to the light source were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for synchronizing a detection system with a light source provide improvements such as improved detection. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological parameters would commonly be combined with techniques for synchronizing a detection system with a light source, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for synchronizing a detection system with a light source, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits C1 through C14 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-C, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the References disclosing smart phone or tablet, References disclosing lenses, References disclosing techniques for increasing signal-to-noise ratio, References disclosing an analog to digital converter, References disclosing a cloud, References disclosing artificial intelligence, References disclosing spatially separated detectors, References disclosing detection system is synchronized to the light source, for the reasons discussed above.

4. U.S. Patent No. 10,874,304

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Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix D the prior art references that render obvious the Asserted Claims of the ’304 Patent and include below exemplary combinations showing the obviousness of the ’304 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix D, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the ’304 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix D, such reference may be combined with any other references listed in Appendix D for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the ’304 Patent Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the ’304 Patent Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix D along with the knowledge of one of ordinary skill in the art to meet the limitations of the ’304 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the ’304 Patent obvious when the references are read in combination with each other, and/or when

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read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix D, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art, including prior art systems that may anticipate and/or render obvious the Asserted Claims (e.g., System Art).. As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the extent not anticipated, the '304 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017).

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Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420-21. Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix D would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix D would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '304 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

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Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix D is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8) the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix D because all of these references relate to the same area of technology and/or are from analogous art. The ’304 Patent Asserted Claims are directed to a physiological measurement system. ’304 Patent at Abstract. The ’304 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the ’304 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the

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teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer to or discuss other prior art, illustrating the close technical relationship among the prior art. For the '304 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references relating to wearable devices measuring physiological parameters.

Demand and Market Forces: For example, market forces suggested a demand for wearable devices for measuring physiological parameters, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the '304 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the '304 Patent, there are a finite number of approaches for providing a wearable device for measuring physiological parameters. For example, as of the priority date of the '304 Patent, a POSITA would have been very familiar with basic elements of the '304 Patent's claims such as semiconductors, optical wavelengths, signal-to-noise ratio, detectors, analog to digital converters, smart phones/tablets, cloud, and their configurations and/or means for the same. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the '304 Patent's claims does not render them novel or non-obvious.

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There are significant similarities in subject matter and objectives for each of many references used in these contentions for the ’304 Patent.

Reflective Surface References: For example, charted reference **LeBoeuf**, as well as numerous other references such as **Basu** and **Valencell** all include teachings related to physiological measurement systems. These references provide numerous methods for using a reflective surface in a sensor to direct the reflected light from a sample to a detector. For example, **LeBoeuf** teaches using a “cover 18” with a “cladding material 21 [which] may be reflective material” to “serve[] as a light guide that… collects light external to the earbud housing 16 and delivers the collected light to the optical detector 26”. LeBoeuf, [0103], [0107], [0115]. **Basu** teaches “[t]he battery 32 may additionally be arranged to provide a reflective surface for the light emitted by the LED 14 toward the photodiode 16.” Basu, [0088]. **Valencell** teaches “The light guiding region 2306 helps direct light to and/or from the sensor module …. In some embodiments, the light guiding region 2306 may be a reflector.” Valencell, [0152].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for physiological measurements. These methods provide the benefit of improved delivery of the light reflected from tissue to the detectors in the sensor. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

SNR Techniques: For example, charted reference **Kassim**, as well as numerous other references such as **Carlson, Basu, Lisogurski, Marbach**, and **LeBoeuf** all include teachings related to physiological measurement systems. These references provide numerous methods for

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improving signal-to-noise ratio through various methods, including increasing light intensity, increasing pulse rate, differencing detected signals, and applying multivariate techniques. For example, **Kassim** teaches "a maximum of the true Red PPG signal (devoid of ambient noise) can simply be obtained by subtracting the obtained maximum value of the Red PPG signal, obtained when the Red LED is turned on, with the obtained maximum value of the ambient PPG signal." Kassim, 22:27-23:3. **Carlson** teaches that "shift[ing] [the] spectrum of signal" can result in "increasing significantly the Signal-to-Noise and Signal-to-Background ratio" when the "frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light." Carlson, [0069]. **Basu** teaches "[t]o maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector." Basu, [0058]. **Lisogurski** teaches "dark subtractor 162 may subtract dark values from the Red and IR components to generate adjusted Red and IR signals. For example, dark subtractor 162 may determine a subtraction amount from the dark signal portion of the detection signal and subtract it from the peak portion of the detection signal in order to reduce the effect of the dark signal on the peak. Lisogurski, 13:60-67. **Marbach** teaches "The LEDs are preferably pulse-modulated with a pulse frequency on the order of several kHz. Low power, quasi-continuous operation is possible by measuring intermittently, e.g., one measurement lasting 10 seconds every 5 minutes. …depending on the sampling rate and SNR requirements," and performing "measurement algorithms" on "multivariate input data" of measurement signals in order to "better the measurement accuracy a.k.a. SNR." Marbach, 17:1-7, 12:19-27. **LeBoeuf** teaches "Channel A refers to inputs from sensors that collect physiological information plus noise information, and Channel B refers to inputs from sensors that collect primarily … noise information. … The filter 203 properties are updated to minimize the difference between Channel A and the post-processed

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Channel B, denoted as B. In this way, noise is removed from Channel A and Channel C contains predominantly physiological information." LeBoeuf, [0143].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for physiological measurements. These methods and systems provide the benefit of increasing a signal-to-noise ratio of the measure signal. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Smartphone/Tablet References: For example, charted reference **Basu**, as well as numerous other references such as **Kassim**, **Kreger**, **Lisogurski**, **Tran**, all include teachings related to physiological measurement systems. These references provide numerous means for a physiological monitoring system to be configured for use with a smart phone or tablet. For example, **Basu** teaches "health ring 44 which can monitor heart rate on a 24 hour basis," and that "combines the sensor with a…wireless transmitter linked to an application running on the user's cell phone." Basu, [0065]-[0066]. For example, **Kassim** teaches "[t]he optical measurement device 300 further comprises a coupling member 316 that can provide coupling between the measurement device 300 to a personal mobile processing device/feedback unit (not shown) in a cableless configuration," and that "the feedback unit may be a portable device, such as a mobile phone, smartphone, personal digital assistant (PDA), tablet, netbook or laptop, although this list is not exhaustive by any means." Kassim, 12:5-14. For example, **Kreger** teaches a "biosensor interface apparatus for use with a mobile communication device 10," that "can be any of a number of mobile phones such as an iPhone® or an Android® phone, a personal digital assistant (PDA)

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such as a Blackberry®, a portable audio playback device such as an MP3 player, a portable media playback device such as an iPod®, or a handheld tablet such as an iPad®." Kreger, 5:40-53; *see also* Kreger, 7:39-46. For example, **Lisogurski** teaches a "monitor [that] may be powered by a battery" with a "[u]ser interface [which] may include user input 182, display 184, and speaker 186. User input 182 may include any type of user input device such as a keyboard, a mouse, a touch screen, buttons, switches, a microphone, a joy stick, a touch pad, or any other suitable input device." Lisogurski, 15:19-23, 18:65-67. For example, **Mault** teaches a blood glucose monitoring system including an electronic device that "can be a portable electronic device or system carried by the person, or a device or system combining multiple functionalities, such as:…a portable computer; any portable Internet access device; [or] a wireless phone…." Mault [0069]-[0070]. For example, **Poeze** teaches "a personal health organizer software module 132 executed on a general purpose computing device 126, with the computing device 126 coupled with the health data collection device 112 via a communications link 128," where the "personal health organizer module 132 can be an executable program on an operating system of a device such as a mobile phone, a personal digital assistant, a portable music player, an electronic book reader, a netbook, a TV media center, and a laptop or desktop computer. For example, the personal health organizer module 132 can be an application that is executed on the operating system of a mobile phone such as the iPhone manufactured by Apple, Inc., a Blackberry device manufactured by Research In Motion, Inc., the Pre manufactured by Palm, Inc, or a mobile device manufactured by HTC, Nokia, or Motorola, etc." Poeze, [0034]; *see also* Poeze [0010]. **Tran** teaches that while a patient with a wearable device is outside a mesh network range, "the wearable appliance communicates with the cell phone," such as a "smart phone[]" and "provides information to the server 200 using the cellular connection." Tran, 34:4-30.

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A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide the benefit of more processing power and more convenient means to flag emergency situations. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Cloud References: For example, charted reference **Kassim**, as well as numerous other references such as **Mault, Basu, Lisogurski**, and **Poeze** all include teachings related to physiological measurement systems. These references provide numerous means for a physiological monitoring system to be configured for use a with cloud. For example, **Kassim** teaches that "[t]he computer platform may further be connected to network resources 2006 which connect to the Internet or other components of a local public or private network. The network resources 2006 may provide instructions and data to the computer platform from a remote location on a network 2007." Kassim, 33:34-34:19. **Mault** teaches "[t]he PDA can access the communications network, such as the Internet, using a wireless connection. Data can be transferred to the remote system over the communications network 20." Mault, [0077]. **Basu** teaches "a cloud-based health monitoring and mentoring framework which integrates remote patient monitoring (RPM) with an online community involving medical caregivers and a social network of the patient's peers." Basu, [0081]. **Lisogurski** teaches "monitor 314 and/or multi-parameter physiological monitor 326 may be coupled to a network to enable the sharing of information with servers or other work-stations." Lisogurski, 18:62-65. **Poeze** teaches "the camera is paired with an

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opti cal character recognition module so that scanned medical forms can be converted into data that can be uploaded for synchronization at a server in a network (e.g. a cloud computing network) or stored on the personal health organizer device." Poeze, [0048].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for physiological measurements. These methods improving the analysis capabilities of measurement systems due to the increased processing and storage power of a cloud. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Optical Detection Techniques References: For example, charted reference **Keller**, as well as numerous other references such as **Mault**, **Carlson, Lisogurski, Basu**, **Jung**, and **Marbach** all include teachings related to physiological measurement systems. These references provide numerous means for effective optical detection through various methods, including synchronizing light sources and detectors and modulating the light source. For example, **Keller** teaches that "[t]he light source 102 may also be pulsed or flashed, in order, for example, to synchronize with the imaging devices 305, 504 (see, FIGS. 3 and 5, respectively) of the invention." Keller, [0088]. **Mault** teaches "electrical modulation of a single device may be used to obtain multiple wavelength emission" Mault, [0020]. **Carlson** teaches "us[ing] a light source modulation to temporarily modulate the optical radiation of the LED … in order to shift the power spectrum of the pulsometer signals into a higher frequency range." Carlson, [0063]-[0065]. **Lisogurski** teaches "front end processing circuitry 150 may use the timing control signals to operate

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synchronously with light drive circuitry 120." Lisogurski, 11:41-43. **Basu** teaches "[t]he LED 14 is modulated at 1 KHz frequency or higher. The received PD signal oscillates at the same frequency." Basu, [0037]. **Jung** teaches "[t]he three monochrome sources, however, are turned on and off rapidly, synchronous with the spectral measurements being taken." Jung, 68:26-30. **Lamego** teaches a "digital-to-analog conversion circuit 338" that includes "a synchronizing latch 323" which "accepts the synchronizing pulses which maintain synchronization between the activation of emitters 302 and the analog to digital conversion circuit 332." Lamego, [0044]-[0045]. **Marbach** teaches "The LEDs are preferably pulse-modulated with a pulse frequency on the order of several kHz. Low power, quasi-continuous operation is possible by measuring intermittently, e.g., one measurement lasting 10 seconds every 5 minutes." Marbach, 17:1-5.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for physiological measurements. These methods and systems provide increased accuracy for monitoring physiological parameters. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Artificial Intelligence / Multivariate Techniques References: For example, charted reference **Tran**, as well as numerous other references such as **Mault** and **Marbach** all include teachings related to physiological measurement systems. These references provide numerous means for using artificial intelligence and multivariate techniques to make decisions and improve signal-to-noise ratios. For example, **Tran** teaches that "feed forward artificial neural networks (NNs) are used to classify valve-related heart disorders." Tran, 74:45-62. **Mault** teaches that

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"[f]eedback, generated by a specialist or computer expert system, may be transmitted to the PDA from the remote computer over the communications network." Mault, [0077]. **Marbach** teaches performing "measurement algorithms" on "multivariate input data" of measurement signals in order to "better the measurement accuracy a.k.a. SNR." Marbach, 12:19-27.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems for physiological measurements. These methods and systems provide increased decision-making capabilities and minimize noise interference. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Arc References: For example, charted reference **Isaacson**, as well as numerous other references such as **Jung**, and **LeBoeuf** all include teachings related to physiological measurement systems. These references provide numerous methods for utilizing a plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs. For example, **Isaacson** teaches emitters 10, 20 and detectors 12, 22 disposed on an arc. Isaacson, 4:64-5:9, Fig. 1. For example, **Jung** teaches "a fiber optic arrangement presented at the forward end of probe tip 1" which "utilizes a single central light source fiber optic…and a plurality of perimeter light receiver fiber optics, denoted as light receivers R1, R2 and R3." Jung, 11:21-50, Fig. 2; *see also* Jung 24:39-48, 24:39-62, 32:66-33:9, 39:41-40:14, Figs. 9, 10A-B, 20, 28A-B. For example, **LeBoeuf** teaches optical emitters 24 and optical detectors 26 configured in an arc. LeBoeuf, [0123]-[1024], Fig. 8B

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A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods provide the benefit of better acquisition of signals from the samples. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix D with any other reference or references listed in Appendix D along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the ’304 Patent.

For example, and without limitation, the Asserted Claims of the ’304 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Reflective Surface References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of the Reflective Surface References all of which relate to systems and methods for physiological monitoring. Each of references **LeBoeuf, Basu** and **Valencell** relate to physiological monitoring systems which use a reflective surface to direct the reflected light from a sample to a detector. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the Reflective Surface References provide means—

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not necessarily expressly present in all other references—for using a reflective surface in a sensor to direct the reflected light from a sample to a detector. A POSITA would have understood that the systems and methods for the Reflective Surface References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for incorporating reflective surfaces into sensors to direct the reflected light from a sample to a detector provide improvements such as enhancing the efficiency of the delivery of the light reflected from or transmitted through the tissue to the detectors in the sensor, minimizing loss of light intensity due to scattering. *E.g.*, LeBoeuf, [0125] ("An advantage of this configuration is … this configuration may reduce unwanted optical signals from regions that may not be relevant to the physiological activity of interest.") A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement systems would commonly be combined with reflective surfaces, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of including basic optical components, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with SNR Techniques References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim, Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of the SNR Techniques References all of which relate to systems and methods for physiological monitoring. Each of references **Kassim, Carlson, Basu, Lisogurski, Marbach**, and **LeBoeuf** relate to physiological monitoring systems which use various methods for improving

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signal-to-noise ratio. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the SNR Techniques References provide means—not necessarily expressly present in all other references—for various methods, including increasing light intensity, increasing pulse rate, and differencing detected signals to improve the SNR of a detected signal. A POSITA would have understood that the systems and methods for the SNR Techniques References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for incorporating the usage of various SNR techniques into physiological measurement systems provide improvements such as reducing the effects of background noise or ambient light on the measurement signal and improving the accuracy of the measurement. *E.g.*, Kassim, 22:28-22:30 ("The inventors have recognized that by identifying and utilizing only significant information for Sp02 calculation, an efficient and accurate calculation can be carried out"). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement systems would commonly be combined with SNR improvement techniques, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of using known noise reduction and signal enhancement methods, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Smartphone/Tablet References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any

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one of Smartphone/Tablet References all of which relate to systems and methods for physiological monitoring. Each of references **Basu**, **Kassim**, **Kreger**, **Lisogurski**, **Mault**, **Poeze**, and **Tran** relate to physiological monitoring systems for use with a smartphone or tablet. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Smartphone/Tablet References provide means—not necessarily expressly present in all other references—for a physiological monitoring system to communicate with a smartphone or tablet. A POSITA would have understood that the systems and methods for Smartphone/Tablet References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for connectivity to smartphones or tablets provide improvements improving the analysis capabilities of measurement systems due to the increased processing power of smartphones and tablets and the additional resources provided by their ability to connect to wireless and cell networks. *E.g.*, Basu, [0066] (physiological monitoring system "combines the sensor with a…wireless transmitter linked to an application running on the user's cell phone."); Kreger, 13:1-3 ("Mobile device smart phone 444 may derive measurements, display plots, transmit medical records of biosensor data, and so forth."); Tran, 34:4-40 ("If the wearable appliance detects a cellphone that is mesh network compatible, the wearable appliance communicates with the cell phone," such as a "smart phone" and "provides information to the server 200 using the cellular connection."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical physiological measurement would commonly be combined with smartphone and personal computing technology and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of providing for connectivity to smartphone or personal computing devices in wearable measurement devices that were ready for improvement,

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in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iv) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Cloud References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of the Cloud References all of which relate to systems and methods for physiological monitoring. Each of references **Kassim**, **Mault, Basu, Lisogurski**, and **Poeze** relate to connecting the physiological monitoring system with a cloud. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the Cloud References provide means—not necessarily expressly present in all other references—for a physiological monitoring system to communicate with a cloud. A POSITA would have understood that the systems and methods for the Cloud References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for connectivity to a cloud provide improvements improving the analysis capabilities of measurement systems due to the increased processing and storage power of a cloud and the additional resources provided by their ability to connect to the internet and other remote networks. *E.g.*, Kassim, 34:14-16 ("The network resources may include 15 storage devices for storing data and executable instructions at a location separate from the computer platform 2001"). *E.g.*, Mault, [0077] ("Data can be transferred to the remote system over the communications network 20, allowing examination by a dietician, physician, other specialist"). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical physiological measurement would commonly be combined with cloud connectivity and thus a POSITA would have been

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motivated to combine the teachings of these references. The combination would apply known techniques of providing for connectivity to smartphone or personal computing devices in wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(v) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Optical Detection Techniques References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of the Optical Detection Techniques References all of which relate to systems and methods for physiological monitoring. Each of references **Keller, Mault**, **Carlson, Lisogurski, Basu**, **Jung**, and **Marbach** relate to physiological monitoring systems which use various methods for effective optical detection. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the Optical Detection References provide means—not necessarily expressly present in all other references—for various methods, including synchronizing light sources and detectors and modulating the light source for effective optical detection of a sample. A POSITA would have understood that the systems and methods for the Optical Detection References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for incorporating the usage of various optical detection techniques into physiological measurement systems provide improvements such as improving the system's ability to effectively detect and measure samples of interest. *E.g.*, Carlson , [0065] ("AC-Coupling or Lock-In Amplification (synchronous detection), is to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range where

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environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent."); Lamego, [0045] ("[D]river circuit," including "synchronizing latch 323 [that] accepts the synchronizing pulses which maintain synchronization between the activation of emitters 302 and the analog to digital conversion circuit 332" "is designed to minimize the noise from the emitters 302."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement systems would commonly be combined with optical detection techniques, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of using known optical detection methods, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(vi) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Artificial Intelligence / Multivariate Techniques References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of the Artificial Intelligence / Multivariate Techniques References all of which relate to systems and methods for physiological monitoring. Each of references **Tran, Mault,** and **Marbach** relate to physiological monitoring systems which use artificial intelligence or multivariate techniques to improve their measurements. Indeed, such components and/or processes were conventional as of the time these references were known. Each of the Artificial Intelligence / Multivariate Techniques References provide means—not necessarily expressly present in all other references—for improving a system's decision-making and the SNR of a measured signal. A POSITA would have understood that the systems and methods for the

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Artificial Intelligence / Multivariate Techniques References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for incorporating the usage artificial intelligence and multivariate techniques into physiological measurement systems provide improvements such as improving the system's ability to effectively make decisions and make accurate measurements with minimal noise interference. *E.g.*, Tran, 5:57-65 ("For example, the system can perform patient behavior analysis such as eating/drinking/smoke habits and medication compliance, among others"). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement systems would commonly be combined with artificial intelligence and multivariate techniques, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of using known artificial intelligence models and multivariate calculation methods, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(vii) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Arc References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix D, with any one of Arc References all of which relate to systems and methods for physiological monitoring. Each of references **Isaacson**, **Jung**, and **LeBoeuf** relate to physiological monitoring systems with their light sources and/or detectors configured in an arc. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Arc References provide means—not necessarily expressly present in all other references—for configuring the

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detectors and/or emitters of a physiological measurement system in an arc formation. A POSITA would have understood that the systems and methods for Arc References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for configuring optical detectors and emitters in an arc formation would provide improvements such as increased measurement accuracy due to lessening the negative effects of light scattering and accounting for the contours of the tissue sample that is being measured. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement would commonly be combined detectors and emitters in an arc formation, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for varying the spatial configurations of emitters and detectors in wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits D1 through D19 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-D, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the Lens References, Light Intensity References, Three Wavelength References, Six LED References, Smartphone/Tablet References, Synchronize Light Source/Detector References, and/or Arc References for the reasons discussed above.

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

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Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix E the prior art references that render obvious the Asserted Claims of the ’455 Patent and include below exemplary combinations showing the obviousness of the ’455 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix E, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the ’455 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix E, such reference may be combined with any other references listed in Appendix E for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the ’455 Patent Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the ’455 Patent Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix E along with the knowledge of one of ordinary skill in the art to meet the limitations of the ’455 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the ’455 Patent obvious when the references are read in combination with each other, and/or when

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read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix E, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art, including prior art systems that may anticipate and/or render obvious the Asserted Claims (e.g., System Art). As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the extent not anticipated, the '455 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017).

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Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420-21. Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix E would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix E would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '455 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

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Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix E is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8) the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix E because all of these references relate to the same area of technology and/or are from analogous art. The ’455 Patent Asserted Claims are directed to a physiological measurement system. ’455 Patent at Abstract. The ’455 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the ’455 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the

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teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer to or discuss other prior art, illustrating the close technical relationship among the prior art. For the ’455 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references relating to wearable devices measuring physiological parameters.

Demand and Market Forces: For example, market forces suggested a demand for wearable devices for measuring physiological parameters, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the ’455 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the ’455 Patent, there are a finite number of approaches for providing a wearable device for measuring physiological parameters. For example, as of the priority date of the ’455 Patent, a POSITA would have been very familiar with basic elements of the ’455 Patent’s claims such as semiconductors, optical wavelengths, lenses, signal-to-noise ratio, detectors, analog to digital converters, smart phones/tablets, cloud, and their configurations and/or means for the same. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the ’455 Patent’s claims does not render them novel or non-obvious.

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There are significant similarities in subject matter and objectives for each of many references used in these contentions for the ’455 Patent.

Lens References: For example, charted reference **Carlson**, as well as numerous other references such as **LeBoeuf**, **Poeze**, **Pologe**, and **Valencell** all include teachings related to physiological measurement systems. These references provide numerous means and methods for using lenses to receive at least a portion of the output optical light and to deliver a lens output light to tissue, which were already well known in the art. For example, **Carlson** teaches using “a beam-shaping element, such as e.g. diffractive or refractive lenses, to direct the emitted optical radiation of, e.g., the LED light Source into the human or animal tissue and the photon detecting element in order to increase the optical signal power, detected by the pulsoximeter sensor, and thus increasing the Signal/Noise-and signal/Background ratio.” Carlson, [0014]; *see also* Carlson, [0024]; [0041], [0062], FIG. 6c. Fore example, **LeBoeuf** teaches “lenses 29L [] configured to focus inspection light 111 onto a particular region of the ear.” LeBoeuf, [0114]; *see also* LeBoeuf, [0011], [0019], [0031], [0036], [0097], [0114], [0116] [0117], [0135], [0138], [0161], [0168]. For example, **Poeze** teaches “the device 112 includes an optional tissue thickness adjuster or tissue shaper 522, which can include one or more…lenses….” Poeze, [0102]. **Pologe** further teaches a “wavelength division multiplexing (WDM) coupler[]” using a lens to combine light signals from emitters into a “single multiplexed light signal on output cable 24.” Pologe, 5:16-51. For example, **Valencell** teaches “optical lenses 715 [that] may be designed for the desired optical coupling between the skin/blood vessel region and the emitter 102 or detector 103.” Valencell, [0118]; *see also* Valencell, [0016]-[0017], [0022]-[0023], [0038], [0119], [0121], [0124]-[0125], [0128]-[0131].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These

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methods provide the benefit of increasing the light intensity to increase signal-to-noise ratio, without increasing power usage. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Light Intensity References: For example, charted reference **Basu**, as well as numerous other references such as **Kassim**, **Lisogurski**, and **Valencell** all include teachings related physiological measurement systems. These references provide numerous methods for increasing the signal-to-noise ratio by increasing light intensity of at least one of the semiconductor sources from an initial light intensity. For example, **Basu** teaches "[t]o maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector." Basu, [0058]. For example, **Kassim** teaches "the effects of ambient light signals 30 can be reduced as much as possible by tuning the intensities of the IR and Red LEDs to be maximized as long as the detection assembly has not reached saturation." Kassim, 16:27-35. For example, **Lisogurski** discloses the "system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio." Lisogurski, 9:46-60. For example, **Valencell** teaches "the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight." Valencell, [0123].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide the benefit of increasing a signal-to-noise ratio of the measure signal.

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Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Three Wavelength References: For example, charted reference **Basu**, as well as numerous other references such as **Lisogurski**, **Lamego**, **LeBoeuf**, **Poeze**, and **Valencell** all include teachings related to physiological measurement systems. These references provide numerous methods for using three optical wavelengths for measuring at least a portion of the one or more of the physiological parameters and using one of said wavelengths to improve measurement of at least one of the one or more physiological parameters using the output signal corresponding to the other two optical wavelengths. For example, **Lisogurski** discloses that its light source "emit photonic signals having one or more wavelength of light" and "include any number of light sources with any suitable characteristics." Lisogurski, 10:48-60, 10:65-11:6, 17:17-39. For example, **Basu** teaches "three LEDs 14, 14′, and 15 may all emit different wavelengths. LEDs 15, and 14, for example, may emit light in the red and IR spectrum, respectively, while LED 14′ may emit light at a wavelength at which the presence of falsifying components can be detected." Basu, [0109]. For example, **Lamego** teaches a multiwavelength physiological monitor "utiliz[ing] at least three different wavelengths of light . . . to determine blood oxygen saturation," and that "adding wave lengths sensitive to additional significant absorbers can help the system compensate for the additional significant absorbers and enable more accurate calculation of the concentration of each absorber and the blood oxygen saturation." Lamego, [0033], [0035]; *see also* Lamego [0034], [0036]-[0037], [0041]. For example, **LeBoeuf** teaches"[t]he optical detectors 26 and emitters 24 may be of multiple wavelengths, with the goal

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of providing specialized physiological information for each wavelength. Referring to FIG. 19, for example, violet or UV light may be used to measure motion-related aspects of the ear, as violet and UV light may not penetrate greatly through the skin of the ear. Green, red, and IR wavelengths may have deeper penetration and provide information on the blood vessels and blood analyte levels. Blue wavelengths may be particularly useful for gauging changes in the size of the blood vessels." LeBoeuf, [0153]; *see also* LeBouef, [0163]. For example, **Poeze** teaches "the emitter 504 of the data collection device 112 can emit, in certain embodiments, combinations of optical radiation in various bands of interest. For example, in some embodiments, for analytes like glucose, the emitter 504 can emit optical radiation at three (3) or more wavelengths between about 1600 nm to about 1700 nm. In particular, the emitter 504 can emit optical radiation at or about 1610 nm, about 1640 nm, and about 1665 nm. In some circumstances, the use of three wavelengths within about 1600 nm to about 1700 nm enable sufficient SNRs of about 100 dB, which can result in a measurement accuracy of about 20 mg/dL or better for analytes like glucose." Poeze, [0109]; *see also* Poeze, [0108], [0110]-[0116]. For example, **Valencell** teaches "collecting light at different wavelengths, and processing these signals collectively, can be used to generate assessments of blood gas levels, such as blood oxygen (SpO2) and carbon dioxide (SpCO2), blood hemoglobin types and levels, or other blood constituents and their respective concentration levels. Multiple wavelengths may be generated by a signal multiwavelength optical emitter, multiple optical emitters, optically filtered optical emitters, or the like. In such case, multiple optical emitters 102 may be located between the two optical filters 715." Valencell, [0130].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide the benefit of increased accuracy in measuring physiological

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parameters. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Six LED References: For example, charted reference **Lamego**, as well as numerous other references such as **LeBoeuf**, **Lisogurski**, and **Pologe** all include teachings related to physiological measurement systems. These references provide numerous means for utilizing a plurality of semiconductor sources comprising six light emitting diodes. For example, **Lamego** teaches a multiwavelength physiological monitor "includ[ing] . . . six . . . LEDs of different wavelengths," and that "adding wave lengths sensitive to additional significant absorbers can help the system compensate for the additional significant absorbers and enable more accurate calculation of the concentration of each absorber and the blood oxygen saturation." Lamego, [0041], [0035]; *see also* Lamego [0033]-[0034], [0036]-[0037]. For example, **LeBoeuf** teaches utilizing "multiple light emitters… of different wavelengths." LeBoeuf, [0163]. For example, **Lisogurski** teaches "that light source 130 may include any number of light sources with any suitable characteristics," and that light source 130 ma include LEDs. Lisogurski, 10:42-11:8. For example, **Pologe** teaches a "main test unit 12 includes: an emitter module 18 having a plurality of emitters 20," and that the "emitters 20 may include…light emitting diodes (LEDs)." Pologe, 4:63-65, 5:16-20.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide the benefit of increased accuracy in measuring physiological parameters. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been

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motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Smartphone/Tablet References: For example, charted reference **Basu**, as well as numerous other references such as **Kassim**, **Kreger**, **Lisogurski**, **Tran**, all include teachings related to physiological measurement systems. These references provide numerous means for a physiological monitoring system to be configured for use with a smart phone or tablet. For example, **Basu** teaches "health ring 44 which can monitor heart rate on a 24 hour basis," and that "combines the sensor with a…wireless transmitter linked to an application running on the user's cell phone." Basu, [0065]-[0066]. For example, **Kassim** teaches "[t]he optical measurement device 300 further comprises a coupling member 316 that can provide coupling between the measurement device 300 to a personal mobile processing device/feedback unit (not shown) in a cableless configuration," and that "the feedback unit may be a portable device, such as a mobile phone, smartphone, personal digital assistant (PDA), tablet, netbook or laptop, although this list is not exhaustive by any means." Kassim, 12:5-14. For example, **Kreger** teaches a "biosensor interface apparatus for use with a mobile communication device 10," that "can be any of a number of mobile phones such as an iPhone® or an Android® phone, a personal digital assistant (PDA) such as a Blackberry®, a portable audio playback device such as an MP3 player, a portable media playback device such as an iPod®, or a handheld tablet such as an iPad®." Kreger, 5:40-53; *see also* Kreger, 7:39-46. For example, **Lisogurski** teaches a "monitor [that] may be powered by a battery" with a "[u]ser interface [which] may include user input 182, display 184, and speaker 186. User input 182 may include any type of user input device such as a keyboard, a mouse, a touch screen, buttons, switches, a microphone, a joy stick, a touch pad, or any other suitable input device." Lisogurski, 15:19-23, 18:65-67. For example, **Mault** teaches a blood glucose monitoring

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system including an electronic device that "can be a portable electronic device or system carried by the person, or a device or system combining multiple functionalities, such as:…a portable computer; any portable Internet access device; [or] a wireless phone…." Mault [0069]-[0070]. For example, **Poeze** teaches "a personal health organizer software module 132 executed on a general purpose computing device 126, with the computing device 126 coupled with the health data collection device 112 via a communications link 128," where the "personal health organizer module 132 can be an executable program on an operating system of a device such as a mobile phone, a personal digital assistant, a portable music player, an electronic book reader, a netbook, a TV media center, and a laptop or desktop computer. For example, the personal health organizer module 132 can be an application that is executed on the operating system of a mobile phone such as the iPhone manufactured by Apple, Inc., a Blackberry device manufactured by Research In Motion, Inc., the Pre manufactured by Palm, Inc, or a mobile device manufactured by HTC, Nokia, or Motorola, etc." Poeze, [0034]; *see also* Poeze [0010]. **Tran** teaches that while a patient with a wearable device is outside a mesh network range, "the wearable appliance communicates with the cell phone and provides information to the server 200 using the cellular connection." Tran, 34:4-30.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide the benefit of more processing power and more convenient means to flag emergency situations. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other

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references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Synchronize Light Source/Detector References: For example, charted reference **Carlson**, as well as numerous other references such as **Jung**, **Lamego**, **Lisogurski**, and **Poeze** all include teachings related to physiological measurement systems. These references provide numerous methods for utilizing a detection system that is configured to be synchronized to the light source. For example, **Carlson** teaches using "AC-Coupling or Lock-In Amplification (synchronous detection), is to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range where environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent." Carlson, [0064]-[0065]; *see also* Carlson, [0011]-[0020], [0018]-[0020], [0027]. For example, **Jung** discloses a spectrometer system were "three monochrome sources, however, are turned on and off rapidly, synchronous with the spectral measurements being taken at, for example, a rate of 1000 Hz." Jung, 68:13-33. For example, **Lamego** teaches a "digital-to-analog conversion circuit 338" that includes "a synchronizing latch 323" which "accepts the synchronizing pulses which maintain synchronization between the activation of emitters 302 and the analog to digital conversion circuit 332." Lamego, [0044]-[0045]; *see also* Lamego [0050]-[0051], [0069]. For example, **Lisogurski** teaches "light drive circuitry 120 may generate a light drive signal, which may be used to turn on and off the light source 130, based on the timing control signals. The front end processing circuitry 150 may use the timing control signals to operate synchronously with light drive circuitry 120." Lisogurski, 11:41-12:9; *see also* Lisogurski, 12:52-13:6 9 ("The peaks of detector current waveform 214 may be synchronous with light 'on' periods driving one or more emitters of a light source, such as light

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Source 130 of FIG. 1."). For example, **Poeze** teaches a "data collection device 112" including "a driver 520 that drives the emitter 504," wherein "[t]he driver 520 can be synchronized with other parts of the sensor 116 and can minimize or reduce jitter in the timing of pulses of optical radiation emitted from the emitter 504." Poeze, [0116]-[0117].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods and systems provide increased accuracy for monitoring physiological parameters. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

Arc References: For example, charted reference **Isaacson**, as well as numerous other references such as **Jung**, and **LeBoeuf** all include teachings related to physiological measurement systems. These references provide numerous methods for utilizing a plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs. For example, **Isaacson** teaches emitters 10, 20 and detectors 12, 22 disposed on an arc. Isaacson, 4:64-5:9, Fig. 1. For example, **Jung** teaches "a fiber optic arrangement presented at the forward end of probe tip 1" which "utilizes a single central light source fiber optic…and a plurality of perimeter light receiver fiber optics, denoted as light receivers R1, R2 and R3." Jung, 11:21-50, Fig. 2; *see also* Jung 24:39-48, 24:39-62, 32:66-33:9, 39:41-40:14, Figs. 9, 10A-B, 20, 28A-B. For example, **LeBoeuf** teaches optical emitters 24 and optical detectors 26 configured in an arc. LeBoeuf, [0123]-[1024], Fig. 8B

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A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that concern physiological monitoring. These methods provide the benefit of better acquisition of signals from the samples. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of more accurate and efficient physiological monitoring.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix E with any other reference or references listed in Appendix E along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the ’455 Patent.

For example, and without limitation, the Asserted Claims of the ’455 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Lens References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Lens References all of which relate to systems and methods for physiological monitoring. Each of references **Carlson**, **LeBoeuf**, **Poeze**, **Pologe**, and **Valencell** relate to physiological monitoring systems utilizing lenses. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Lens References provide means—not necessarily expressly present in all other references—for a wearable device comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens

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output light to tissue. A POSITA would have understood that the systems and methods for Lens References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for wearable device comprising one or more lenses configured to receive at least a portion of the output optical light and to deliver a lens output light to tissue provide improvements such as focusing output optical light to increase the intensity of the light transmitted to the wearer's tissue thereby reducing the light source's power consumption, reducing the detrimental effects of ambient light, reducing the loss of energy due to scattered light, and increasing signal-to-noise ratio. *E.g.*, Carlson, [0014] (lens system "increase[s] the optical signal power, detected by the pulsoximeter sensor, and thus increase[s] the Signal/Noise-and signal/Background ratio."); LeBoeuf, [0114] ("Lenses 29L are configured to focus inspection light 111 onto a particular region of the ear."). Valencell, [0017] ("The first lens focuses light emitted by the optical emitter…."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement systems would commonly be combined with lens systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of including basic optical components, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Light Intensity References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Light Intensity References all of which relate to systems and methods for physiological

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monitoring. Each of references **Basu, Kassim**, **Lisogurski**, and **Valencell** relate to physiological monitoring systems that utilize increased light intensity of their emitters to increase signal-to-noise ratio of their detection signal. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Light Intensity References provide means—not necessarily expressly present in all other references—for improving signal-to-noise ratio by increasing the intensity of light sources. A POSITA would have understood that the systems and methods for Light Intensity References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for improving signal-to-noise ratio by increasing the intensity of light sources provide improvements such as increasing the accuracy of measured physiological parameters. *E.g.*, Basu, [0058] ("To maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector."); Kassim, 16:27-35 ("[T]he effects of ambient light signals 30 can be reduced as much as possible by tuning the intensities of the IR and Red LEDs to be maximized as long as the detection assembly has not reached saturation."), Lisogurski 9:46-60 ("[S]ystem may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio."); Valencell, [0123] ("[T]he intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurements systems would commonly be combined with circuity coupled to light sources that allow for the control of the light source's parameters, such as light intensity, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of allowing for the variability of light source parameters to wearable measurement devices that were

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ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Three Wavelength References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Three Wavelength References all of which relate to systems and methods for physiological monitoring. Each of references **Basu**, **Lamego**, **LeBoeuf**, **Poeze**, and **Valencell** relate to physiological monitoring systems utilizing three wavelengths and using one of said wavelengths to improve measurement of at least one of the one or more physiological parameters using the output signal corresponding to the other two optical wavelengths. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Three Wavelength References provide means—not necessarily expressly present in all other references—for using three optical wavelengths for measuring at least a portion of the one or more of the physiological parameters or using one of said wavelengths to improve measurement of at least one of the one or more physiological parameters using the output signal corresponding to the other two optical wavelengths. A POSITA would have understood that the systems and methods for Three Wavelength References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for utilizing three optical wavelengths provide improvements such as the ability to target different physiological absorbers according to their wavelength sensitivity and therefore providing for more accurate measurements. *E.g.*, Basu, [0109] ("It is known that certain factors may render pulse oximetry unreliable because the presence of other components (e.g. methemoglobin or carboxyhemoglobin) in the blood may

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mimic the absorption of oxyhemoglobin at the IR LED frequency so that the reading is falsified. Such errors can be minimized by adding a third LED emitting light of a wavelength at which the component shows a different behavior than oxyhemoglobin and reduced hemoglobin."); Lamego, [0035] ("[A]dding wave lengths sensitive to additional significant absorbers can help the system compensate for the additional significant absorbers and enable more accurate calculation of the concentration of each absorber and the blood oxygen saturation."); Poeze, [0109] ("[T]he use of three wavelengths within about 1600 nm to about 1700 nm enable sufficient SNRs of about 100 dB, which can result in a measurement accuracy of about 20 mg/dL or better for analytes like glucose."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for multiwavelength emitters would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of the variability of light source parameters, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iv) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Six LED References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Six LED References all of which relate to systems and methods for physiological monitoring. Each of references **Lamego**, **LeBoeuf**, **Lisogurski**, and **Pologe** relate to physiological monitoring systems using multiple LEDs as emitters. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Six LED References

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provide means—not necessarily expressly present in all other references—for utilizing six LED optical emitters in a light source. A POSITA would have understood that the systems and methods for Six LED References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for utilizing six LEDs provide improvements such as the ability to target different physiological absorbers according to their wavelength sensitivity and therefore providing for more accurate measurements, increasing intensity of optical output light, and reducing the detrimental effects on ambient light. *E.g.*, Lamego, [0035] ("[A]dding wave lengths sensitive to additional significant absorbers can help the system compensate for the additional significant absorbers and enable more accurate calculation of the concentration of each absorber and the blood oxygen saturation."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical physiological measurement would commonly be combined with multiple LED emitters and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for increasing the number of optical emitters in a light to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(v) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Smartphone/Tablet References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Smartphone/Tablet References all of which relate to systems and methods for physiological monitoring. Each of references **Basu**, **Kassim**, **Kreger**, **Lisogurski**, **Mault**, **Poeze**, and **Tran**

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relate to physiological monitoring systems for use with a smartphone or tablet. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Smartphone/Tablet References provide means—not necessarily expressly present in all other references—for a physiological monitoring system to communicate with a smartphone or tablet. A POSITA would have understood that the systems and methods for Smartphone/Tablet References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for connectivity to smartphones or tablets provide improvements improving the analysis capabilities of measurement systems due to the increased processing power of smartphones and tablets and the additional resources provided by their ability to connect to wireless and cell networks. *E.g.*, Basu, [0066] (physiological monitoring system "combines the sensor with a…wireless transmitter linked to an application running on the user's cell phone."); Kreger, 13:1-3 ("Mobile device smart phone 444 may derive measurements, display plots, transmit medical records of biosensor data, and so forth."); Tran, 34:4-40 ("If the wearable appliance detects a cellphone that is mesh network compatible, the wearable appliance communicates with the cell phone and provides information to the server 200 using the cellular connection."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical physiological measurement would commonly be combined with smartphone and personal computing technology and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques of providing for connectivity to smartphone or personal computing devices in wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve

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simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

References Lisogurski and Basu Combined with Synchronize Light Source/Detector References

A POSITA would have had reason to combine references **Lisogurski** or **Basu**, or any of the references in Appendix E, with any one of Synchronize Light Source/Detector References all of which relate to systems and methods for physiological monitoring. Each of references **Carlson**, **Jung**, **Lamego**, **Lisogurski**, and **Poeze** relate to physiological monitoring systems that synchronize their detection systems to the their light sources. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Synchronize Light Source/Detector References provide means—not necessarily expressly present in all other references—for synchronizing the sampling of a detector to the output of a light source. A POSITA would have understood that the systems and methods for Synchronize Light Source/Detector References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for synchronizing the sampling of a detector to the output of a light source provide improvements such as increased measurement accuracy. *E.g.*, Carlson, [0065] ("AC-Coupling or Lock-In Amplification (synchronous detection), is to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range where environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent."); Lamego, [0045] ("[D]river circuit," including "synchronizing latch 323 [that] accepts the synchronizing pulses which maintain synchronization between the activation of emitters 302 and the analog to digital conversion circuit 332" "is designed to minimize the noise from the emitters 302."); Poeze, [0117] ("The driver 520 can be synchronized with other parts of the sensor 116 and can minimize or reduce jitter in the timing of pulses of

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optical radiation emitted from the emitter 504."). A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement would commonly be combined with detector and light source synchronization, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for varying the collection parameters of a detection system and the output parameters of light source in wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(vi) Lisogurski, Kassim, Chandrasekar2012, Valencell, Mault, and Basu Combined with Arc References

A POSITA would have had reason to combine references **Lisogurski**, **Kassim**, **Chandrasekar2012**, **Valencell**, **Mault**, or **Basu**, or any of the references in Appendix E, with any one of Arc References all of which relate to systems and methods for physiological monitoring. Each of references **Isaacson**, **Jung**, and **LeBoeuf** relate to physiological monitoring systems with their light sources and/or detectors configured in an arc. Indeed, such components and/or processes were conventional as of the time these references were known. Each of Arc References provide means—not necessarily expressly present in all other references—for configuring the detectors and/or emitters of a physiological measurement system in an arc formation. A POSITA would have understood that the systems and methods for Arc References were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for configuring optical detectors and emitters in an arc formation would provide improvements such as increased measurement accuracy due to lessening the negative effects of light scattering and accounting for the contours of the tissue sample that is being measured. A

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POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for optical measurement would commonly be combined detectors and emitters in an arc formation, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for varying the spatial configurations of emitters and detectors in wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits E1 through E18 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-E, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the Lens References, Light Intensity References, Three Wavelength References, Six LED References, Smartphone/Tablet References, Synchronize Light Source/Detector References, and/or Arc References for the reasons discussed above.

6. U.S. Patent No. 12,193,790

Pursuant to P.R. 3-3(a) and (b), Defendants identify in Appendix F the prior art references that render obvious the Asserted Claims of the '790 Patent and include below exemplary combinations showing the obviousness of the '790 Patent Asserted Claims in view of the prior art. To the extent Plaintiff contends that an element is not disclosed in any one of the anticipatory references described in Appendix F, the limitation would have been obvious in light of the disclosures within the reference and the knowledge of one of ordinary skill in the art at the time of the '790 Patent. Moreover, to the extent Plaintiff contends that an element is not disclosed in any

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one of the anticipatory references described in Appendix F, such reference may be combined with any other references listed in Appendix F for such element, thereby rendering the claims invalid for obviousness. To the extent a finder of fact determines that a limitation of any of the '790 Patent Asserted Claims is not disclosed by one of the references identified above pursuant to P.R. 3-3(a), the claim is nevertheless unpatentable as obvious because they contain nothing that constitutes a patentable innovation. To the extent a finder of fact determines that a limitation of the '790 Patent Asserted Claims is not anticipated, it does not go beyond combining familiar elements according to known methods to achieve predictable results or does more than choose between clear alternatives known to those of ordinary skill in the art.

a. Obviousness Rationale and Motivations to Combine

Obviousness: For at least the reasons described in these contentions, it would have been obvious to one of ordinary skill in the art to combine any of a number of prior art references, including any combination of those prior art references identified in Appendix F along with the knowledge of one of ordinary skill in the art to meet the limitations of the '790 Patent Asserted Claims. As a result, the references identified herein render one or more Asserted Claims of the '790 Patent obvious when the references are read in combination with each other, and/or when read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of Omni's Asserted Claims. Defendants may rely upon a subset of the identified references or all of the references identified herein, including all references in Appendix F, for purposes of obviousness depending on the Court's claim construction, positions taken by Omni during this litigation, and further investigation and discovery.

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Reservation of Rights: Moreover, as mentioned above, Defendants have not yet completed their search or discovery concerning additional prior art. As such, Defendants' inclusion of exemplary combinations does not preclude them from identifying other invalidating combinations as appropriate, and Defendants reserve the right to identify additional specific combinations as well as to detail and explain such combinations.

No More Than Ordinary Variations of Prior Art; No Unexpected Results: To the extent not anticipated, the '790 Patent Asserted Claims represent no more than the result of ordinary variations of the prior art. Defendants further believe that no showing of a specific motivation to combine prior art is required to combine the references disclosed above and in the attached charts, as each combination of art would have no unexpected results, and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415-16 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1058 (Fed. Cir. 2016); *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017). Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420-21. Nevertheless, in addition to the information contained elsewhere in these contentions, Defendants identify motivation and reason to combine the cited art.

Predictable Results; Obvious to Try: One or more combinations of the prior art references identified in Appendix F would have been obvious because these references would have been combined using: known methods to yield predictable results; known techniques in the same

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way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. Further, the combinations of the prior art references identified in Appendix F would have been obvious because the combinations represent known potential options with a reasonable expectation of success.

Interrelated Teachings: Additional evidence that there would have been a motivation to combine the prior art references identified above includes the interrelated teachings of multiple prior art references; common authorship; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the '790 Patent Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge that would have been possessed by a person having ordinary skill in the art.

Summary of Motivations to Combine: Thus, the motivation to combine the teachings of the prior art references disclosed in Appendix F is found in the references themselves and also in: (1) the nature of the problem being solved; (2) the express, implied and inherent teachings of the prior art; (3) the knowledge of persons of ordinary skill in the art; (4) the predictable results obtained in combining the different elements of the prior art; (5) the predictable results obtained in simple substitution of one known element for another; (6) the use of a known technique to improve similar devices, methods, or products in the same way; (7) the predictable results obtained in applying a known technique to a known device, method, or product ready for improvement; (8)

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the finite number of identified predictable solutions that had a reasonable expectation of success; and (9) known work in various technological fields that could be applied to the same or different technological fields based on design incentives or other market forces.

Same Area of Technology: Additionally, it would be obvious to one of ordinary skill in the art to consult and/or combine any of the prior art listed in Appendix F because all of these references relate to the same area of technology and/or are from analogous art. The '790 Patent Asserted Claims are directed to "An optical system comprises a wearable device for measuring one or more physiological parameters." '790 Patent at Abstract. The '790 Patent Asserted Claims merely unite old elements, well known in the field, with no change in their respective function or result. Given the interrelated teachings of the prior art, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art, it would have been obvious for one of ordinary skill in the art to combine these familiar elements, disclosed and/or embodied in the prior art listed above to practice the '790 Patent Asserted Claims.

Same Technical Issues: A person of ordinary skill would have been motivated to combine the above prior art based on his/her knowledge, the nature of the problem to be solved, and the teachings of the prior art. The identified prior art addresses the same or similar technical issues and suggests the same or similar solutions to those issues. Moreover, some of the prior art refer to or discuss other prior art, illustrating the close technical relationship among the prior art. For the '790 Patent, one of ordinary skill in the art would have been motivated to combine known prior art solutions described in these references relating to wearable devices measuring physiological parameters.

Demand and Market Forces: For example, market forces suggested a demand for

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wearable devices measuring physiological parameters, and thus one of skill in the art would have thought to combine or modify references that described known methods that one of skill in the art would have recognized as offering improvements to solutions of that time.

Known Elements; Obvious to Try: Moreover, many of the claim elements were already known as admitted by the applicant in the patent specification. These elements represented design choices available to a person of ordinary skill. When there is a design need or market pressure to solve a problem such as identified previously and/or described in the '790 Patent, and there are a finite number of identified, predictable solutions, a person of ordinary skill would be motivated to combine the known options that are within his or her technical grasp. For the '790 Patent, there are a finite number of approaches for providing a wearable device for measuring physiological parameters. For example, as of the priority date of the '790 Patent, a POSITA would have been very familiar with basic elements of the '790 Patent's claims such as semiconductors diodes, optical wavelengths, lenses, signal-to-noise ratio, detectors, and analog to digital convertors. Such elements were within the knowledge of a POSITA, whether or not disclosed in any particular reference, and the inclusion of such elements in the '790 Patent's claims does not render them novel or non-obvious.

There are significant similarities in subject matter and objectives for each of many references used in these contentions for the '790 Patent.

References disclosing lenses: For example, charted reference Carlson, Poeze, and Soller, as well as numerous other references such as LeBoeuf and Park, all include teachings related to using one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue. These references provide numerous methods for using lenses to direct an optical output beam. For example, Carlson teaches "us[ing] a beam-shaping

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element, such as e.g. diffractive or refractive lenses, to direct the emitted optical radiation of, e.g., the LED light source into the human or animal tissue and the photon detecting element in order to increase the optical signal power, detected by the pulsoximeter sensor, and thus increasing the Signal/Noise—and signal/Background ratio. The increase of the S/B ratio is estimated e.g. to a factor 5." Carlson at [0014]. Poeze teaches "[using] a lens which collects attenuated light exiting the measurement site and focuses onto one or more detectors. The protrusion can advantageously include plastic, including a hard opaque plastic, such as a black or other colored plastic, helpful in reducing light noise." Poeze at 7:52-8:7. Soller teaches "a variety of different collimating elements 56 can be used in sensor 10. Exemplary collimating elements include fiber faceplates (e.g., fiber optic windows), collimating hole devices, gradient index (GRIN) lenses, fiber bundles, lens arrays, optical windows (including shaped optical windows), and other similar devices." Soller at 18:37-56.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with using lenses to direct an optical output beam. These methods are known to be effective in directing an optical output beam using known lens structures. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of directing an optical output beam.

References disclosing techniques for increasing signal-to-noise ratio: For example, charted reference Basu, Lisogurski, and Carlson, as well as numerous other references such as LeBoeuf and Park, all include teachings related to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. These

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references provide numerous methods for increasing a light intensity and increasing a pulse rate of an LED. For example, Basu teaches that "[t]o maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible without saturating the detector. In the OPS 10, the LED intensity and modulation frequencies are programmable through the serial interface. In the case of the Vishay VCNL4000, the intensity is programmable from 10-200 mA in 10 mA increments." Basu at [0058]. Lisogurski teaches "that modulation of the light drive signal . . . may include modulation of parameters including drive current or light brightness, duty cycle, firing rate, modulation parameters, other suitable parameters, or any combination thereof" and that "[t]he system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio." Lisogurski at 27:44-55, 9:46-60. Carlson teaches that the "frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which, according to FIG. 7b, is in the range of above approximately 1000 Hz. Thus, the pulsoximeter signals are readily discriminated from electronic and parasitic contributions of environmental optical radiation outside the frequency fc+/−5 Hz increasing significantly the Signal-to-Noise and Signal-to-Background ratio." Carlson at [0069]. LeBoeuf teaches that "the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight" and that "it is important to consider the emitter pulsing frequency and sampling approach" because "choosing a frequency that is too low may result in unsatisfactory subtraction." LeBoeuf at [0123], [0139]. Park teaches that "the light source intensity may be increased to maintain the output signal from the light detector within a desired range of output values." Park at 16:8-20.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with improving signal-to-noise

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ratio in optical measurement systems. These methods are known to be effective in improving the signal-to-noise ratio for such systems, and merely modulate the functioning of the existing LEDs in each system. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of improving signal-to-noise ratio.

References disclosing an analog to digital converter: For example, charted reference Basu, Goodman, Lisogurski, Rulkov, Moon, Poeze, Chandrasekar, Al-Ali, Kreger, and Sakai all include teachings related to an analog to digital converter. These references provide numerous methods for using an analog to digital converter coupled to a detector. For example, Basu discloses "a digital interface for communication with a microcontroller." Basu at [0007]. Goodman discloses "On board analog-to-digital converter A/D 44 (10 bit, 5 channel input) is used to convert the conditioned PPG signals at B and B′ into time sampled digital signals which are then provided to processing device 14. Goodman at 11:66-12:21. Lisogurski discloses a "[f]ront end processing circuitry 150 may perform various analog and digital processing of the detector signal." Lisogurski at 12:42-51. Rulkov discloses that "The microprocessor741 has a LED control715 connected to DAC702 for controlling the intensity of the LEDs737. The signal from the photodetector736 is transmitted to a high pass filter (HPF) 703 which sends it to an analog to digital converter704, and the signal from the photodetector737 is also sent directly to a second analog to digital converter704." Rulkov at 11:39-60. Moon discloses that "[a] filter removes any high-frequency noise (e.g. 60 Hz electrical noise) that is not related to the PPG waveform, and yields a preliminary waveform that is digitized with an analog-to-digital converter 176, and processed as described above to generate a DC portion of the PPG." Moon at [0091]. Poeze discloses "[f]ront-end

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interfaces 108 may be implemented using transimpedance amplifiers that are coupled to analog to digital converters in a sigma delta converter." Poeze at 40:15-27. Chandrasekar discloses "In principle, PPGs are considered simple devices; however, in practice, implementation requires a careful design involving optics (multiple paths, alignments, leakage barriers) and mixed signal electronics (transimpedance amplifiers, analog digital conversion, drivers, modulators, filters)." Chandrasekar at 1. Kreger discloses "Biosensor signals may also be received by one or more RF receivers in the dock 246 (not shown) and communicated to the mobile 212 via wired electrical connector 246, for example, to allow the wireless sensor to utilize the features of the wired audio input's anti-alias filters and analog to digital converter as will be explained in detail below." Kreger at 10:14-28. Sakai discloses "A/D converter 2013 d which converts a voltage value of analog signal into 10-bit digital value." Al-Ali discloses "As shown in FIG. 2, the processor board 250 includes a front end signal conditioner 252, an analog-to-digital (A/D) converter 253, a digital signal processor (DSP) 258, a memory reader 256, emitter drivers 254 and digital-to-analog (D/A) converters 255." Al-Ai at [0045].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with incorporating an analog to digital converter into optical measurement systems. These methods are known to be effective in incorporating an analog to digital converter into such systems. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of signal processing.

References disclosing spatially separated detectors: For example, charted references

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Lisogurski, Poeze, Soller, and Terumoto, all include teachings related to using detectors that are spatially separated. These references provide numerous methods for using light detectors. For example, Lisogurski teaches that "[o]ne or more detector 318 may also be provided in sensor unit 312 for detecting the light that is reflected by or has traveled through the subject's tissue. Any suitable configuration of light source 316 and detector 318 may be used. In an embodiment, sensor unit 312 may include multiple light sources and detectors, which may be spaced apart." Lisogurski at 17:35-45. Poeze discloses that "multiple detectors are employed and arranged in a spatial geometry. This spatial geometry provides a diversity of path lengths among at least some of the detectors and allows for multiple bulk and pulsatile measurements that are robust." Poeze at 9:18-27. Soller discloses "a plurality of spectral detectors attached to the circuit board, each spectral detector being configured to analyze radiation derived from the radiation source" and depicts the detectors as spatially separated. Soller at 3:16-27; Fig. 34. Terumoto discloses "[t]he light sensor portions 101-1 to 101-n are located equally spaced from one another and to go round the armlet type housing 107 same as the fourth to sixth implementations." Terumoto at [0152].

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that detect light. These methods provide using detectors that are spatially separated. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of measuring physiological parameters.

References disclosing detection system is synchronized to the light source: For example, charted reference Lisogurski, Carlson, Poeze, Kreger, and Sakai all include teachings

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related to detection system is synchronized to the light source. These references provide numerous methods for synchronizing detection system with the light source. For example, Lisogurski discloses "he front end processing circuitry 150 may use the timing control signals to operate synchronously with light drive circuitry 120. For example, front end processing circuitry 150 may synchronize the operation of an analog-to-digital converter and a demultiplexer with the light drive signal based on the timing control signals." Lisogurski at 11:33-49. Carlson discloses "[t]he basic idea of using AC-Coupling or Lock-In Amplification (synchronous detection), is to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range where environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent. AC-Coupling or Lock-In Amplification is well known out of the state of the art and is described in literature 3." Carlson at [0065]. Poeze teaches that "[a] control signal can be useful in order to synchronize, minimize, or reduce jitter in the timing of pulses emitted from the emitter 104. Accordingly, this control signal can be useful in order to cause optical radiation pulses emitted from the emitter 104 to follow a precise timing and consistent pattern." Poeze at 15:27-48. Kreger discloses "Thus, it is another object to provide compatible signals to the mobile's electrical connectors which may involve transforming the biosensor signals to match requisite impedance and signal levels, eliminate noise, cancel DC noise and drift, demultiplex or multiplex multiple measurements, provide electrical isolation, serialization, synchronization, and so forth." Kreger at 3:17-23. Sakai discloses "he A/D converter 14 operates in synchronization with the light emission timing of the driver 12, to thereby convert the pulse wave detection signal detected upon light emission from the green LED 11 a and the body motion detection signal detected upon light emission from the infrared LED 11 b into digital data, and provides these digital data, as biological

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information, to the information processor 20." Sakai at 5:66-6:9.

A person of skill in the art would understand that the functionality taught in these references could be added to other methods and systems that are concerned with measuring physiological parameters. These methods are known to be effective in incorporating synchronizing detection system with the light source. Moreover, to the extent that any of these references includes a feature not expressly disclosed in one or more other references, a POSITA would have naturally looked to, and been motivated to combine, any one of these references with one or more of the other references in order to better achieve their common goals of signal processing.

b. Combinations

For at least the reasons described above, it would have been obvious to one of ordinary skill in the art to combine each prior art reference listed in Appendix C with any other reference or references listed in Appendix C along with the knowledge of one of ordinary skill in the art to arrive at the inventions claims in the '790 Patent.

For example, and without limitation, the Asserted Claims of the '790 Patent would have been obvious to one of ordinary skill in the art in view of the following combinations:

(i) Rulkov, Basu, Goodman, Chandersekar, Kassim, Lisogurski, Moon, Terumoto, Al-Ali, Kreger, and Sakai combined with References disclosing lenses

A POSITA would have had reason to combine references Rulkov, Basu, Goodman, Kassim, Lisogurski, Moon, Terumoto, Al-Ali, Kreger, and Sakai with any one of References disclosing lenses, all of which relate to systems and methods for using lenses to direct an optical output beam. Each of References disclosing lenses relate to using one or more lenses configured to receive a portion of at least one of the output optical lights and to direct a lens output light to tissue. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing lenses provide means—not necessarily

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expressly present in all other references—for using lenses to direct an optical output beam. A POSITA would have understood that the systems and methods for References disclosing lenses were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using lenses provide improvements such as disrecting the light to tissue. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for using lenses to direct an optical output beam would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using lenses to direct an optical output beam, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(ii) Kassim, Rulkov, Goodman, Moon, Chandersekar, Poeze, Soller, Terumoto, Al-Ali, Kreger, and Sakai combined with References disclosing techniques for increasing signal-to-noise ratio

A POSITA would have had reason to combine Kassim, Rulkov, Goodman, Moon, Poeze, Soller, Terumoto, Al-Ali, Kreger, and Sakai with any one of References disclosing techniques for increasing signal-to-noise ratio, all of which relate to systems and methods for increasing a light intensity and increasing a pulse rate of an LED. Each of References disclosing techniques for increasing signal-to-noise ratio relate to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing techniques for increasing signal-to-noise ratio

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provide means—not necessarily expressly present in all other references—for increasing signal-to-noise ratio relate to increasing the signal-to-noise ratio of optical measurement systems by increasing a light intensity and increasing a pulse rate of an LED. A POSITA would have understood that the systems and methods for References disclosing techniques for increasing signal-to-noise ratio were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for increasing a light intensity and increasing a pulse rate of an LED provide improvements such as increasing signal-to-noise ratio. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for increasing signal-to-noise ratio would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for increasing signal-to-noise ratio, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iii) Carlson, Kassim, Soller, Chandersekar, and Terumoto combined with References disclosing an analog to digital converter

A POSITA would have had reason to combine references Carlson, Kassim, Soller, and Terumoto with any one of References disclosing an analog to digital converter, all of which relate to systems and methods for using an analog to digital converter coupled to a detector. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing an analog to digital converter provide means—not necessarily expressly present in all other references—for using an analog to digital converter coupled to a detector. A POSITA would have understood that the systems and methods for

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References disclosing an analog to digital converter were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for using an analog to digital converter provide improvements such as ability to process a signal digitally. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for using an analog to digital converter would commonly be combined with optical measurement systems, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using an analog to digital converter, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(iv) Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Al-Ali, Kreger, and Sakai combined with References disclosing spatially separated detectors

A POSITA would have had reason to combine references Carlson, Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Al-Ali, Kreger, and Sakai with any one of References disclosing spatially separated detectors all of which relate to systems and methods for using spatially separated detectors. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing spatially separated detectors provide means—not necessarily expressly present in all other references—for using spatially separated detectors. A POSITA would have understood that the systems and methods for References disclosing spatially separated detectors were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for spatially separated detectors provide improvements such as improved detection quality. A POSITA would further understand that in order to implement a wearable measurement device, the systems and

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methods for measuring physiological parameters would commonly be combined with spatially separated detectors, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for using spatially separated detectors, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

(v) Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Soller, Terumoto, and Al-Ali combined with References disclosing detection system is synchronized to the light source

A POSITA would have had reason to combine references Rulkov, Chandersekar, Basu, Goodman, Kassim, Moon, Soller, Terumoto, and Al-Ali with any one of References disclosing detection system is synchronized to the light source, all of which relate to systems and methods for synchronizing a detection system with a light source. Indeed, such components and/or processes were conventional as of the time these references were known. Each of References disclosing detection system is synchronized to the light source provide means—not necessarily expressly present in all other references—for synchronizing a detection system with a light source. A POSITA would have understood that the systems and methods for References disclosing detection system is synchronized to the light source were intended to be incorporated into wearable measurement devices. A POSITA would understand that systems and methods for synchronizing a detection system with a light source provide improvements such as improved detection. A POSITA would further understand that in order to implement a wearable measurement device, the systems and methods for measuring physiological parameters would commonly be combined with techniques for synchronizing a detection system with a light

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source, and thus a POSITA would have been motivated to combine the teachings of these references. The combination would apply known techniques for synchronizing a detection system with a light source, to wearable measurement devices that were ready for improvement, in order to yield predictable results. The combination would further be "obvious to try," because it would involve simple design choices from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Furthermore, to the extent any limitation of an Asserted Claim is deemed not to be exactly disclosed by an item of prior art, then the claim is rendered obvious by combination of the prior art in Exhibits F1 through F14 standing alone, in combination with the reference(s) in any other claim chart, in combination with any system art identified in Table 2-F, in combination with Applicant's Admitted Prior Art, in view of the knowledge of a person of ordinary skill in the art, and/or in view of the References disclosing lenses, References disclosing techniques for increasing signal-to-noise ratio, References disclosing an analog to digital converter, References disclosing spatially separated detectors, References disclosing detection system is synchronized to the light source, for the reasons discussed above.

V. P.R. 3-3(c) – Claim Charts

Pursuant to Rule 3-3(c), Defendants identify invalidity claim charts identifying disclosures in the references identified in Sections III-IV supra as to the Asserted Claims of the Asserted Patents are provided in attached Appendix A ('868 Patent), Appendix B ('533 Patent), Appendix C ('484 Patent), Appendix D ('304 Patent), Appendix E ('455 Patent), and Appendix F ('790 Patent).

Defendants have identified relevant portions and/or features of the prior art. However, the identified prior art may contain additional descriptions of or alternative support for the claim

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limitations. Defendants may rely on uncited portions or features of the identified prior art, other documents, and expert testimony, to provide context or to aid in understanding the identified prior art and the state of the art. Citations to a particular figure in a reference include the caption and description of the figure and any text relating to the figure. Similarly, citations to particular text referring to a figure include the figure and caption as well. Portions relevant to dependent claims incorporate by reference the citations to the chain of claims from which that dependent claim derives. Likewise, portions related to subsequent limitations that refer to claim elements identified, described, and/or cited to in earlier limitations may rely on the citations related to those portions of the claim chart that identify and/or describe these elements.

Throughout the invalidity claim charts in Appendices A-F, Defendants provide exemplary citations showing where references disclose subject matter recited in preambles of the Asserted Claims, regardless of whether the preambles limit the claims. Defendants reserve the right to argue that the preambles are or are not limitations. Further, where an entry in a claim chart corresponding to a given limitation refers back to the discussion of another claim, the entry incorporates all evidence cited for the other claim.

As noted above, the asserted claims have not yet been construed. Additional portions of the references may become relevant after claim construction. Further, to the extent that any claim term is governed by 35 U.S.C. § 112 ¶ 6, the claim charts identify, by the citations provided, the structure(s), act(s), or material(s) in each reference performing the claimed function for each limitation of the asserted claims. Plaintiffs' claim construction positions, expert analysis and testimony, and additional discovery could all inform which portions of the references disclose a limitation, including under 35 U.S.C. § 112 ¶ 6, and whether any particular limitation is governed by 35 U.S.C. § 112 ¶ 6. Defendants' contentions are based on the information presently available,

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and Defendants reserve all rights to provide their claim construction positions in accordance with the Docket Control Order in this case.

VI. P. R. 3-3(d) – Other Grounds for Invalidity

A. U.S. Patent No. 9,055,868

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '868 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '868 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '868 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '868 Patent Asserted Claims at the time the '868 Patent was filed, at least as plaintiff appears to be asserting those limitations. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to

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those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '868 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '868 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '868 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '868 Patent fail to sufficiently enable the limtiations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '868 Patent fails to sufficiently describe or enable them as required by 35 U.S.C. § 112, ¶ 1:[9]

Term	Relevant Claim(s)
"a software application capable of generating data"	7
"a status of the user"	7
"at least a portion of the status or associated information"	7
"a multiplexer capable of combining the plurality of semiconductor diodes"	8

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted).

[9] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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"Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '868 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '868 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or because they omit elements that one of skill in the art would understand as part of the '868 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Several of the '868 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '868 Patent Asserted Claims are indefinite in whole, in part or in combination:[10]

Term	Relevant Claim(s)
"a part of a user's body comprising blood"	7
"physiological information associated with the user"	7
"wireless data"	7
"voice input signals and manually entered input signals"	7
"at least a portion of the status or associated information"	7

[10] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
"a multiplexer capable of combining the plurality of semiconductor diodes"	8
"generating the input light beam comprising one or more wavelengths"	8
"adapted for use in a diagnostics"	9
"a plurality of associated wavelengths transmitted or reflected from the blood"	9

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

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '533 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '533 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '533 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '533 Patent Asserted Claims at the time the '533 Patent was filed, at least as plaintiff appears to be asserting those limitations.

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Ariad Pharms., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '533 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '533 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '533 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '533 Patent fail to sufficiently enable the limtiations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '533 Patent fails to sufficiently describe or enable them as required by 35 U.S.C. § 112, ¶ 1:[11]

Term	Relevant Claim(s)
"the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths"	5
"the processed output signal"	5
"one of more detectors"	11
"to select a fraction of the one or more optical wavelengths"	11

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus.,*

[11] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Inc., 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted). "Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '533 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '533 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or because they omit elements that one of skill in the art would understand as part of the '533 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Several of the '533 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '533 Patent Asserted Claims are indefinite in whole, in part or in combination:[12]

Term	Relevant Claim(s)
"the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths"	5
"the processed output signal"	5
"one of more detectors"	11

[12] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
"to select a fraction of the one or more optical wavelengths"	11

C. U.S. Patent No. 10,517,484

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '484 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '484 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '484 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '484 Patent Asserted Claims at the time the '484 Patent was filed, at least as plaintiff appears to be asserting those limitations. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing

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date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '484 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '484 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '484 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '484 Patent fail to sufficiently enable the limtiations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '484 Patent fails to sufficiently describe or enable them as required by 35 U.S.C. § 112, ¶ 1:[13]

Term	Relevant Claim(s)
"wherein the output signal is indicative of one or more of the physiological parameters"	7-10
"increase the signal-to-noise ratio by comparing the first signal and the second signal"	7-10
"a property of at least some of the output signal is compared by at least one of the wearable device, the smart phone or tablet to a threshold"	8-10
"wherein the wearable device is at least in part configured to identify an object"	8-10
"wherein the wearable device is configured to use artificial intelligence to process at least a portion of the output signal"	10

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus.,*

[13] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Inc., 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted). "Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '484 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '484 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or because they omit elements that one of skill in the art would understand as part of the '484 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Several of the '484 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '484 Patent Asserted Claims are indefinite in whole, in part or in combination:[14]

Term	Relevant Claim(s)
"spatially separated detectors"	7-10
"increase the signal-to-noise ratio by comparing the first signal and the second signal"	7-10

[14] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
"wherein the detection system is configured to be synchronized to the light source"	7-10
"a cloud configured to receive over the wireless transmission link an output status"	7-10
"wherein the wearable device is at least in part configured to identify an object"	8-10
"gain configured to improve detection sensitivity"	9-10
"wherein the wearable device is configured to use artificial intelligence"	10

D. U.S. Patent No. 10,874,304

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '304 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '304 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '304 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '304 Patent Asserted Claims

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at the time the '304 Patent was filed, at least as plaintiff appears to be asserting those limitations. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '304 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '304 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '304 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '304 Patent fail to sufficiently enable the limitations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '304 Patent fails to sufficiently describe or enable them as required by 35 U.S.C. § 112, ¶ 1:[15]

Term	Relevant Claim(s)
a cloud configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data, and wherein the cloud is capable of storing a history of at least a portion of the received output status over a specified period of time.	11
the light source configured to increase signal-to-noise ratio by increasing a light intensity relative to an initial light intensity from at least one of the plurality of semiconductor sources	11
wherein the measurement system is further configured to improve the signal-to-noise ratio by differencing the first signal and the second signal	11

[15] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
wherein the light source is configured to further increase the signal-to-noise ratio by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate	13
the receiver comprises a plurality of detectors arranged along a first arc, and wherein the plurality of semiconductor sources are arranged along a second arc that is offset from the first arc.	15, 21
wherein the first arc and the second arc are concentric	16, 22
the measurement device further configured to improve a signal-to-noise ratio of the input optical beam reflected from the tissue by: differencing the first signal and the second signal, and increasing the light intensity relative to the initial light intensity from at least one of the semiconductor sources	19
a measurement device including a light source comprising a plurality of semiconductor sources for measuring one or more physiological parameters	19
wherein the light source is configured to further improve the signal-to-noise ratio of the input optical beam reflected from the tissue by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate	20

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted). "Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '304 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '304 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or

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because they omit elements that one of skill in the art would understand as part of the '304 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc*., 572 U.S. 898, 901 (2014). Several of the '304 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '304 Patent Asserted Claims are indefinite in whole, in part or in combination:[16]

Term	Relevant Claim(s)
a receiver configured to: … synchronize to the light source	11
the light source configured to increase signal-to-noise ratio by increasing a light intensity relative to an initial light intensity from at least one of the plurality of semiconductor sources	11
wherein the measurement system is at least in part configured for selection or identification of an object	12
wherein the measurement system is configured to use artificial intelligence in making decisions	12
wherein the light source is configured to further increase the signal-to-noise ratio by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate	13
the receiver comprises a plurality of detectors arranged along a first arc, and wherein the plurality of semiconductor sources are arranged along a second arc that is offset from the first arc.	15, 21
wherein the first arc and the second arc are concentric	16, 22
a receiver configured to: … synchronize to the modulation of the at least one of the semiconductor sources	19
the measurement device further configured to improve a signal-to-noise ratio of the input optical beam reflected from the tissue by:	19

[16] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
differencing the first signal and the second signal, and increasing the light intensity relative to the initial light intensity from at least one of the semiconductor sources	
wherein the light source is configured to further improve the signal-to-noise ratio of the input optical beam reflected from the tissue by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate	20

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

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '455 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '455 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '455 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '455 Patent Asserted Claims at the time the '455 Patent was filed, at least as plaintiff appears to be asserting those limitations.

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Ariad Pharms., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '455 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '455 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '455 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '455 Patent fail to sufficiently enable the limtiations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '455 Patent fails to sufficiently describe or enable them as required by 35 U.S.C. § 112, ¶ 1:[17]

Term	Relevant Claim(s)
A system for measuring one or more physiological parameters	1, 8, 15
the processed output signal	1, 8, 15
wherein the output signal is indicative of one or more of the physiological parameters	1, 8, 15
the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the [plurality of] semiconductor sources from an initial light intensity	1, 8, 15
increase the signal-to-noise ratio by comparing the first signal and the second signal	1, 8, 15
at least a portion of the one or more of the physiological parameters	1, 10
the plurality of semiconductor sources configured to generate an output optical light having a plurality of optical wavelengths	1

[17] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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Term	Relevant Claim(s)
the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs	2, 9, 15
the light emitting diodes configured to generate an output optical light having one or more optical wavelengths	8, 15

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted). "Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '455 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '455 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or because they omit elements that one of skill in the art would understand as part of the '455 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Several of the '455 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art

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about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '455 Patent Asserted Claims are indefinite in whole, in part or in combination:[18]

Term	Relevant Claim(s)
spatially separated detectors	1, 2, 8, 9, 15
a plurality of detectors that are spatially separated from each other	1, 8, 15
wherein the detection system is configured to be synchronized to the light source	1, 8, 15
increase the signal-to-noise ratio by comparing the first signal and the second signal	1, 8, 15
the plurality of semiconductor sources configured to generate an output optical light having a plurality of optical wavelengths	1
the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the semiconductor sources from an initial light intensity	1
the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs	2, 9, 15
the light emitting diodes configured to generate an output optical light having one or more optical wavelengths	8, 15

F. U.S. Patent No. 12,193,790

Pursuant to Rule 3-3(d), Defendants hereby identify grounds of invalidity for the '790 Patent based on lack of written description under 35 U.S.C. § 112, first paragraph; lack of enablement under 35 U.S.C. § 112, first paragraph; indefiniteness under 35 U.S.C. § 112, second paragraph; and indefiniteness under 35 U.S.C. § 112, sixth paragraph. These contentions shall not be construed as an admission that any claim construction advanced by Defendants in this case is in any way inconsistent, flawed, or erroneous. Nor should these contentions prevent Defendants from advancing claim construction and/or non-infringement positions in lieu of, or in addition to, invalidity positions. Further, these contentions shall not be construed as an admission of or

[18] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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acquiescence to Plaintiff's purported construction of the claim language or of other positions advanced by Plaintiff during the course of this litigation. Defendants' invalidity contentions under 35 U.S.C. § 112 may depend, in part, on the Court's claim construction, as well as Plaintiff's alleged scope of the '790 Patent Asserted Claims. Consequently, Defendants only identify the issues under 35 U.S.C. § 112 of which they are presently aware.

1. Lack of Written Description and/or Enablement Under 35 U.S.C. § 112, ¶ 1

The '790 Patent does not provide sufficient written description to establish that the inventors were in possession of the alleged inventions recited in the '790 Patent Asserted Claims at the time the '790 Patent was filed, at least as plaintiff appears to be asserting those limitations. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the applicants did not describe their purported inventions in a manner that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* One of ordinary skill in the art would not have understood that the inventors were in possession of the full scope of the claimed apparatus and methods, at least as plaintiff appears to be asserting the claims. For example, the claims of the '790 Patent do not provide sufficient written description of the limitations listed below.

The specification of the '790 Patent also does not enable one of ordinary skill in the art to make and/or use certain recited elements of the '790 Patent Asserted Claims without undue experimentation, at least as plaintiff appears to be asserting those limitations. For example, the claims of the '790 Patent fail to sufficiently enable the limtiations listed below.

To the extent the following limitations are definite (under 35 U.S.C. § 112, ¶ 2), the application that became the '790 Patent fails to sufficiently describe or enable them as required by

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35 U.S.C. § 112, ¶ 1:[19]

Term	Relevant Claim(s)
"a wearable device for measuring one or more physiological parameters"	7
"signal is indicative of one or more of the physiological parameters"	7
"wherein the wearable device is at least in part configured to identify an object"	7

2. Invalidity Under 35 U.S.C. § 112, ¶ 2

"[T]he second paragraph of § 112 contains two requirements: first, the claim must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotation marks and alteration omitted). "Where it would be apparent to one of skill in the art, based on the specification, that the invention set forth in a claim is not what the patentee regarded as his invention," the claim is "invalid under § 112, paragraph 2." *Id.* at 1349. Several of the '790 Patent Asserted Claims are invalid because it would be apparent to one of skill in the art, based on the specification, that the invention set forth in these claims are not what the patentee regarded as his invention, at least as the claims are being asserted by the Plaintiff. *Id.* These claims are invalid under the "applicant regards" prong of § 112 at least because they contain elements that differ from and/or conflict with the '790 Patent's written description of the invention, at least as the claim elements are being asserted by Plaintiff, or because they omit elements that one of skill in the art would understand as part of the '790 Patent's invention based on the specification.

Independently, under § 112, ¶ 2, "a patent is invalid for indefiniteness if its claims, read in

[19] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc*., 572 U.S. 898, 901 (2014). Several of the '790 Patent Asserted Claims are also invalid as indefinite under § 112, ¶ 2 because they fail to inform those skilled in the art about the scope of the invention with reasonable certainty and are indefinite.

The following limitations recited in the '790 Patent Asserted Claims are indefinite in whole, in part or in combination:[20]

Term	Relevant Claim(s)
"a plurality of detectors that are spatially separated from each other"	7
"increase the signal-to-noise ratio by comparing the first signal and the second signal"	7
"wherein the wearable device is at least in part configured to identify an object"	7
"wherein the detection system is configured to be synchronized to the light source"	7

VII. Subject Matter Eligibility

Pursuant to the court's Standing Order Regarding Subject Matter Eligibility Contentions Applicable to All Patent Infringement Cases Assigned to Chief District Judge Rodney Gilstrap ("Order Regarding Eligibility"), Samsung provides the following Eligibility Contentions.

As described below, in Appendices A-F, and in Exhibits A101, B101, C101, D101, E101, and F101 (collectively "Appendix 101"), which are hereby incorporated by reference as if fully set forth herein, Defendants contend that the Asserted Claims of the Asserted Patents are drawn to subject matter that is not patentable under 35 U.S.C. § 101. Pursuant to section (a)(1) of the Order Regarding Eligibility, Appendix 101 contains a chart for each Asserted Patent identifying each

[20] Listed claims also include all Asserted Claims dependent thereon, even if those claims are not individually listed.

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exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. Pursuant to section (a)(2)(A) of the Order Regarding Eligibility the charts of Appendix 101, read in conjunction with the discussion herein and in Appendices A-F, and together with the material described, referenced, or cited in the charts, further provide a description of the indsutry, at the relevant time, in which the Challenged Claims are alleged to be well understood, routine, and conventional, and the factual and legal basis therefor. Further, pursuant to sections (a)(2)(B) and (a)(3) of the Order Regarding Eligibility the charts of Appendix 101, read in conjunction with the discussion herein, and together with the material described, referenced, or cited in the charts, further provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Additionally, pursuant to section (b) of the Order Regarding Eligibility, Defendants are concurrently producing or making available for inspection and copying the materials on which Defendants presently seek to rely for subject-matter eligibility purposes. These prior art references and other materials are cited herein or in Appendices 101, A-F. For the avoidance of doubt, Defendants may rely on the materials identified in Section III, above. Without concession that expert testimony is necessary to resolve the subject matter eligibility of the Asserted Claims, Defendants reserve the right to further rely on expert testimony to be disclosed in accordance with the Docket Control Order. Defendants' search for prior art references, additional documentation, and/or corroborating evidence concerning prior art systems and devices is ongoing. Accordingly, Defendants reserve the right to supplement their production as Defendants obtain additional prior art references, documentation, and/or corroborating evidence concerning subject matter eligibility

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during the course of discovery.

Defendants reserve the right to supplement their document production pursuant to section (b) of the Order Regarding Eligibility as authorized by the Patent Local Rules, the Order Regarding Eligibility, or any other order of the Court.

A. U.S. Patent No. 9,055,868

Each of the Asserted Claims of the '868 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The '868 Patent Asserted Claims are unpatentable for failure to recite patent eligible subject matter.

The '868 Patent Asserted Claims are directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice Corp. Pty. Ltd. v. CLS Bank Intern.*, 573 U.S. 208, 216 (2014). By way of example, the Asserted Claims of the '868 Patent are generally directed to the abstract idea of collecting, processing, and storing light-based physiological data for diagnostics. Although the Asserted Claims recite concrete, tangible components, the specification provides no technical details but instead describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, '868 Patent at Figs. 1, 2, 4, 5 (illustrating exemplary embodiments via generic technology and functional language). This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting, processing, and storing light-based physiological data. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of diagnostic technique. Thus, under *Alice* Step 1, the Asserted Claims of the '868 Patent are directed to one or more ineligible concepts.

Under *Alice* Step 2, the '868 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a "handful of

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generic computer components configured to implement" the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor diodes and the claimed lens system have long been used in optical sensing; touchscreens, location sensors, applications, and wireless transceivers are common in smartphones; and terms like "host," "digital file," and "control logic" represent generic computer components. Optical systems, phone applications, and remote storage are well-known, and their combination follows the general trend toward interconnectivity. *See Chamberlain Grp., Inc. v. Techtronic Indus. Co.*, 935 F.3d 1341, 1347–48 (Fed. Cir. 2019) (noting the ability to "transmit[] data wirelessly" is "not a technological improvement, but rather simply a feature of wireless communication"). The '868 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. *See Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016) ("We have repeatedly held that such invocation of computers and networks that are not even arguably inventive are insufficient to pass the test of an inventive concept in the application of an abstract idea." (cleaned up)). Instead, the '868 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g., Intell. Ventures I LLC v. Cap. Fin. Corp.*, 850 F.3d 1332, 1342 (Fed. Cir. 2017). The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit A101 contains a chart identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit A101 each Challenged Claim of the '868 Patent is directed to one or more abstract ideas and therefore is not directed to patent eligible subject matter. Exhibit A101 also identifies claim 7 as representative of the other Challenged Claims for purposes of the eligibility inquiry. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit A101, read in conjunction with the

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preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the '868 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the '868 Patent were conventional, routine, and well known in the medical device and wearable health tech industries. *See generally* Appendix A. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the '868 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The '868 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants' contentions that the Asserted Claims of the '868 Patent do not qualify as patent-eligible subject matter are contained in Exhibit A101.

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

Each of the Asserted Claims of the '533 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The '533 Patent Asserted Claims are unpatentable for failure to recite patent eligible subject matter.

The '533 Patent Asserted Claims are directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice*, 573 U.S. at 216. By way of example, the

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Asserted Claims of the ’533 Patent are generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. Although the Asserted Claims recite concrete, tangible components, the specification provides no technical details but instead describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, ’533 Patent at 9:34-38, 2:26-29, 26:49-27:2. This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting, processing, and storing light-based data. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. Thus, under *Alice* Step 1, the Asserted Claims of the ’533 Patent are directed to one or more ineligible concepts.

Under *Alice* Step 2, the ’533 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a “handful of generic computer components configured to implement” the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor diodes, filters, and lenses have long been used in optical sensing; touchscreens, receivers, and transmitters are common in smartphones; and a “remote device” represents a conventional computer or storage unit. Optical systems, phone applications, and remote storage are well-known, and their combination follows the general trend toward interconnectivity. *See Chamberlain*, 935 F.3d at 1347–48. The ’533 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. Instead, the ’533 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g., Intell. Ventures*, 850 F.3d at 1342. The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit B101 contains a chart

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identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit B101, each Challenged Claim of the ’533 Patent is directed to one or more abstract ideas and therefore is not directed to patent eligible subject matter. Exhibit B101 also identifies claim 11 as representative of the other Challenged Claims for purposes of the eligibility inquiry. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit B101, read in conjunction with the preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the ’533 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the ’533 Patent were conventional, routine, and well known in the optoelectronics and laboratory analytical instrumentation industries. *See generally* Appendix B. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the ’533 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The ’533 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants’ contentions that the Asserted Claims of the ’533 Patent do not qualify as patent-eligible subject matter are contained in Exhibit B101.

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C. U.S. Patent No. 10,517,484

Each of the Asserted Claims of the ’484 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The ’484 Patent Asserted Claims are unpatentable for failure to recite patent eligible subject matter.

The ’484 Patent Asserted Claims are directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice*, 573 U.S. at 216. By way of example, the Asserted Claims of the ’484 Patent are generally directed to the abstract ideas of collecting, processing, and storing light-based physiological data for analysis. Although the Asserted Claims recite concrete, tangible components, the specification provides no technical details but instead describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, ’484 Patent at 11:3-6, 32:45-65. This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting, processing, and storing light-based data. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. Thus, under *Alice* Step 1, the Asserted Claims of the ’484 Patent are directed to one or more ineligible concepts.

Under *Alice* Step 2, the ’484 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a “handful of generic computer components configured to implement” the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor diodes, detectors, and lenses have long been used in optical sensing; touchscreens, receivers, and transmitters are common in smartphones; and the cloud is ubiquitous with modern computing. Optical systems, phone applications, and remote storage are well-known, and their combination follows the general trend toward interconnectivity. *See Chamberlain*, 935

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F.3d at 1347–48. The ’484 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. Instead, the ’484 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g., Intell. Ventures*, 850 F.3d at 1342. The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit C101 contains a chart identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit C101, each Challenged Claim of the ’484 Patent is directed to one or more abstract ideas and therefore is not directed to patent eligible subject matter. Exhibit C101 also identifies claim 8 as representative of the other Challenged Claims for purposes of the eligibility inquiry. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit C101, read in conjunction with the preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the ’484 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the ’484 Patent were conventional, routine, and well known in the medical device and wearable health tech industries. *See generally* Appendix C. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the ’484 Patent. Instead, these concepts had been

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known for years and were the subject of many published articles and/or patents from around the world. The ’484 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants’ contentions that the Asserted Claims of the ’484 Patent do not qualify as patent-eligible subject matter are contained in Exhibit C101.

D. U.S. Patent No. 10,874,304

Each of the Asserted Claims of the ’304 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The ’304 Patent Asserted Claims are unpatentable for failure to recite patent eligible subject matter.

The ’304 Patent Asserted Claims are directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice*, 573 U.S. at 216. By way of example, the Asserted Claims of the ’304 Patent are generally directed to the abstract ideas of collecting, processing, and storing light-based physiological data for analysis. Although the Asserted Claims recite concrete, tangible components, the specification provides no technical details but instead describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, ’304 Patent at 13:21-25, 33:45-64. This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting, processing, and storing light-based physiological data. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. Thus, under *Alice* Step 1, the Asserted Claims of the ’304 Patent are directed to one or more ineligible concepts.

Under *Alice* Step 2, the ’304 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a “handful of

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generic computer components configured to implement" the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor diodes and receivers have long been used in optical sensing; touchscreens, receivers, and transmitters are common in smartphones; and the cloud is ubiquitous with modern computing. Optical systems, phone applications, and remote storage are well-known, and their combination follows the general trend toward interconnectivity. *See Chamberlain*, 935 F.3d at 1347–48. The '304 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. Instead, the '484 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g., Intell. Ventures*, 850 F.3d at 1342. The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit D101 contains a chart identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit D101 each Challenged Claim of the '304 Patent is directed to one or more abstract ideas and therefore is not directed to patent eligible subject matter. Exhibit D101 also identifies claim 11 as representative of the other Challenged Claims for purposes of the eligibility inquiry. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit D101, read in conjunction with the preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged

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priority date for the ’304 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the ’304 Patent were conventional, routine, and well known in the medical device and wearable health tech industries. *See generally* Appendix D. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the ’304 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The ’304 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants’ contentions that the Asserted Claims of the ’304 Patent do not qualify as patent-eligible subject matter are contained in Exhibit D101.

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

Each of the Asserted Claims of the ’455 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The ’455 Patent Asserted Claims are unpatentable for failure to recite patent eligible subject matter.

The ’455 Patent Asserted Claims are directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice*, 573 U.S. at 216. By way of example, the Asserted Claims of the ’455 Patent are generally directed to the abstract ideas of collecting, processing, and storing light-based physiological data for analysis. Although the Asserted Claims recite concrete, tangible components, the specification provides no technical details but instead describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, ’455 Patent at 16:66-17:3, 45:43-62. This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting, processing, and storing light-based physiological data. Indeed, the patent does not purport to have invented or

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improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. Thus, under *Alice* Step 1, the Asserted Claims of the '455 Patent are directed to one or more ineligible concepts.

Under *Alice* Step 2, the '455 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a "handful of generic computer components configured to implement" the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor sources, lenses, and detectors have long been used in optical sensing; touchscreens, receivers, and transmitters are common in smartphones; and the combination of optical systems and smartphones follows the general trend toward interconnectivity. *See Chamberlain*, 935 F.3d at 1347–48. The '455 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. Instead, the '455 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g.*, *Intell. Ventures*, 850 F.3d at 1342. The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit E101 contains a chart identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit E101 each Challenged Claim of the '455 Patent is directed to one or more abstract ideas and therefore is not directed to patent eligible subject matter. Exhibit E101 also identifies claim 1 as representative of the other Challenged Claims for purposes of the eligibility inquiry. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit E101, read in conjunction with the preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an

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identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the '455 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the '455 Patent were conventional, routine, and well known in the medical device and wearable health tech industries. *See generally* Appendix E. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the '455 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The '455 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants' contentions that the Asserted Claims of the '455 Patent do not qualify as patent-eligible subject matter are contained in Exhibit E101.

F. U.S. Patent No. 12,193,790

The Asserted Claim of the '790 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The '790 Patent Asserted Claim is unpatentable for failure to recite patent eligible subject matter.

The '790 Patent Asserted Claim is directed to abstract ideas and therefore not eligible subject matter under 35 U.S.C. § 101. *E.g.*, *Alice*, 573 U.S. at 216. By way of example, the Asserted Claim of the '790 Patent is generally directed to the abstract idea of collecting and processing light-based data to determine physiological parameters. Although the Asserted Claim recites concrete, tangible components, the specification provides no technical details but instead

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describes them—both individually and collectively—in generic and functional terms. *See, e.g.*, '790 Patent at 7:50-55, 84:63-67, 32:28-67. This confirms that the recited physical components merely provide a generic environment in which to carry out the abstract idea of collecting and processing natural phenomena. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. Thus, under *Alice* Step 1, the Asserted Claim of the '790 Patent is directed to one or more ineligible concepts.

Under *Alice* Step 2, the '790 Patent does not add an inventive step to the general abstract idea. The claimed elements, individually and as an ordered combination, recite only a "handful of generic computer components configured to implement" the abstract idea. *See Alice*, 573 U.S. at 226. The claimed light source (e.g., LEDs), semiconductor diodes, lenses, detection system, detectors, and analog-to-digital converters are conventional and perform their ordinary, expected functions. The claimed enhancement of signal-to-noise ratio by increasing light intensity or by subtracting background signal is a well-known technique in signal processing and does not constitute an unconventional arrangement or improvement in technology. The '790 Patent, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. Instead, the '790 Patent recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g.*, *Intell. Ventures*, 850 F.3d at 1342. The law requires more.

Pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit F101 contains a chart identifying each exception to eligibility to which each Challenged Claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit F101 each Challenged Claim of the '790 Patent is directed to one or more abstract ideas and therefore is not

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directed to patent eligible subject matter. Also, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit F101, read in conjunction with the preceding paragraphs herein provides: (i) a description of how each element of each Challenged Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the Challenged Claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the '790 Patent, the relevant industry was well-developed. All individual elements disclosed and recited in the '790 Patent were conventional, routine, and well known in the medical device and wearable health tech industries. *See generally* Appendix F. As shown in the accompanying claim charts, none of the claimed concepts were new or merely on the verge of development as of the alleged priority date of the '790 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The '790 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

Further detail regarding Defendants' contentions that the Asserted Claims of the '790 Patent do not qualify as patent-eligible subject matter are contained in Exhibit F101.

VIII. P. R. 3-4 – Productions

Pursuant to P.R. 3-4(a), each Defendant is concurrently producing and/or making available for inspection documents and other materials sufficient to show the operation of any aspects or elements of the Accused Products identified by Plaintiff in its P.R. 3-1(c) charts.

Additionally, and pursuant to P.R. 3-4(b), Defendants are concurrently producing a copy

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of each item of prior art identified herein. These prior art references and corroborating evidence are cited in attached invalidity claim charts in Appendices 101, A-F. Defendants will also make available for inspection any prior art systems or devices upon request to the extent Defendants acquire such systems or devices. References that were cited during prosecution of the Asserted Patents may not be contained in Defendants' production as they are not required to be under the local patent rules. Defendants' search for prior art references, additional documentation, and/or corroborating evidence concerning prior art systems and devices is ongoing. Accordingly, Defendants reserve the right to supplement their production as Defendants obtain additional prior art references, documentation, and/or corroborating evidence concerning invalidity during the course of discovery.

Defendants reserve the right to supplement their P. R. 3-4 document production pursuant to the Patent Local Rules and the orders of the Court.

Dated: June 3, 2025 Respectfully Submitted,

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EXHIBIT B101

Preliminary Eligibility Contentions for U.S. Patent No. 9,651,533

Based on Omni's apparent positions, as best they can be deciphered, as to the scope of asserted claims of U.S. Patent No. 9,651,533, the chart below provides Defendants' current contentions regarding the patent ineligibility of each asserted claim.

This disclosure is not an admission that Defendants concede any claim construction implied or suggested by Omni's apparent positions as to the scope of the patent's claims, nor is it an admission by Defendants that any of their products are covered by or infringe the patent's claims, particularly when they are properly construed and applied. Defendants are not taking any claim construction positions through this disclosure, including whether the preamble is a limitation.

Defendants reserve the right to rely on additional citations or sources of evidence that also may be applicable, or that may become applicable in light of claim construction, changes in Omni's infringement contentions, and/or information obtained during discovery as the case progresses. Defendants further reserve the right to amend or supplement this claim chart at a later date as more fully set forth in the Invalidity and Subject Matter Eligibility Contentions.

The asserted claims, claims 11 and 12, are drawn to patent-ineligible subject matter under 35 U.S.C. § 101. The claims are generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. And none of the claims contain an "'inventive concept' . . . sufficient to ensure that the patent in practice amounts to *significantly more* than a patent upon the ineligible concept itself." *See Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 573 U.S. 208, 217–18 (2014) (emphasis added).

Claim 11 of the '533 patent is representative.

Claim 11 may be treated as representative for purposes of § 101 because the asserted claims are "substantially similar and linked to the same abstract idea." *See Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343, 1348–49 (Fed. Cir. 2014). Claims 11 and 12 both depend on Claim 5, which essentially recites a system for collecting, processing, and storing light-based data for analysis. *See* '533 patent at cl. 5.

Claims 11 and 12 narrow the scope of Claim 5, but both remain directed to the same abstract idea: collecting, processing, and storing light-based data. For example, Claim 11 specifies that Claim 5's "receiver" includes "one or more filters" that can "select a fraction" of wavelengths. *Id.* at cl. 11. And Claim 12 specifies that the "output signal" of Claim 5 is "generated" by comparing multiple wavelengths in the "optical beam." *Id.* at cl. 12. The differences between claims 11 and 12 are nothing more than well-known, routine, and conventional features or methodologies. *See* Ex. B1-B8. Because "well-known, routine, and conventional" features are not meaningful limitations for purposes of § 101, claims 11 and 12 do not require separate evaluation. *See, e.g.*, *Content Extraction*, 776

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F.3d at 1348–49 (explaining that "well-known, routine, and conventional" features are not meaningful limitations because they cannot provide an "inventive concept"); *Cleveland Clinic Found. v. True Health Diagnostics LLC*, 859 F.3d 1352, 1360 (Fed. Cir. 2017) (holding that the recitation of "known methods of detecting" physiological parameters does not provide an inventive concept); *Clear with Computers, LLC v. Dick's Sporting Goods, Inc.*, 21 F. Supp. 3d 758, 763 (E.D. Tex. 2014) ("Nor is a claim meaningfully limited if it contains only insignificant or token pre- or post-solution activity—such as identifying a relevant audience, a category of use, field of use, or technological environment." (cleaned up)).

Accordingly, Claim 11 may be treated as representative for purposes of § 101. *See PPS Data, LLC v. Jack Henry & Assocs., Inc.*, 404 F. Supp. 3d 1021, 1031–32 (E.D. Tex. 2019) (explaining that a defendant can make out a "prima facie case demonstrating representativeness" through "an analysis tethered to the claim language" showing "that there are no legally relevant distinctions between the claim identified as representative and the remaining asserted claims").

***Alice* Step One: The asserted claims are generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis.**

The *Alice* test requires the Court to look at the "focus of the claimed advance over the prior art to determine if the claim's character as a whole is directed to excluded subject matter." *Affinity Labs of Tex., LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1257 (Fed. Cir. 2016) (cleaned up). The '533 patent alleges an "unmet need for non-invasive glucose monitoring" with "adequate sensitivity and selectivity, along with repeatability of the results," as well as a need for a "rapid, non-destructive, non-contact optical method for screening or identification of counterfeit pharmaceuticals." *See* '533 patent at 1:63–65, 3:59–63. According to the patent, readings from near-infrared spectroscopy are often inaccurate due to either a weak signal or interference (noise). *Id.* at 3:66–4:17. The '533 patent purports to address this shortcoming in two ways: (1) by adjusting the light intensity to increase signal levels for purposes of data collection and (2) by using "software analysis tools" or "other mathematical manipulations" to reduce noise. *Id.* at 4:15–17, 10:65–11:6. The patent further explains that the "measurement device may also benefit from communicating the data to the 'cloud'" to provide a "panoramic, high-definition, relatively comprehensive view of a patient" that doctors and patients can analyze. *Id.* at 26:30–48.

Claim 11 is thus generally directed to the abstract idea of collecting, processing, and transmitting light-based data for analysis. The claimed system is configured to take a measurement of a sample by observing its relationship to light—specifically, it measures the correlation between two naturally occurring phenomena, which is an abstract natural law. *See, e.g.*, *id.* at cl. 5, 8:29–46; *Cleveland Clinic*, 859 F.3d at 1361 (holding claims directed to measuring the relationship between naturally occurring phenomena are directed to an abstract natural law); *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1376 (Fed. Cir. 2015) (holding that claims "generally directed to detecting the presence of a naturally occurring thing" are abstract). The system is then configured to process that

data and generate a signal. The system may then transmit that signal to a personal device and a remote device for further processing, display, and storage.

Claim 11 amounts to nothing more than a compilation of abstract ideas. Indeed, the patent does not purport to have invented or improved signal generation or processing; data transmission or remote storage; or any sort of measurement technique. The "use of a mathematical calculation, even one that yields different or better results, does not render patent eligible subject matter." *In re Bd. of Trs. of Leland Stanford Junior Univ.*, 991 F.3d 1245, 1251 (Fed. Cir. 2021). Nor does "[a]dding one abstract idea (math) to another abstract idea" (e.g., measuring natural phenomena). *See RecogniCorp, LLC v. Nintendo Co., Ltd.*, 855 F.3d 1322, 1327 (Fed. Cir. 2017). And collecting, processing, storing, and transmitting information have long been held abstract. *See, e.g.*, *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353–54 (Fed. Cir. 2016) (collecting cases); *Content Extraction*, 776 F.3d at 1347 ("The concept of data collection, recognition, and storage is undisputedly well-known.").

Although Claim 11 requires concrete, tangible components such as "light emitting diodes," "lenses," a "receiver," a "personal device," and "filters," "the specification makes clear that the recited physical components merely provide a generic environment in which to carry out the abstract idea" of collecting, processing, and storing data. *See In re TLI Commc'ns LLC Pat. Litig.*, 823 F.3d 607, 611–12 (Fed. Cir. 2016) (finding claims "directed to the use of conventional or generic technology in a nascent but well-known environment" to be abstract). In fact, the specification provides no technical details for the tangible components, but instead describes them—both individually and collectively—in generic and functional terms. *See infra*, *Alice* Step Two. So instead of providing any new or useful system, Claim 11 recites the abstract idea of collecting, processing, and storing light-based data through conventional technology and result-oriented steps. *See In re Gopalan*, 809 F. App'x 942, 945–46 (Fed. Cir. 2020).

***Alice* Step Two: The asserted claims do not contain a transformative inventive concept.**

Claim 11 likewise contains no inventive concept that transforms the abstract idea into patent-eligible subject matter.

The claimed elements, individually and as an ordered combination, recite only a "handful of generic computer components configured to implement" the abstract idea. *See Alice*, 573 U.S. at 226. Semiconductor diodes, filters, and lenses have long been used in optical sensing; touchscreens, receivers, and transmitters are common in smartphones; and a "remote device" represents a conventional computer or storage unit. Optical systems, phone applications, and remote storage are well-known, and their combination follows the general trend toward interconnectivity. *See* Ex. B1-B8; Cover Pleading at § III.G; *Chamberlain Grp., Inc. v. Techtronic Indus. Co.*, 935 F.3d 1341, 1347–48 (Fed. Cir. 2019) (noting the ability to "transmit[] data wirelessly" is "not a technological improvement, but rather simply a feature of wireless communication").

Claim 11, moreover, does not recite any new or improved algorithm, measurement method, or hardware design. *See Elec. Power Grp.*, 830 F.3d at 1354 ("We have repeatedly held that such invocation of computers and networks that are not even arguably inventive are insufficient to pass the test of an inventive concept in the application of an abstract idea." (cleaned up)). Instead, Claim 11 recites functional, result-oriented language that fails to transform the claimed abstract idea beyond routine and conventional tasks. *See, e.g., Intell. Ventures I LLC v. Cap. Fin. Corp.*, 850 F.3d 1332, 1342 (Fed. Cir. 2017) ("[T]he claim language here provides only a result-oriented solution, with insufficient detail for how a computer accomplishes it. Our law demands more."). In other words, the claim does not offer any specific technological solution to improve the functioning of the sensors, hardware, or anything else, but instead describes an interconnected system of conventional components that mirrors existing spectroscopic paradigms.

Finally, Claim 11 follows a generic data-processing pipeline, describing a system that: (1) collects, (2) processes, (3) transmits, and (4) stores data. This is a classic data-processing and transmission sequence—the kind the Federal Circuit has consistently held to be ineligible when implemented using generic computing equipment. *See, e.g.*, *Two-Way Media Ltd. v. Comcast Cable Commc'ns, LLC*, 874 F.3d 1329, 1339 (Fed. Cir. 2017) (holding that a "conventional ordering of steps . . . with conventional technology to achieve its desired result" is insufficient to provide an inventive concept). And the specification confirms that each of the result-oriented claim elements can be carried out by generic hardware operating in a conventional fashion. *See, e.g.*, '533 patent at 9:34–38 ("In one embodiment, the 'optical light' and/or 'optical beam' and/or 'light beam' may originate from a fiber, a fiber laser, a laser, a light emitting diodes, a lamp, a pump laser, or a light source."); *id.* at 2:26–29 ("In particular embodiments, the detection system may be a dispersive spectrometer, a Fourier transform infrared spectrometer, or a hyper-spectral imaging detector or camera."); *id.* at 26:49–27:2 (reciting generic technologies, including "a transmitter," "a processor," "wireless technologies such as Bluetooth," and recognizing that "other devices could be used and are included in the scope of this disclosure"). At bottom, Claim 11, whether considered limitation-by-limitation or as a whole, does not sufficiently transform the abstract idea of collecting, processing, and storing light-based data into a patentable invention.

'533 Patent – Claim 11	**Subject Matter Eligibility Contentions**
[5pre] A measurement system comprising:	Representative Claim 11 of the '533 patent depends on Claim 5. Claim 5 is directed to an abstract idea. And it contains no inventive concept sufficient to ensure that the claim amounts to significantly more than the patent-ineligible concept itself. Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. *See, e.g.*, *AI*

	Visualize, Inc. v. Nuance Commc'ns, Inc., 97 F.4th 1371, 1378–79 (Fed. Cir. 2024); *In re TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 611–13 (Fed. Cir. 2016); *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353–54 (Fed. Cir. 2016); *Intell. Ventures I LLC v. Cap. Fin. Corp.*, 850 F.3d 1332, 1340–41 (Fed. Cir. 2017); *Univ. of Fla. Rsch. Found., Inc. v. Gen. Elec. Co.*, 916 F.3d 1363, 1367–68 (Fed. Cir. 2019); *CardioNet, LLC v. InfoBionic, Inc.*, 816 F. App'x 471, 475–77 (Fed. Cir. 2020); *In re Bd. of Trs. Of Leland Stanford Junior Univ.*, 991 F.3d 1245, 1250–51 (Fed. Cir. 2021); *Audio Evolution Diagnostics, Inc. v. United States*, 160 Fed. Cl. 513, 526–27 (2022), *aff'd*, No. 2023-1096, 2024 WL 2143376 (Fed. Cir. May 14, 2024); *Braemar Mfg., LLC v. ScottCare Corp.*, 816 F. App'x 465, 470 (Fed. Cir. 2020); *Philips N. Am. LLC v. Fitbit LLC*, 626 F. Supp. 3d 292, 306–09 (D. Mass. 2022); *Two-Way Media Ltd. v. Comcast Cable Commc'ns, LLC*, 874 F.3d 1329, 1337–39 (Fed. Cir. 2017); *In re Gopalan*, 809 F. App'x 942, 945–46 (Fed. Cir. 2020); *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1376 (Fed. Cir. 2015); *Cleveland Clinic Found. v. True Health Diagnostics LLC*, 859 F.3d 1352, 1361 (Fed. Cir. 2017); *RecogniCorp, LLC v. Nintendo Co., Ltd.*, 855 F.3d 1322, 1327 (Fed. Cir. 2017); *Chamberlain Grp., Inc. v. Techtronic Indus. Co.*, 935 F.3d 1341, 1346–48 (Fed. Cir. 2019); *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014). Claim 5 also contains no inventive concept. At the time of the alleged invention, the elements of Claim 5 were well-understood, routine, and/or conventional. Claim 5 employs well-known components or functionality, as shown for example in Defendants' invalidity contentions, which is not enough to

	impart patent eligibility. *See*, *e.g.*, Ex. B1-B8 at all disclosures for [5pre]; Cover Pleading at § III.G.
[5a] a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5a]; Cover Pleading at § III.G.
[5b] the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5b]; Cover Pleading at § III.G.
[5c] an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5c]; Cover Pleading at § III.G.
[5d] a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5d]; Cover Pleading at § III.G.

[5e] a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5e]; Cover Pleading at § III.G.
[5f] the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5f]; Cover Pleading at § III.G.
[5g] a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	As explained above, Claim 5 is generally directed to the abstract idea of collecting, processing, and storing light-based data for analysis. At the time of the alleged invention, this element was well-understood, routine, and/or conventional. *See, e.g.*, Ex. B1-B8 at all disclosures for [5g]; Cover Pleading at § III.G.
[11] The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	Claim 11 narrows the scope of Claim 5, but it remains generally directed to the same abstract idea of collecting, processing, and storing light-based data for analysis. *See* [5]. Claim 11 also does not contain any inventive concept. At the time of the alleged invention, the elements of Claim 11 were well-understood, routine, and/or conventional. Claim 11 employs well-known components or functionality, as shown for example in Defendants' invalidity contentions, which is not

	enough to impart patent eligibility. *See* Ex. B1-B8 at all disclosures for [11]; Cover Pleading at § III.G.

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EXHIBIT B1

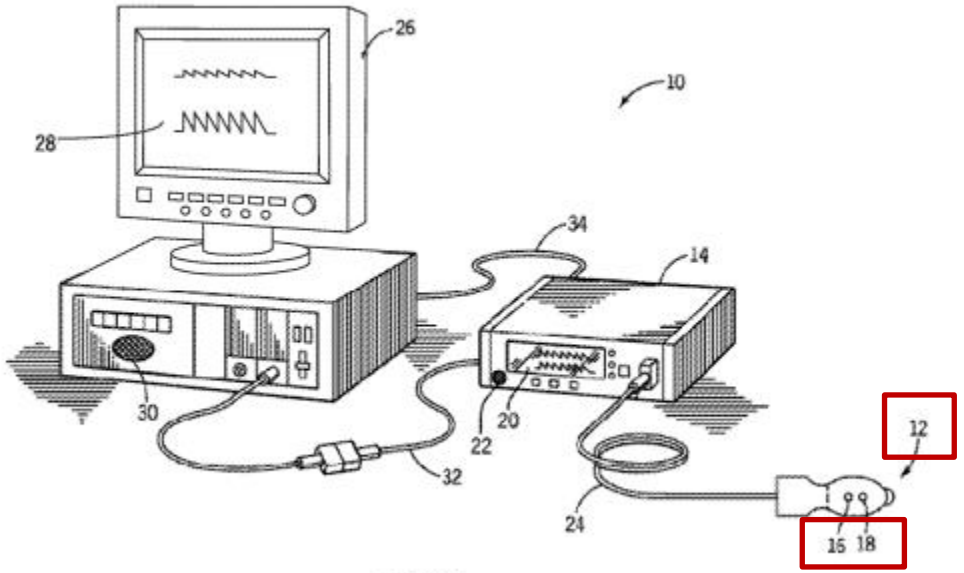
U.S. Pat. No. 9,651,533 B2 in view of U.S. Patent Publication No. 20110028802 to Paul Stanley Addison ("Addison")

As described in detail below, Addison (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 B2 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Addison. The cited portions of Addison are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Addison. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Addison "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Addison does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Addison (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Addison anticipates and/or renders obvious the Asserted Claims of the '533 Patent

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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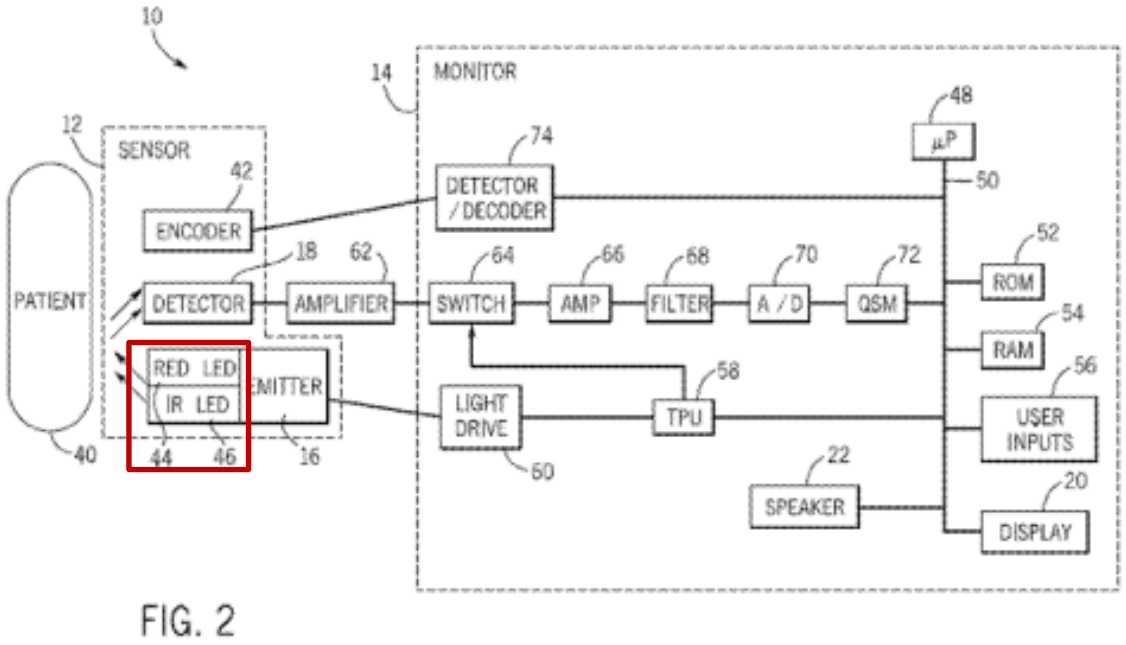
’533 Patent	Addison
Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Addison discloses or renders obvious a measurement system. **FIG. 1 is a perspective view of an embodiment of an effort system 10. In an embodiment, effort system 10 is implemented as part of a pulse oximetry system. System 10 may include a sensor 12 and a monitor 14. Sensor 12 may include an emitter 16 for emitting light at two or more wavelengths into a patient's tissue. A detector 18 may also be provided in sensor 12 for detecting the light originally from emitter 16 that emanates from the patient's tissue after passing through the tissue**. Addison at [0049]  FIG.1 Addison at Figure 1

’533 Patent	Addison
	According to another embodiment and as will be described, **system 10 may include a plurality of sensors forming a sensor array in lieu of single sensor 12. Each of the sensors of the sensor array may be a complementary metal oxide semiconductor (CMOS) sensor. Alternatively, each sensor of the array may be charged coupled device (CCD) sensor. In another embodiment, the sensor array may be made up of a combination of CMOS and CCD sensors. The CCD sensor may comprise a photoactive region and a transmission region for receiving and transmitting data whereas the CMOS sensor may be made up of an integrated circuit having an array of pixel sensors. Each pixel may have a photodetector and an active amplifier.** Addison at [0051] According to an embodiment, **emitter 16 and detector 18 may be on opposite sides of a digit such as a finger or toe, in which case the light that is emanating from the tissue has passed completely through the digit. In an embodiment, emitter 16 and detector 18 may be arranged so that light from emitter 16 penetrates the tissue and is reflected by the tissue into detector 18, such as a sensor designed to obtain pulse oximetry data from a patient's forehead**. Addison at [0052] In an embodiment**, the sensor or sensor array may be connected to and draw its power from monitor 14 as shown. In another embodiment, the sensor may be wirelessly connected to monitor 14 and include its own battery or similar power supply (not shown). Monitor 14 may be configured to calculate physiological parameters based at least in part on data received from sensor 12 relating to light emission and detection. In an alternative embodiment, the calculations may be performed on the monitoring device itself and the result of the effort or oximetry reading may be passed to monitor 14. Further, monitor 14 may include a display 20 configured to display the physiological parameters or other information about the system. In the embodiment shown, monitor 14 may also include a speaker 22 to provide an audible sound that may be used in various other embodiments**, such as for example, sounding an audible alarm in the event that a patient's physiological parameters are not within a predefined normal range. Addison at [0052]

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’533 Patent	Addison
	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Addison discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. FIG. 2 is a block diagram of an effort system, such as effort system 10 of FIG. 1, which may be coupled to a patient 40 in accordance with an embodiment. Certain illustrative components of sensor 12 and monitor 14 are illustrated in FIG. 2. **Sensor 12 may include emitter 16, detector 18, and encoder 42. In the embodiment shown, emitter 16 may be configured to emit one or more wavelengths of light (e.g., RED and/or IR) into a patient's tissue 40. Hence, emitter 16 may include a RED light emitting light source such as RED light emitting diode (LED) 44 and/or an IR light emitting light source such as IR LED 46 for emitting light into the patient's tissue 40 at the wavelengths used to calculate the patient's physiological parameters. In one embodiment, the RED wavelength may be between about 600 nm and about 700 nm, and the IR wavelength may be between about 800 nm and about 1000 nm. In embodiments where a sensor array is used in place of single sensor, each sensor may be configured to emit a single wavelength. For example, a first sensor emits only a RED light while a second only emits an IR light.** Addison at [0057]

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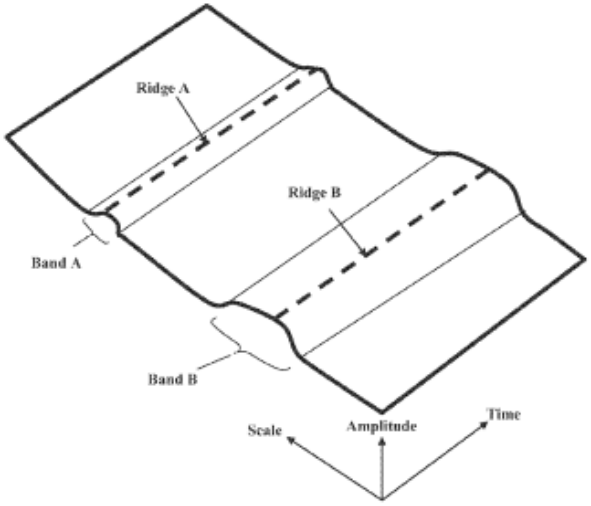
’533 Patent	Addison
	 FIG. 2 Addison at figure 2 **An oximeter may include a light sensor that is placed at a site on a patient, typically a fingertip, toe, forehead or earlobe, or in the case of a neonate, across a foot. The oximeter may pass light using a light source through blood perfused tissue and photoelectrically sense the absorption of light in the tissue. For example, the oximeter may measure the intensity of light that is received at the light sensor as a function of time.** A signal representing light intensity versus time or a mathematical manipulation of this signal (e.g., a scaled version thereof, a log taken thereof, a scaled version of a log taken thereof, etc.) may be referred to as the photoplethysmograph (PPG) signal. In addition, the term “PPG signal,” as used herein, may also refer to an absorption signal (i.e., representing the amount of light absorbed by the tissue) or any suitable mathematical manipulation thereof. The light intensity or the amount of light absorbed may then be used to calculate the amount of the blood constituent (e.g., oxyhemoglobin) being measured as well as the pulse rate and when each individual pulse occurs.

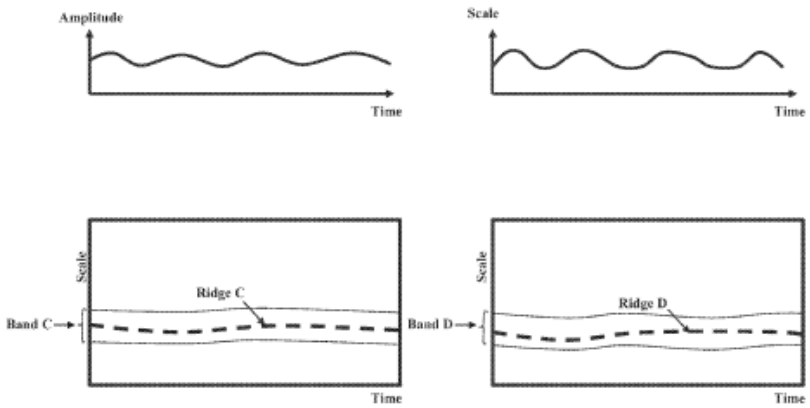
’533 Patent	Addison
	Addison at [0033] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	Addison discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. **The optical signal through the tissue can be degraded by noise, among other sources. One source of noise is ambient light that reaches the light detector. Another source of noise is electromagnetic coupling from other electronic instruments. Movement of the patient also introduces noise and affects the signal. For example, the contact between the detector and the skin, or the emitter and the skin, can be temporarily disrupted when movement causes either to move away from the skin.** In addition, because blood is a fluid, it responds differently than the surrounding tissue to inertial effects, thus resulting in momentary changes in volume at the point to which the probe is attached. Addison at [0066] **Noise (e.g., from patient movement) can degrade a pulse oximetry signal relied upon by a physician, without the physician's awareness. This is especially true if the monitoring of the patient is remote, the motion is too small to be observed, or the doctor is watching the instrument or other parts of the patient, and not the sensor site. Processing effort and pulse oximetry (i.e., PPG) signals may involve operations that reduce the amount of noise present in the signals or otherwise identify noise components in order to prevent them from affecting measurements of physiological parameters derived from the PPG signals.** Addison at [0067]

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	This will be referred to as the “primary band”. In addition, it may be assumed that the system from which the signal originates, and from which the transform is subsequently derived, exhibits some form of coupling between the signal components in band A and band B. When noise or other erroneous features are present in the signal with similar spectral characteristics of the features of band B then the information within band B can become ambiguous (i.e., obscured, fragmented or missing). In this case, the ridge of band A may be followed in wavelet space and extracted either as an amplitude signal or a scale signal which will be referred to as the “ridge amplitude perturbation” (RAP) signal and the “ridge scale perturbation” (RSP) signal, respectively. The RAP and RSP signals may be extracted by projecting the ridge onto the time-amplitude or time-scale planes, respectively. The top plots of FIG. 3(d) show a schematic of the RAP and RSP signals associated with ridge A in FIG. 3(c). Below these RAP and RSP signals are schematics of a further wavelet decomposition of these newly derived signals. This secondary wavelet decomposition allows for information in the region of band B in FIG. 3(c) to be made available as band C and band D. The ridges of bands C and D may serve as instantaneous time-scale characteristic measures of the signal components causing bands C and D. This technique, which will be referred to herein as secondary wavelet feature decoupling (SWFD), may allow information concerning the nature of the signal components associated with the underlying physical process causing the primary band B (FIG. 3(c)) to be extracted when band B itself is obscured in the presence of noise or other erroneous signal features. Addison at [0083]

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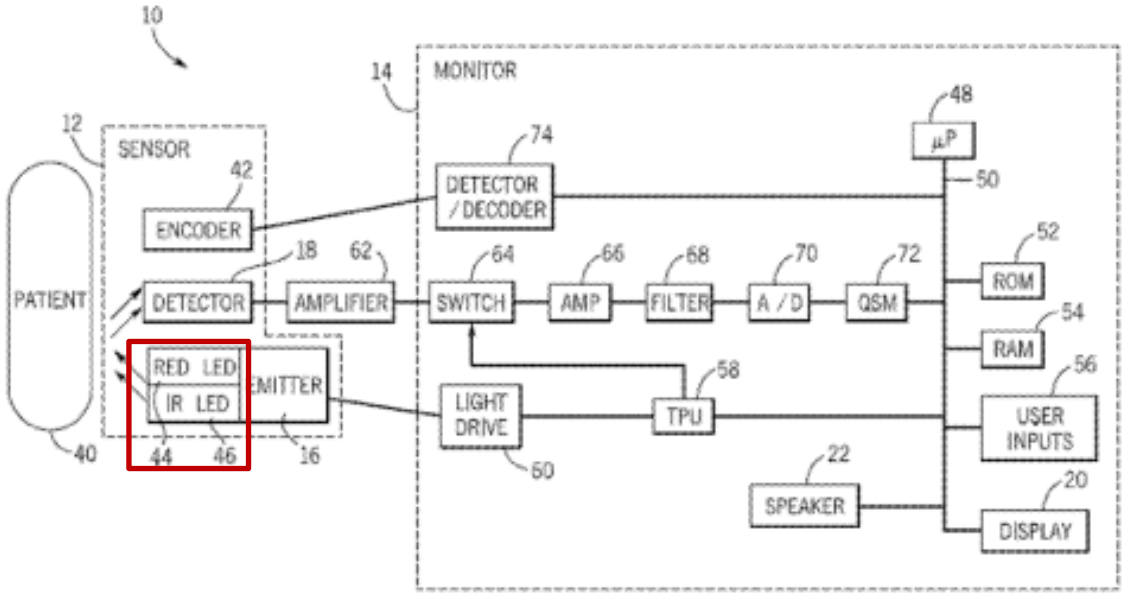
’533 Patent	Addison
	 FIG. 3(c) Addison at figure 3c

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	 **FIG. 3(d)** Addison at figure 3c In accordance with certain aspects of the present disclosure, a much more lightly filtered PPG signal is employed. For example, the pass band of the filtering applied to the PPG signal may be opened out to include a wider range of signal component frequencies, while still removing very high frequency noise (and possibly also very low frequency noise) that is not useful in the analysis and that may actually inhibit the clinician viewer from interpreting the waveform. In this lightly filtered case the PPG signal may be band-pass filtered at or around a range of 4 Hz to 0.005 Hz. In an alternative embodiment the lower end of this range may be reduced even further, e.g., to 0 Hz. In this last-mentioned case, the band-pass filter becomes a low-pass filter set at or around 4 Hz. Those skilled in the art will appreciate that the frequency range of interest may be limited by or chosen on the basis of the physiological parameter(s) of interest. Thus the frequency range may alter accordingly. Further, the frequency range may change in time as the parameters being observed change. For example, dynamic or adaptive filtering may be applied. Addison at [0131]

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	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Addison discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample FIG. 2 is a block diagram of an effort system, such as effort system 10 of FIG. 1, which may be coupled to a patient 40 in accordance with an embodiment. Certain illustrative components of sensor 12 and monitor 14 are illustrated in FIG. 2. **Sensor 12 may include emitter 16, detector 18, and encoder 42. In the embodiment shown, emitter 16 may be configured to emit one or more wavelengths of light (e.g., RED and/or IR) into a patient's tissue 40. Hence, emitter 16 may include a RED light emitting light source such as RED light emitting diode (LED) 44 and/or an IR light emitting light source such as IR LED 46 for emitting light into the patient's tissue 40 at the wavelengths used to calculate the patient's physiological parameters. In one embodiment, the RED wavelength may be between about 600 nm and about 700 nm, and the IR wavelength may be between about 800 nm and about 1000 nm. In embodiments where a sensor array is used in place of single sensor, each sensor may be configured to emit a single wavelength. For example, a first sensor emits only a RED light while a second only emits an IR light.** Addison at [0057]

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	 FIG. 2 Addison at figure 2 **It will be understood that, as used herein, the term “light” may refer to energy produced by radiative sources and may include one or more of ultrasound, radio, microwave, millimeter wave, infrared, visible, ultraviolet, gamma ray or X-ray electromagnetic radiation. As used herein, light may also include any wavelength within the radio, microwave, infrared, visible, ultraviolet, or X-ray spectra, and that any suitable wavelength of electromagnetic radiation may be appropriate for use with the present techniques**. Detector 18 may be chosen to be specifically sensitive to the chosen targeted energy spectrum of the emitter 16. Addison at [0058] In an embodiment, **detector 18 may be configured to detect the intensity of light at the RED and IR wavelengths. Alternatively, each sensor in the array may be configured to detect an intensity**

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	of a single wavelength. In operation, light may enter detector 18 after passing through the patient's tissue 40. Detector 18 may convert the intensity of the received light into an electrical signal. The light intensity is directly related to the absorbance and/or reflectance of light in the tissue 40. That is, when more light at a certain wavelength is absorbed or reflected, less light of that wavelength is received from the tissue by the detector 18. After converting the received light to an electrical signal, detector 18 may send the signal to monitor 14, where physiological parameters may be calculated based on the absorption of the RED and IR wavelengths in the patient's tissue 40. Addison at [0059] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Addison discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source **It will be understood that, as used herein, the term “light” may refer to energy produced by radiative sources and may include one or more of ultrasound, radio, microwave, millimeter wave, infrared, visible, ultraviolet, gamma ray or X-ray electromagnetic radiation. As used herein, light may also include any wavelength within the radio, microwave, infrared, visible, ultraviolet, or X-ray spectra, and that any suitable wavelength of electromagnetic radiation may be appropriate for use with the present techniques**. Detector 18 may be chosen to be specifically sensitive to the chosen targeted energy spectrum of the emitter 16. Addison at [0058]

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	In an embodiment, **detector 18 may be configured to detect the intensity of light at the RED and IR wavelengths. Alternatively, each sensor in the array may be configured to detect an intensity of a single wavelength. In operation, light may enter detector 18 after passing through the patient's tissue 40. Detector 18 may convert the intensity of the received light into an electrical signal. The light intensity is directly related to the absorbance and/or reflectance of light in the tissue 40. That is, when more light at a certain wavelength is absorbed or reflected, less light of that wavelength is received from the tissue by the detector 18. After converting the received light to an electrical signal, detector 18 may send the signal to monitor 14, where physiological parameters may be calculated based on the absorption of the RED and IR wavelengths in the patient's tissue 40.** Addison at [0059] **In an embodiment, encoder 42 may contain information about sensor 12, such as what type of sensor it is (e.g., whether the sensor is intended for placement on a forehead or digit) and the wavelength or wavelengths of light emitted by emitter 16. This information may be used by monitor 14 to select appropriate algorithms, lookup tables and/or calibration coefficients stored in monitor 14 for calculating the patient's physiological parameters.** Addison at [0060] Encoder 42 may contain information specific to patient 40, such as, for example, the patient's age, weight, and diagnosis. This information may allow monitor 14 to determine, for example**, patient-specific threshold ranges in which the patient's physiological parameter measurements should fall and to enable or disable additional physiological parameter algorithms. Encoder 42 may, for instance, be a coded resistor which stores values corresponding to the type of sensor 12 or the type of each sensor in the sensor array, the wavelengths of light emitted by emitter 16 on each sensor of the sensor array, and/or the patient's characteristics. In another embodiment, encoder 42 may include a memory on which one or more of the following information may be stored for communication to monitor 14**: the type of the sensor 12; the wavelengths of light emitted by emitter 16; the particular wavelength each sensor in the sensor array is monitoring; a signal threshold for each sensor in the sensor array; any other suitable information; or any combination thereof.

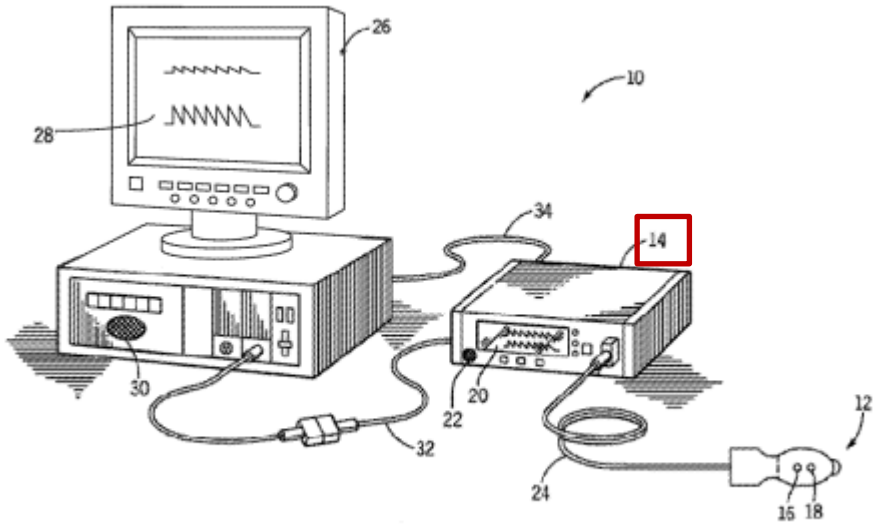
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	Addison at [0061] The light passed through the tissue is selected to be of one or more wavelengths that are absorbed by the blood in an amount representative of the amount of the blood constituent present in the blood. The amount of light passed through the tissue varies in accordance with the changing amount of blood constituent in the tissue and the related light absorption. Red and infrared wavelengths may be used because it has been observed that highly oxygenated blood will absorb relatively less red light and more infrared light than blood with a lower oxygen saturation. By comparing the intensities of two wavelengths at different points in the pulse cycle, it is possible to estimate the blood oxygen saturation of hemoglobin in arterial blood. Addison at [0034] In the illustrated embodiment, effort system 10 may also include a multi-parameter patient monitor 26. The monitor may be cathode ray tube type, a flat panel display (as shown) such as a liquid crystal display (LCD) or a plasma display, or any other type of monitor now known or later developed. Multi-parameter patient monitor 26 may be configured to calculate physiological parameters and to provide a display 28 for information from monitor 14 and from other medical monitoring devices or systems (not shown). For example, multiparameter patient monitor 26 may be configured to display an estimate of a patient's respiratory effort or blood oxygen saturation (referred to as an “SpO2” measurement)generated by monitor 14, pulse rate information from monitor 14 and blood pressure from a blood pressure monitor (not shown) on display 28. Addison at [0055] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	Addison discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen In an embodiment, **the sensor or sensor array may be connected to and draw its power from monitor 14** as shown. In another embodiment**, the sensor may be wirelessly connected to monitor 14** and include its own battery or similar power supply (not shown). Monitor 14 may be configured to calculate physiological parameters based at least in part on data received from sensor 12 relating to light emission and detection. In an alternative embodiment, the calculations may be performed on the monitoring device itself and the result of the effort or oximetry reading may be passed to monitor 14. Further, **monitor 14 may include a display 20 configured to display the physiological parameters or other information about the system. In the embodiment shown, monitor 14 may also include a speaker 22 to provide an audible sound that may be used in various other embodiments, such as for example, sounding an audible alarm in the event that a patient's physiological parameters are not within a predefined normal range.** Addison at [0053] In an embodiment, sensor 12, or **the sensor array, may be communicatively coupled to monitor 14 via a cable 24. However, in other embodiments, a wireless transmission device (not shown) or the like may be used instead of or in addition to cable 24**. Addison at [0054] In the illustrated embodiment, effort system 10 may also include a multi-parameter patient monitor 26. **The monitor may be cathode ray tube type, a flat panel display (as shown) such as a liquid crystal display (LCD) or a plasma display, or any other type of monitor now known or later developed. Multi-parameter patient monitor 26 may be configured to calculate physiological parameters and to provide a display 28 for information from monitor 14 and from other medical monitoring devices or systems (not shown). For example, multiparameter patient monitor 26 may be configured to display an estimate of a patient's respiratory effort or blood oxygen saturation (referred to as an “SpO2”**

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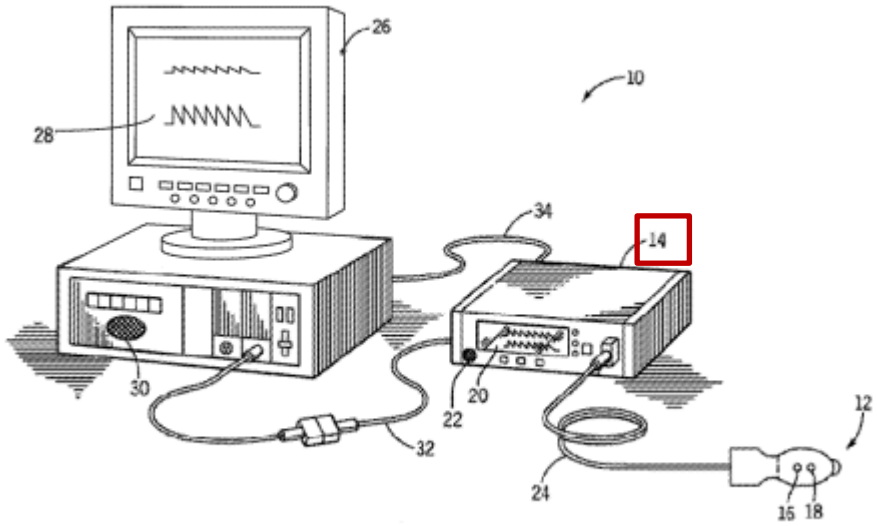
’533 Patent	Addison
	Addison at [0055] In an embodiment, signals from detector 18 and encoder 42 may be transmitted to monitor 14**. In the embodiment shown, monitor 14 may include a general-purpose microprocessor 48 connected to an internal bus 50. Microprocessor 48 may be adapted to execute software, which may include an operating system and one or more applications, as part of performing the functions described herein. Also connected to bus 50 may be a read-only memory (ROM) 52, a random access memory (RAM) 54, user inputs 56, display 20, and speaker 22.** Addison at [0055]  FIG.1 Addison at Figure 1 Processor 412 may be coupled to output 414. **Output 414 may be any suitable output device such as, for example, one or more medical devices (e.g., a medical monitor that displays various**

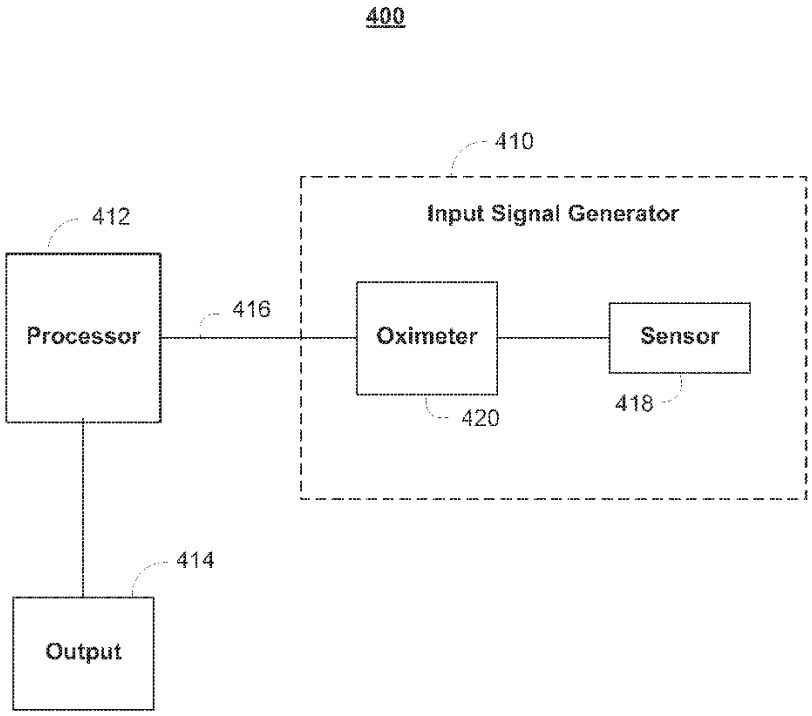
’533 Patent	Addison
	physiological parameters, a medical alarm, or any other suitable medical device that either displays physiological parameters or uses the output of processor 412 as an input), one or more display devices (e.g., monitor, PDA, mobile phone, any other suitable display device, or any combination thereof), one or more audio devices, one or more memory devices (e.g., hard disk drive, flash memory, RAM, optical disk, any other suitable memory device, or any combination thereof), one or more printing devices, any other suitable output device, or any combination thereof. Addison at [0092] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Addison discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **Processor 412 may be coupled to one or more memory devices (not shown) or incorporate one or more memory devices such as any suitable volatile memory device (e.g., RAM, registers, etc.), non-volatile memory device (e.g., ROM, EPROM, magnetic storage device, optical storage device, flash memory, etc.), or both. The memory may be used by processor 412 to, for example, store data corresponding to a continuous wavelet transform of input signal 416, such as data representing a scalogram. In one embodiment, data representing a scalogram may be stored in RAM or memory internal to processor 412 as any suitable three-dimensional data structure such as a three-dimensional array that represents the scalogram as energy levels in a time-scale plane**. Any other suitable data structure may be used to store data representing a scalogram. Addison at [0091]

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	In an embodiment, **the sensor or sensor array may be connected to and draw its power from monitor 14** as shown. In another embodiment**, the sensor may be wirelessly connected to monitor 14** and include its own battery or similar power supply (not shown). **Monitor 14 may be configured to calculate physiological parameters based at least in part on data received from sensor 12 relating to light emission and detection. In an alternative embodiment, the calculations may be performed on the monitoring device itself and the result of the effort or oximetry reading may be passed to monitor 14.** Further, **monitor 14 may include a display 20 configured to display the physiological parameters or other information about the system. In the embodiment shown, monitor 14 may also include a speaker 22 to provide an audible sound that may be used in various other embodiments, such as for example, sounding an audible alarm in the event that a patient's physiological parameters are not within a predefined normal range.** Addison at [0053] In an embodiment, sensor 12, or **the sensor array, may be communicatively coupled to monitor 14 via a cable 24. However, in other embodiments, a wireless transmission device (not shown) or the like may be used instead of or in addition to cable 24**. Addison at [0054] In the illustrated embodiment, effort system 10 may also include a multi-parameter patient monitor 26. **The monitor may be cathode ray tube type, a flat panel display (as shown) such as a liquid crystal display (LCD) or a plasma display, or any other type of monitor now known or later developed. Multi-parameter patient monitor 26 may be configured to calculate physiological parameters and to provide a display 28 for information from monitor 14 and from other medical monitoring devices or systems (not shown). For example, multiparameter patient monitor 26 may be configured to display an estimate of a patient's respiratory effort or blood oxygen saturation (referred to as an “SpO2”** Addison at [0055]

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	In an embodiment, signals from detector 18 and encoder 42 may be transmitted to monitor 14**. In the embodiment shown, monitor 14 may include a general-purpose microprocessor 48 connected to an internal bus 50. Microprocessor 48 may be adapted to execute software, which may include an operating system and one or more applications, as part of performing the functions described herein. Also connected to bus 50 may be a read-only memory (ROM) 52, a random access memory (RAM) 54, user inputs 56, display 20, and speaker 22.** Addison at [0055]  FIG.1 Addison at Figure 1 Processor 412 may be coupled to output 414. **Output 414 may be any suitable output device such as, for example, one or more medical devices (e.g., a medical monitor that displays various physiological parameters, a medical alarm, or any other suitable medical device that either displays physiological parameters or uses the output of processor 412 as an input), one or more**

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	display devices (e.g., monitor, PDA, mobile phone, any other suitable display device, or any combination thereof), one or more audio devices, one or more memory devices (e.g., hard disk drive, flash memory, RAM, optical disk, any other suitable memory device, or any combination thereof), one or more printing devices, any other suitable output device, or any combination thereof. Addison at [0092]  FIG. 4 Addison at figure 4

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	FIG. 4 is an illustrative continuous wavelet processing system in accordance with an embodiment. In an embodiment, input signal generator 410 generates an input signal 416. As illustrated, input signal generator 410 may include oximeter 420 coupled to sensor 418, which may provide as input signal 416, a PPG signal. It will be understood that input signal generator 410 may include any suitable signal source, signal generating data, signal generating equipment, or any combination thereof to produce signal 416. Signal 416 may be any suitable signal or signals, such as, for example, biosignals (e.g., electrocardiogram, electroencephalogram, electrogastrogram, electromyogram, heart rate signals, pathological sounds, ultrasound, or any other suitable biosignal), dynamic signals, non-destructive testing signals, condition monitoring signals, fluid signals, geophysical signals, astronomical signals, electrical signals, financial signals including financial indices, sound and speech signals, chemical signals, meteorological signals including climate signals, and/or any other suitable signal, and/or any combination thereof. Addison at [0089] Processor 412 may be coupled to output 414. Output 414 may be any suitable output device such as, for example, one or more medical devices (e.g., a medical monitor that displays various physiological parameters, a medical alarm, or any other suitable medical device that either displays physiological parameters or uses the output of processor 412 as an input), one or more display devices (e.g., monitor, PDA, mobile phone, any other suitable display device, or any combination thereof), one or more audio devices, one or more memory devices (e.g., hard disk drive, flash memory, RAM, optical disk, any other suitable memory device, or any combination thereof), one or more printing devices, any other suitable output device, or any combination thereof. Addison at [0092] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it

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	would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	Addison discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data In an embodiment, sensor 12, or **the sensor array, may be communicatively coupled to monitor 14 via a cable 24. However, in other embodiments, a wireless transmission device (not shown) or the like may be used instead of or in addition to cable 24**. Addison at [0054] In the illustrated embodiment, effort system 10 may also include a multi-parameter patient monitor 26. **The monitor may be cathode ray tube type, a flat panel display (as shown) such as a liquid crystal display (LCD) or a plasma display, or any other type of monitor now known or later developed. Multi-parameter patient monitor 26 may be configured to calculate physiological parameters and to provide a display 28 for information from monitor 14 and from other medical monitoring devices or systems (not shown). For example, multiparameter patient monitor 26 may be configured to display an estimate of a patient's respiratory effort or blood oxygen saturation (referred to as an “SpO2”** Addison at [0055] Monitor 14 may be communicatively coupled to multi-parameter patient monitor 26 via a cable 32 or 34 that is coupled to a sensor input port or a digital communications port, respectively and/or may communicate wirelessly (not shown). In addition, monitor 14 and/or multi-parameter patient monitor 26 may be coupled to a network to enable the sharing of information with servers or other workstations (not shown). Monitor 14 may be powered by a battery (not shown) or by a conventional power source such as a wall outlet. Addison at [0056]

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	Processor 412 may be coupled to one or more memory devices (not shown) or incorporate one or more memory devices such as any suitable volatile memory device (e.g., RAM, registers, etc.), non-volatile memory device (e.g., ROM, EPROM, magnetic storage device, optical storage device, flash memory, etc.), or both. **The memory may be used by processor 412 to, for example, store data corresponding to a continuous wavelet transform of input signal 416, such as data representing a scalogram. In one embodiment, data representing a scalogram may be stored in RAM or memory internal to processor 412 as any suitable three-dimensional data structure such as a three-dimensional array that represents the scalogram as energy levels in a time-scale plane. Any other suitable data structure may be used to store data representing a scalogram.** Addison at [0091] **Processor 412 may be coupled to output 414. Output 414 may be any suitable output device such as, for example, one or more medical devices (e.g., a medical monitor that displays various physiological parameters, a medical alarm, or any other suitable medical device that either displays physiological parameters or uses the output of processor 412 as an input), one or more display devices (e.g., monitor, PDA, mobile phone, any other suitable display device, or any combination thereof), one or more audio devices, one or more memory devices (e.g., hard disk drive, flash memory, RAM, optical disk, any other suitable memory device, or any combination thereof), one or more printing devices, any other suitable output device, or any combination thereof.** Addison at [0092] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	

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11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	See claim 5 above Addison discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. In the embodiment shown, a time processing unit (TPU) 58 may provide timing control signals to a light drive circuitry 60, which may control when emitter 16 is illuminated and multiplexed timing for the RED LED 44 and the IR LED 46. TPU 58 may also control the gating-in of signals from detector 18 through an amplifier 62 and a switching circuit 64. These signals are sampled at the proper time, depending upon which light source is illuminated. **The received signal from detector 18 may be passed through an amplifier 66, a low pass filter 68, and an analog-to-digital converter 70. The digital data may then be stored in a queued serial module (QSM) 72 (or buffer) for later downloading to RAM 54 as QSM 72 fills up. In one embodiment, there may be multiple separate parallel paths having amplifier 66, filter 68, and A/D converter 70 for multiple light wavelengths or spectra received**. Addison at [0064] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	See claim 5 above Addison discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. **The light passed through the tissue is selected to be of one or more wavelengths that are absorbed by the blood in an amount representative of the amount of the blood constituent present in the**

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	blood. The amount of light passed through the tissue varies in accordance with the changing amount of blood constituent in the tissue and the related light absorption. Red and infrared wavelengths may be used because it has been observed that highly oxygenated blood will absorb relatively less red light and more infrared light than blood with a lower oxygen saturation. By comparing the intensities of two wavelengths at different points in the pulse cycle, it is possible to estimate the blood oxygen saturation of hemoglobin in arterial blood. Addison at [0034] **[0043]** The traditional approach measures light absorption at two wavelengths (e.g., red and infrared (IR)), and then calculates saturation by solving for the “ratio of ratios” as follows. **[0044]** 1. First, the natural logarithm of (1) is taken (“log” will be used to represent the natural logarithm) for IR and Red $\log I = \log I_o - (s\beta_o + (1-s)\beta_r)l$ (2) **[0045]** (2) is then differentiated with respect to time $\frac{d\log I}{dt} = -(s\beta_O + (1-s)\beta_r)\frac{dl}{dt}$ (3) **[0046]** 3. Red (3) is divided by IR (3) $\frac{d\log I(\lambda_R)/dt}{d\log I(\lambda_{IR})/dt} = \frac{s\beta_O(\lambda_R) + (1-s)\beta_r(\lambda_R)}{s\beta_O(\lambda_{IR}) + (1-s)\beta_r(\lambda_{IR})}$ (4) **[0047]** 4. Solving for s $s = \frac{\frac{d\log I(\lambda_{IR})}{dt}\beta_r(\lambda_R) - \frac{d\log I(\lambda_R)}{dt}\beta_r(\lambda_{IR})}{\frac{d\log I(\lambda_R)}{dt}(\beta_O(\lambda_{IR}) - \beta_r(\lambda_{IR})) - \frac{d\log I(\lambda_{IR})}{dt}(\beta_O(\lambda_R) - \beta_r(\lambda_R))}$ Note in discrete time $\frac{d\log I(\lambda, t)}{dt} \approx \log I(\lambda, t_2) - \log I(\lambda, t_1)$

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	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Addison, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Addison, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B2

U.S. Pat. No. 9,651,533 B2 in view of 61/616524 Provisional of U.S. Patent Publication No. 20150057511 to Amar Sarbbasesh Basu ("Basu")

As described in detail below, Basu (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 B2 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Basu. The cited portions of Basu are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Basu. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Basu "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Basu does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Basu (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Basu anticipates and/or renders obvious the Asserted Claims of the '533 Patent

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Basu discloses or renders obvious a measurement system. **This invention includes two new technologies for sensing heart rate and blood pressure (The latter is indirectly measured using pulse wave velocity). Both approaches can be combined in one sensor.** Basu at [0032] **In a first approach, this device utilizes electronic optical proximity sensors (OPS) 10 to sense a patient's heart rate. Optical proximity sensors, also called light beam sensors, detect distance by measuring the magnitude of light reflected from an object**. **Variations of OPS are widely used for non-contact distance measurement in a variety of applications. In smart phones, for example, OPS detect when a phone is placed in a pocket, triggering touch-screen locking. In factory robotics, OPS are used for motion feedback control**. In many industrial and consumer applications, OPS serve as touchless switches and gesture sensing devices in personal notebooks, vending machines, sanitary dispensers, lavatories, dimming control, and video games. Basu at [0033] **An OPS is comprised of a light emitter (usually an infrared LED), LED drivers, a photodiode, a visible light blocking filter, an optical barrier, and mixed signal circuits for amplification, signal conditioning, and digitization. A second photodiode, sensitive to visible light, serves as an ambient lights sensor (ALS), useful for ambient noise cancellation.** Integrated digital OPS, available recently, are highly integrated devices which include all the above components in a small, surface mount package, typically a few mm in size. These sensors also provide a bidirectional serial interface to a microcontroller for sending data and configuring the device. Basu at [0034] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references

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	identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Basu discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. **In a further development, a compact OPS may contain a plurality of LEDs that may each emit light in a different spectral range (Figs. 9, 12, and 15). A photo detector equipped with different photodiodes tuned to the emitted wavelengths can distinguish the individual reflected photons by their wavelength**. For example, if one LED emits red light and a second LED emits light in the near infrared, a pulse oximetry sensor can be realized with a very small size. Fig. 9 illustrates how one red and one IR LED are arranged on opposite sides of a photo detector that includes photo diodes sensitive to different spectral ranges, here red and near IR. **Each of the LEDs is separated from the photo detector by an optical barrier. The optical barriers do not touch the transparent cover that separates the sensor from the human skin because a direct contact between the skin and the cover might otherwise result in a bad signal quality. But the height of the optical barriers can be altered with empirical measurements until an optimum configuration is found**. Basu at [0087] 20. **An optical proximity sensor comprising** the following in a single package: one or more LED emitters, one or more photo detectors, one or more visible light blocking filters, **one or more infrared blocking filters, an optical barrier between the LED and photo detectors** **an electronic IC which comprises an amplifier the photo detector signal, an analog to digital converter with at least 8 bit resolution, LED drivers, noise reduction and ambient light cancellation circuitry, and a digital serial interface for communication with a microcontroller.**

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	Basu at Claim 20. 11. The sensor of claim 10, **wherein the first and second electronic boards are arranged on a ring wearable on a finger, the ring forming electronic conducts connecting the first and second electronic boards**. Basu at Claim 11. **suitable wavelengths for pulse oximetry are in the range of about 600 nm to 700 nm for the red LED 15, preferably between about 650 nm and 670 nm, and about 850 nm to 950 nm, preferably about 900 nm to 940 nm for the near infrared LED 14**. Notably, a deviation from the preferred wavelengths is feasible and may make the sensor 10 cheaper due to the availability of commercially produced LEDs 14 and 15. The two LEDs 14 and 15 may be pulsed. Optionally, the two LEDs 14 and 15 may be pulsed at different frequencies through frequency multiplexing. Alternatively. The LEDs 14 and 15 may be pulsed in an alternating mode through time multiplexing. Pulsing the LEDs 14 and 15 promotes an easy distinction of the two signals where both signals are received by the same photo detector. Basu at [0091]. Integrated IR LED and visible light blocking filter: In many integrated OPS 10, **the emitter wavelength is in the near infrared range (850-950 nm), which is ideal for photoplethysmography**. Other OPS 10 allow the designer to add any discrete LED 14′ and 15, as will be later described in connection with FIGS. 14 and 15. The visible light blocking filter 14 included on some OPS 10 reduces the impact of ambient light. Basu at [0040]. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would

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	have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;[AP1]	Basu discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. **For providing a good signal-to-noise ratio, the LED may be pulsed so that the influx of ambient light can be measured during OFF phases of the LED. The ambient light component can be subtracted from the photo detector signal during ON phases to provide a sensitivity offset for proper calibration.** Basu at [0064] **Intensity control: To maximize the signal-to-noise ratio in photoplethysmography, the LED intensity should be made as large as possible** without saturating the detector. **In the OPS 10, the LED intensity and modulation frequencies are programmable through the serial interface**. **In the case of the Vishay VCNL4000, the intensity is programmable from 10-200 mA in 10 mA increments**. Others (like the APDS-9190), include digital interrupts which trigger when the photo detector signal is saturated. Basu at [0048] **OPS can provide heart rate sensing comparable to commercial reflectance pulse oximeters (RPO),** but in a package <5mm and with power consumption <10mW. This order of magnitude improvement enables us to make a 24 hour wearable heart rate sensor, and one small enough to be worn unobtrusively on a finger, ear, etc. (Figs. 3 and 4 and, e.g., Fig. 2B). Fig. 3, for example, is a picture of adigital optical proximity sensor (OPS) used for photoplethysmography. Heart rate sensing can be performed out of the box with more than one order of magnitude improvement in power. **In a second approach, a new sensor approach for detecting pulse wave velocity (PWV) (Fig. 5) uses a novel sensor setup which detects how fast a pulse wave travels (Figs. 5A and 5C). This approach is robust to environmental noise. PWV can be correlated with blood pressure**. The device works in the near infrared (~950 nm) range. By putting two sensors in two different locations (Fig. 5A), the

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	time it takes for a pulse wave to move through the vessel can be measured (Fig. 5B). This is called pulse wave velocity (PWV), and it is correlated with blood pressure and arterial stiffness. Basu at [0035] The embedded signal processing IC handles LED modulation, current control (10-200 mA in 10 mA steps), photo detector amplification and signal conditioning, ambient light cancellation, 16-bit ADC, and 120 bus communication. The ADC can resolve pulsation indices of 15 ppm. The LED can be modulated at frequencies up to 3.1MHz (user selectable) for electronic noise cancellation. Basu at [0037] An OPS uses electronic modulation to cancel noise and ambient light. The LED emitter is modulated at 1 KHz frequency or higher. Basu at [0045] **In a further development, a compact OPS may contain a plurality of LEDs that may each emit light in a different spectral range (Figs. 9, 12, and 15). A photo detector equipped with different photodiodes tuned to the emitted wavelengths can distinguish the individual reflected photons by their wavelength**. For example, if one LED emits red light and a second LED emits light in the near infrared, a pulse oximetry sensor can be realized with a very small size. Fig. 9 illustrates how one red and one IR LED are arranged on opposite sides of a photo detector that includes photo diodes sensitive to different spectral ranges, here red and near IR. **Each of the LEDs is separated from the photo detector by an optical barrier. The optical barriers do not touch the transparent cover that separates the sensor from the human skin because a direct contact between the skin and the cover might otherwise result in a bad signal quality. But the height of the optical barriers can be altered with empirical measurements until an optimum configuration is found**. Basu at [0087] The use of a multi-LED OPS for pulse oximetry is shown schematically in Figs. 9, 12, and 15. The sensor detects signals from multiple discrete LED emitters which can be multiplexed on a single photodiode detector. A typical sensor chip (shaded in green) includes the photodiode, 2 or more LED

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	drivers, and electronics for signal conditioning and multiplexing the data channels. The LEDs are added separately to the circuit board, along with an optical barrier to reduce leakage if desired. While this increases the chip count, it does allow flexibility in positioning the LEDs for either transmittance or reflectance mode, and in choosing the appropriate wavelengths. For pulse oximetry, a minimum of two LEDs are required, typically in the 650-950 nm range. A wide spectral sensitivity in the photo detector is preferable. The measurements from the two LEDs can be time multiplexed or frequency multiplexed. In the former case, each LED is modulated at a unique frequency, and reflectance signal from each LED can be extracted using on-chip demodulators. In time multiplexing, the LED measurements are interleaved. In both modes, frequency modulation can be used to improve noise reduction. Basu at [0090] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Basu discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample. **In a further development, a compact OPS may contain a plurality of LEDs that may each emit light in a different spectral range (Figs. 9, 12, and 15). A photo detector equipped with different photodiodes tuned to the emitted wavelengths can distinguish the individual reflected photons by their wavelength**. For example, if one LED emits red light and a second LED emits light in the near infrared, a pulse oximetry sensor can be realized with a very small size. Fig. 9 illustrates how one red and one IR LED are arranged on opposite sides of a photo detector that includes photo diodes sensitive to different spectral ranges, here red and near IR. **Each of the LEDs is separated from the photo detector by an optical barrier. The optical barriers do not touch the transparent cover that separates the sensor from the human skin because a direct contact between the skin and the cover might otherwise result in a bad signal quality. But the height of the optical barriers can be altered with empirical measurements until an optimum configuration is found**.

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	Basu at [0087] It is notable that most of the optoelectronic components and performance specifications required for OPS are the same as those used in PPG. In this paper, we show that a digital OPS can serve as a high-performance, reflectance-mode PPG sensor. Figs. 2D and 13 illustrate the working mechanism. The OPS is placed in direct contact with the skin, near a capillary bed. Ideal locations include the fingertip, earlobe, or forehead. **A protective overlay can be added if desired. The IR LED emits light into the tissue, where it experiences diffuse reflection from the tissue and capillary bed.** This establishes a baseline reflectance signal at the IR photodiode. When a pressure wave propagates through the capillary bed, the signal falls slightly (0.5-5%) due to increased light scattering. The change is detected by amplification and signal processing circuitry embedded in the OPS. Basu at [0036]. Electronic noise and offset reduction. The second function of the bandpass filter in PPG sensors is to remove high frequency noise, including 60/120 Hz noise from ambient light sources. While a 0.5-5Hz filter can usually remove such noise, it limits the bandwidth of the PPG sensor, which makes it difficult to resolve some time dependent features of the pressure pulse. An OPS uses electronic modulation to cancel noise and ambient light. The LED emitter is modulated at 1 KHz frequency or higher. The received PD signal oscillates at the same frequency, and the on-chip signal processing utilizes a bandpass or lock-in filtering scheme to remove all the other signal components. This technique effectively eliminates both high and low frequency noise without limiting the bandwidth. It also diminishes the impact of sunlight, which occurs in DC. **Finally, it can reduce offset if a glass overlay is placed between the sensor and the skin.** An ambient light sensor (ALS) can also be used for additional ambient light cancellation. Basu at [0045]. The ring serves as a housing for the sensor. The sensor includes electronics embedded into a plastic or rubber ring. As shown in Fig. 2C, the ring will be composed of two PCB boards, with interconnection provided by a flexible printed cable (FPC) similar to those used cell phones. In one embodiment, the lower board will contain the OPS sensor, a Bluetooth system on a chip (BT-SOC) module, and a 2.4GHz fractal antenna. The OPS sensor includes the optical barrier, LED, photodiode, ambient light

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	detector, and electronic amplification/drive components which are controlled by an IZC interface. **There may also be a transparent overlay between the sensor and the skin.** Basu at [0059]. **The light travels from the LED through the finger to the blood vessel and tissue, where it is partially reflected. The reflected signal is sensed by the PD. As a pulse of blood flows through the capillary bed, both photodiodes experience nearly identical pulse waves offset by a short transit time due to the finite velocity of the pulse wave.** A difference amplifier will produce a series of pulses whose width is inversely proportional to PWV. An illustrative electronic circuit is shown in Fig. 5C. An alternate approach uses two independent OPS sensors operating at different modulation frequencies. Both OPS signals can be processed by the same microprocessor to obtain real-time results. This approach is simpler but consumes more power. Both approaches will keep the sensor size small (<20% increase in total area). Basu at [0067]. In a further development, a compact OPS may contain a plurality of LEDs that may each emit light in a different spectral range (Figs. 9, 12, and 15). A photo detector equipped with different photodiodes tuned to the emitted wavelengths can distinguish the individual reflected photons by their wavelength. For example, if one LED emits red light and a second LED emits light in the near infrared, a pulse oximetry sensor can be realized with a very small size. Fig. 9 illustrates how one red and one IR LED are arranged on opposite sides of a photo detector that includes photo diodes sensitive to different spectral ranges, here red and near IR. Each of the LEDs is separated from the photo detector by an optical barrier. **The optical barriers do not touch the transparent cover that separates the sensor from the human skin because a direct contact between the skin and the cover might otherwise result in a bad signal quality.** But the height of the optical barriers can be altered with empirical measurements until an optimum configuration is found. Basu at [0087]. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references

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	identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Basu discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source. Photoplethysmography (PPG) is a ubiquitous monitoring technique for measuring heart rate and oxygen saturation. PPG sensors detect blood volume pulsations by time-resolved analysis of optical radiation either absorbed or scattered by a capillary bed [3]. Typical sensors include one or more light emitting diodes (LEDs) with wavelengths in the 600-1000 nm range, and a photodiode (PD). In transmission mode PPG, the LEDs and detectors are mounted on opposite sides of the tissue (such as a fingertip), and in reflectance mode, they are mounted adjacent to one another. As a pulse wave travels through the capillary bed, the transmitted or reflected light signal falls slightly due to the vessel expansion. The pulsation index, defined as the percentage change in the light signal, is typically 1-5%. **The changes are detected by the PD and processed through signal conditioning modules.** Reflectance PPG is simpler to implement, but often has a smaller pulsation index (PI), which is defined as the percentage change in the light signal. Basu at [0006]. 20. **An optical proximity sensor comprising** the following in a single package: one or more LED emitters, **one or more photo detectors,** one or more visible light blocking filters, one or more infrared blocking filters, an optical barrier between the LED and photo detectors an electronic IC which comprises an amplifier the photo detector signal, an analog to digital converter with at least 8 bit resolution, LED drivers, noise reduction and ambient light cancellation circuitry, and a digital serial interface for communication with a microcontroller.

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	Basu at Claim 20. **For providing a good signal-to-noise ratio, the LED may be pulsed so that the influx of ambient light can be measured during OFF phases of the LED. The ambient light component can be subtracted from the photo detector signal during ON phases to provide a sensitivity offset for proper calibration.** Basu at [0064] Electronic noise and offset reduction. The second function of the bandpass filter in PPG sensors is to remove high frequency noise, including 60/120 Hz noise from ambient light sources. While a 0.5-5Hz filter can usually remove such noise, it limits the bandwidth of the PPG sensor, which makes it difficult to resolve some time dependent features of the pressure pulse. An OPS uses electronic modulation to cancel noise and ambient light. **The LED emitter is modulated at 1 KHz frequency or higher. The received PD signal oscillates at the same frequency, and the on-chip signal processing utilizes a bandpass or lock-in filtering scheme to remove all the other signal components.** This technique effectively eliminates both high and low frequency noise without limiting the bandwidth. It also diminishes the impact of sunlight, which occurs in DC. Finally, it can reduce offset if a glass overlay is placed between the sensor and the skin. An ambient light sensor (ALS) can also be used for additional ambient light cancellation. Basu at [0045]. First, an optical barrier placed between the LED and photo detector (PD) greatly reduces the offset signal by eliminating light leakage and crosstalk from the LED to the photo detector (Fig. 2D and Fig. 13). Second, the small distance between LED and photo detector improves sensitivity. One of the challenges in reflectance pulse oximetry is that the majority of light emitted by the LED is forward scattered (diffused) through the tissue, leaving <5% backscattered to the detector. The backscattered light, which forms a concentric ring around the excitation LED falls off as 1/r2. In OPS sensors, the distance between LED and detector is <1 mm, whereas traditional reflectance pulse sensors require 4-5 mm. Thus, sensitivity is improved by a factor of about 10-50. The added sensitivity allows the sensor to operate at lower light, which reduces the power consumption. **The light travels from the LED through the finger to the blood vessel and tissue, where it is partially reflected. The reflected**

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	signal is sensed by the PD. This is the principle of reflectance pulse oximetry, which is a technique known per se. Basu at [0050]. The digital OPS used for single wavelength PPG is the VCNL4000 (Vishay Semiconductor), a fully integrated digital proximity and ambient light sensor with 16-bit resolution in a 4x4 mm leadless surface mount package (Figs. 2D and 13). It includes an embedded 895 nm IR LED and a photo detector with visible light blocking filter. The spacing between the LED and photo detector is about 2 mm, resulting in a large reflectance and sensitivity. The LED is embedded in a recessed region which serves as an optical barrier to reduce light leakage. **The embedded signal processing IC handles LED modulation, current control (10-200 mA in 10 mA steps), photo detector amplification and signal conditioning, ambient light cancellation, 16-bit ADC, and 1 2C bus communication.** The ADC can resolve pulsation indices of 15 ppm. The LED can be modulated at frequencies up to 3.1 MHz (user selectable) for electronic noise cancellation. To reduce power consumption, each measurement is completed in 75 μsec, and the LED is kept off at the remainder of the measurement cycle. Basu at [0037]. Blood pressure sensing using a differential-mode PWV Sensor is illustrated in Figs. 5A and 5B. Blood pressure, a ubiquitous stress marker, can be indirectly measured using pulse wave velocity (PWV) (Fig. 5B). A novel differential mode sensor can perform PWV while also reducing the common mode noise and drift of the sensor. A logical extension of the OPS, the structure includes an LED flanked by two symmetric photodiodes with optical barriers in between (Fig. 5A). The light travels from the LED through the finger to the blood vessel and tissue, where it is partially reflected. **The reflected signal is sensed by the PD. As a pulse of blood flows through the capillary bed, both photodiodes experience nearly identical pulse waves offset by a short transit time due to the finite velocity of the pulse wave. A difference amplifier will produce a series of pulses whose width is inversely proportional to PWV. An illustrative electronic circuit is shown in Fig. 5C.** An alternate approach uses two independent OPS sensors operating at different modulation frequencies. Both OPS signals can be processed by the same microprocessor to obtain real-time results. This approach is simpler but consumes more power. Both approaches will keep the sensor size small (<20% increase in total area).

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	Basu at [0067]. Fig. 10 illustrates the absorption spectra of oxyhemoglobin, i.e. hemoglobin that has been enriched with oxygen and is found in arterial blood, and of reduced hemoglobin, i.e. hemoglobin that does not carry oxygen. Because Oxyhemoglobin is typically found in arteries, pulse oximetry measures the component of the reflected infrared signal that alternates with the pulse of a patient. The red signal, on the other hand, is much more indicative of the reduced hemoglobin, which is more prevalent in veins and should thus not show a strong pulse. The red LED thus gives a baseline measurement. Comparing the signals from the two LEDs allows one to measure blood oxygenation, also referred to as SPO2, or oxygen partial pressure. Basu at [0092]. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	Basu discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen. **In a first approach, this device utilizes electronic optical proximity sensors (OPS) 10 to sense a patient's heart rate.** Optical proximity sensors, also called light beam sensors, detect distance by measuring the magnitude of light reflected from an object. Variations of OPS are widely used for non-contact distance measurement in a variety of applications. **In smart phones, for example, OPS detect when a phone is placed in a pocket, triggering touch-screen locking.** In factory robotics, OPS are used for motion feedback control. In many industrial and consumer applications, OPS serve as touchless switches and gesture sensing devices in personal notebooks, vending machines, sanitary dispensers, lavatories, dimming control, and video games.

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	Basu at [0033] In another preferred embodiment, **the upper board contains the battery, battery charger, USB port for charging, a microprocessor programmed with an operating system and the wireless module including a processor and an antenna for communications**. This arrangement frees up space on the lower board for the PD or PDS, the LED and the optical barriers (Fig. 7). The lower board may thus additionally carry a temperature sensor and the previously mentioned GSR sensor (Fig. 7). Basu at [0062] Having demonstrated that the sensor technology is fairly robust, **a wireless ring which combines the sensor with a Bluetooth transmitter linked to an Android application running on the user's cell phone**. Notably any other suitable operating system may be used. Android is one example of an open-source operating system that may same on licensing royalties. Basu at [0057] The sensor and transmitter electronics can be arranged on a printed circuit board (PCB) using standard software. A light Android application may connect to the ring via Bluetooth, downloads the PPG data, displays it on the screen, and uses signal processing to calculate the heart rate. Android is an open-source programming model with built-in libraries for simplifying the programming of Bluetooth and displays. Other operating systems and wireless protocols capable of communicating with a mobile device are also suitable. A ring for slipping the sensor onto a finger may be made of injection molded plastics or cured elastomers, both of which are inexpensive, compatible with embedded electronics, and flexible to allow for multiple ring sizes. Basu at [0058] These technologies will be integrated with a Bluetooth module or another suitable wireless technology and with rechargeable batteries in a small package, is wireless and can be comfortably worn throughout the day. OPS sensors and a low power Bluetooth transmitter can be integrated into the underside of a ring or placed on a board with the batteries. Beside Bluetooth technology and Bluetooth Low Energy technology, any other low-power transmission protocol is suitable for communication with a computer for evaluation.

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	Basu at [0052] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Basu discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **In another preferred embodiment, the upper board contains the battery, battery charger, USB port for charging, a microprocessor programmed with an operating system and the wireless module including a processor and an antenna for communications. This arrangement frees up space on the lower board for the PD or PDS, the LED and the optical barriers (Fig. 7). The lower board may thus additionally carry a temperature sensor and the previously mentioned GSR sensor (Fig. 7).** Basu at [0062] **Having demonstrated that the sensor technology is fairly robust, a wireless ring which combines the sensor with a Bluetooth transmitter linked to an Android application running on the user's cell phone.** Notably any other suitable operating system may be used. Android is one example of an open-source operating system that may same on licensing royalties. Basu at [0057] **The sensor and transmitter electronics can be arranged on a printed circuit board (PCB) using standard software. A light Android application may connect to the ring via Bluetooth, downloads**

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	the PPG data, displays it on the screen, and uses signal processing to calculate the heart rate. Android is an open-source programming model with built-in libraries for simplifying the programming of Bluetooth and displays. Other operating systems and wireless protocols capable of communicating with a mobile device are also suitable. A ring for slipping the sensor onto a finger may be made of injection molded plastics or cured elastomers, both of which are inexpensive, compatible with embedded electronics, and flexible to allow for multiple ring sizes. Basu at [0058] **These technologies will be integrated with a Bluetooth module or another suitable wireless technology and with rechargeable batteries in a small package, is wireless and can be comfortably worn throughout the day. OPS sensors and a low power Bluetooth transmitter can be integrated into the underside of a ring or placed on a board with the batteries. Beside Bluetooth technology and Bluetooth Low Energy technology, any other low-power transmission protocol is suitable for communication with a computer for evaluation.** Basu at [0052] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to	Basu discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **A "cloud-based" RPM infrastructure can actively manage cardiovascular health (Fig. 1). Using OPS technology, cardiovascular parameters can be monitored on a 24-hour ambulatory basis using wearable biosensors, with wireless transmission of relevant data to the patient's electronic**

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generate processed data and to store the processed data.	**medical record.** These data will then be available to the patient's physician, providing an effective tool for quantitative assessment, without bias from "white-coat" alteration, thus providing a means for evidence-based medical management. **In emergency situations, notifications can be sent to a medical response team and family members. Our underlying hypothesis is that an RPM-driven model will dramatically reduce the cost of chronic cardiovascular care through earlier detection of impending decompensation, white also improving health outcomes by motivating the patient to actively monitor health and take preventative measures.** Basu at [0055] The proposed system directly addresses chronic fatigue syndrome (CFS), which is increasingly affecting U.S. soldiers returning from deployment. It is aligned with CDMRP Psychological Health program to develop screening and diagnostic technologies that will serve its mission of improved prevention, detection, and treatment of psychological disorders which affect one in six soldiers post-deployment. Specifically, CDMRP has an interest in portable telemedicine-enabled diagnostic devices which can quantitatively assess the efficacy of CFS treatment. The low-cost, wireless health ring monitor provides a means to quantitatively assess all three aspects of CFS treatment (sleep, graded exercise, stress management), enabling patient self-monitoring and driven decision making by health care providers. **The key benefits to the proposed approach is 1) low cost, so it can be deployed to a large number of patients, ii) the sensor is small and nonintrusive, reducing patient discomfort and thereby increasing patient compliance, iii) it consumes low power, so it can provide 24 hour operation, iv) data is automatically transmitted wirelessly via Bluetooth, further reducing patient burden. The technology will result in new methods to assess efficacy and improve patient compliance to anti-CFS measures.** Basu at [0071] **The technology developed as a part of this proposal will ultimately be deployed in a cloud-based health monitoring and mentoring framework which integrates RPM with an online community involving medical caregivers and a social network of the veteran's peers (Fig. 1**). Accordingly, we have assembled a multidisciplinary team which includes a Pl, who is an expert in biosensor technology, and a co-Pl, an expert on stress and health. Also serving an advisory role is a medical chief at a regional Veterans Affairs (VA) hospital, and a former US Army Major who served as a combat

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	physician in Iraq. Our team firmly believes that this framework can be used to treat not only CFS but other psychosocial disorders. Basu at [0072] **In another preferred embodiment, the upper board contains the battery, battery charger, USB port for charging, a microprocessor programmed with an operating system and the wireless module including a processor and an antenna for communications. This arrangement frees up space on the lower board for the PD or PDS, the LED and the optical barriers (Fig. 7). The lower board may thus additionally carry a temperature sensor and the previously mentioned GSR sensor (Fig. 7).** Basu at [0062] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	See claim 5 above Basu discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. The digital OPS used for single wavelength PPG is the VCNL4000 (Vishay Semiconductor), a fully integrated digital proximity and ambient light sensor with 16-bit resolution in a 4x4 mm leadless surface mount package (Figs. 2D and 13). **It includes an embedded 895 nm IR LED and a photo detector with visible light blocking filter.** The spacing between the LED and photo detector is about 2 mm, resulting in a large reflectance and sensitivity. The LED is embedded in a recessed region which

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	serves as an optical barrier to reduce light leakage. The embedded signal processing IC handles LED modulation, current control (10-200 mA in 10 mA steps), photo detector amplification and signal conditioning, ambient light cancellation, 16-bit ADC, and 12C bus communication. The ADC can resolve pulsation indices of 15 ppm. The LED can be modulated at frequencies up to 3.1 MHz (user selectable) for electronic noise cancellation. To reduce power consumption, each measurement is completed in 75 μsec, and the LED is kept off at the remainder of the measurement cycle. This allows one to use a large LED current (100 mA) while consuming <200 μW power at a 100 Hz data rate. The supply voltage range is 2.5-3.6V, which is well suited for operation from a 3V coin cell battery. The IR LED is placed on a separate supply to reduce the effects of digital switching noise. The I2C serial interface, supported by most microcontrollers,is used to transmit data and configure the sensor. The cost of the component is <$2. Basu at [0037] Integrated IR LED and visible light blocking filter. In many integrated OPS, the emitter wavelength is in the near infrared range (850-950 nm), which is ideal PPG []. Other OPS allow the designer to add any discrete LED. The visible light blocking filter included on some OPS reduces the impact of ambient light. Basu at [0040] Suitable wavelengths for pulse oximetry are in the range of about 600 nm to 700 nm for the red LED, preferably between about 650 nm and 670 nm, and about 850 nm to 950 nm, preferably about 900 nm to 940 nm for the near infrared LED. Notably, a deviation from the preferred wavelengths is feasible and may make the sensor cheaper due to the availability of commercially produced LEDs. The two LEDs may be pulsed. Optionally, the two LEDs may be pulsed at different frequencies through frequency multiplexing. Alternatively. The LEDs may be pulsed in an alternating mode through time multiplexing. Pulsing the LEDs promotes an easy distinction of the two signals where both signals are received by the same photo detector. Basu at [0091]. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of

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	the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	See claim 5 above Basu discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. **Suitable wavelengths for pulse oximetry are in the range of about 600 nm to 700 nm for the red LED, preferably between about 650 nm and 670 nm, and about 850 nm to 950 nm, preferably about 900 nm to 940 nm for the near infrared LED. Notably, a deviation from the preferred wavelengths is feasible and may make the sensor cheaper due to the availability of commercially produced LEDs. The two LEDs may be pulsed. Optionally, the two LEDs may be pulsed at different frequencies through frequency multiplexing. Alternatively. The LEDs may be pulsed in an alternating mode through time multiplexing. Pulsing the LEDs promotes an easy distinction of the two signals where both signals are received by the same photo detector.** Basu at [0091]. **In a further development, a compact OPS may contain a plurality of LEDs that may each emit light in a different spectral range (Figs. 9, 12, and 15). A photo detector equipped with different photodiodes tuned to the emitted wavelengths can distinguish the individual reflected photons by their wavelength. For example, if one LED emits red light and a second LED emits light in the near infrared, a pulse oximetry sensor can be realized with a very small size. Fig. 9 illustrates how one red and one IR LED are arranged on opposite sides of a photo detector that includes photo diodes sensitive to different spectral ranges, here red and near IR. Each of the LEDs is separated from the photo detector by an optical barrier. The optical barriers do not touch the transparent cover that separates the sensor from the human skin because a direct contact between the skin and the cover might otherwise result in a bad signal quality. But the height of**

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	the optical barriers can be altered with empirical measurements until an optimum configuration is found. Basu at [0087]. Fig. 10 illustrates the absorption spectra of oxyhemoglobin, i.e. hemoglobin that has been enriched with oxygen and is found in arterial blood, and of reduced hemoglobin, i.e. hemoglobin that does not carry oxygen. Because Oxyhemoglobin is typically found in arteries, pulse oximetry measures the component of the reflected infrared signal that alternates with the pulse of a patient. The red signal, on the other hand, is much more indicative of the reduced hemoglobin, which is more prevalent in veins and should thus not show a strong pulse. The red LED thus gives a baseline measurement. Comparing the signals from the two LEDs allows one to measure blood oxygenation, also referred to as SPO2, or oxygen partial pressure. Basu at [0092]. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendant’s Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclsoed by Basu, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Basu, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B3

U.S. Pat. No. 9,651,533 in view of U.S. Patent Publication No. 2005/0049468 to Sven-Erik Carlson ("Carlson")

As described in detail below, Carlson (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

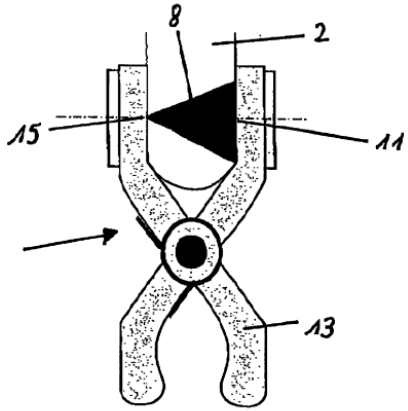
The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Carlson. The cited portions of Carlson are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Carlson. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Carlson "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Carlson does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Carlson (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Carlson anticipates and/or renders obvious the Asserted Claims of the '533 Patent

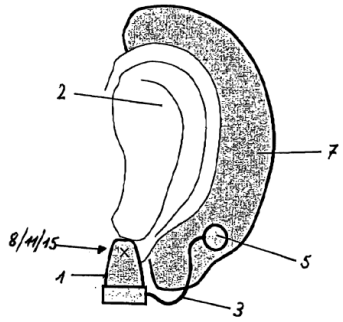
This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

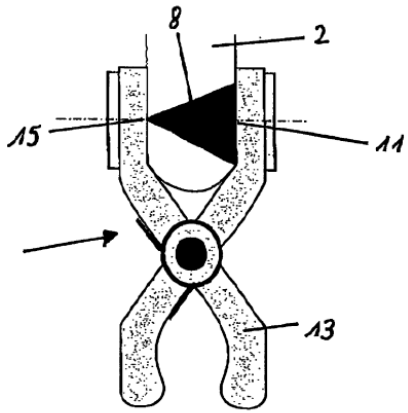
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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Carlson discloses or renders obvious a measurement system. The invention relates in particular to **optical pulsoximetry** used for **non-invasive measurement of pulsation and oxygen saturation in arterial human or animal blood, and is particularly concerned with increasing the technical performance of pulsoximetry in terms of quality and robustness of the measurement signal versus environmental disturbances and energy consumption**. Carlson at [0002] **at least one measuring Sensor for the acquisition of the medical data, Such as the State of the cardiovascular and pulmonary System, as e.g. pulsa tion frequency, oxygen Saturation of blood, breathing frequency, etc. of a human being or an animal, comprising at least one light Source which can emit light at least at two wavelengths, as well as at least one light receiver for determining the light transmit ted through a tissue portion of the perSon or the animal:** Carlson at [0012] FIG. 2 schematically the ear clip of FIG. 1 in cross section view.

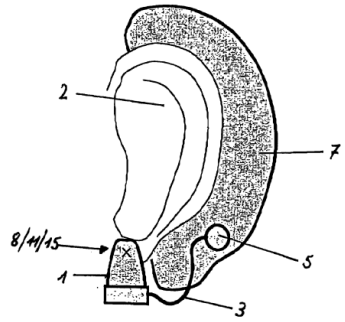
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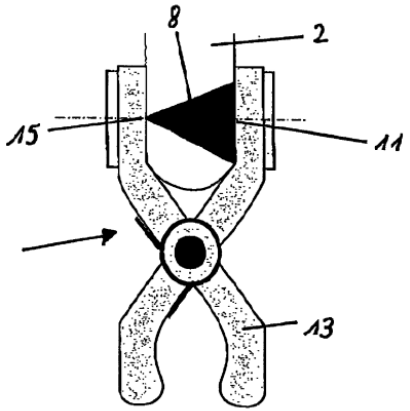
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	 Figure 2 Carlson at Fig.2. By using one of the proposed devices or methods, respectively, according to the present invention or a combination thereof, **it is possible to use pulsoximetric measurement or monitoring to survey the health condition of a person or an animal which is mobile.** In other words, **pulsoximetric measurement is not restricted for use in, e.g., a hospital but can also be used, if a person is travelling, is staying at home, etc.** Furthermore, it is also possible to study health conditions of animals living in nature such as e.g. cows feeding outside. Carlson at [0072]

’533 Patent	Carlson
	 Figure 1 Carlson at Fig.1. As already mentioned in the introduction, **the sensor is working according to the oximetric principal** which is known best out of the state of the art. **Optical pulsoximetry is used for non-invasive measurement, e.g. for pulsation and oxygen saturation in the human body**. The light source is emitting light at two wavelengths, at 660 nm and a second wavelength within the range of 800 to 1000 nm, which means in the present case at 890 nm. Therefore, it is of course also possible to have two light emitting sources arranged, which means two LEDs. The light receiver is determining the light transmitted through the earlobe, which means through the tissue portion of a person to be surveyed. Carlson at [0050]. Coming back to the fixing system, which means **a clip as shown in FIGS. 1 and 2, it has to be mentioned that when using a clip for fixing a pulsoximetric sensor, problems could occur due to strong movements of the human or animal individual or due to swelling or contracting of the human or animal tissue during the measurement with the pulsoximetric sensor**. In other words, if e.g. an earlobe of an ear 2, as shown in FIG. 2, would swell, than the distance between the LED 15 and the photo detector 11 would increase and, what is even more critical, the beam path could divert substantially from the optical axis of the LED and the photo detector. Carlson at [0073]

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	 Figure 2 Carlson at Fig.2. **In FIG. 2, the ear clip 1 is shown in cross section where it can specifically be seen that the sensor is designed in form on a clip 13.** The sensor or ear clip 13 furthermore includes a light source 15 which emits a light beam 8 to a light receiver 11. The light is guided or emitted through the ear skin or earlobe 2. Carlson at [0049] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting	Carlson discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam

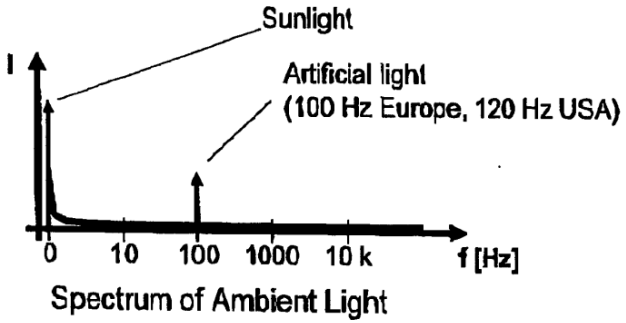
’533 Patent	Carlson
diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. Proposed is a configuration for the acquisition and/or monitoring of medical data, in particular the state of the cardiovascular and pulmonary system, blood values or blood composition, characterised by at least one measuring sensor for the acquisition of the medical data such as the state of the cardiovascular system, etc. of a person comprising at least one light source which can emit light at least at two wavelengths, as well as at least one light receiver for determining the light transmitted and/or reflected through a tissue portion of a person or an animal further comprising means in order to increase the optical Signal-to-Noise and/or Signal-to-Background ratio. Carlson at Abstract Pulsoximetry is a widely used standard optical technology for non-invasive monitoring of pulsation and oxygen saturation in arterial human or animal blood [1]. The method consists of measuring the absorption of reduced (Hb)—and oxidized (HbO2) haemoglobin at two optical wavelengths, where the relative absorption coefficients differ significantly, e.g. 660 nm and a second wavelength in the range of 800 to 1000 nm, preferably 890 nm or 950 nm. A concise description of the measurement method and the sensor signals is given in [2]. Carlson at [0003] FIG. 1 shows schematically the arrangement of **an ear sensor 1 which can be arranged in form of an ear clip**. **This sensor 1 can be arranged e.g. at an earlobe of ear 2.** Furthermore, the sensor or ear clip is connected via a wire 3 and the connection 5 with the main unit 7 including e.g. a power source, like a battery, and measuring and/or monitoring electronics. Carlson at [0048] Of course, **the sensor can also be arranged at other parts of the human body, such as e.g. at a finger or a toe. In addition, the monitoring can also be executed at animals, which means that pulsoximetric sensors can also be arranged e.g. at the ear of animals, such as e.g. cows.** According to an alternative design of the sensor, it could also be possible to arrange the light receiver in such a

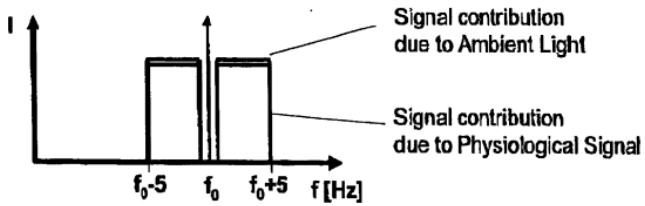
’533 Patent	Carlson
	way so that the light reflected through the earlobe is determined. Again, according to a further alternative, it could even be possible by arranging at least two light receivers to determine the light transmitted through the earlobe and the light reflected by the earlobe. Carlson at [0052] By using one of the proposed devices or methods, respectively, according to the present invention or a combination thereof, **it is possible to use pulsoximetric measurement or monitoring to survey the health condition of a person or an animal which is mobile.** In other words, **pulsoximetric measurement is not restricted for use in, e.g., a hospital but can also be used, if a person is travelling, is staying at home, etc.** Furthermore, it is also possible to study health conditions of animals living in nature such as e.g. cows feeding outside. Carlson at [0072]  Figure 1 Carlson at Fig.1. Coming back to the fixing system, which means **a clip as shown in FIGS. 1 and 2, it has to be mentioned that when using a clip for fixing a pulsoximetric sensor, problems could occur due to strong movements of the human or animal individual or due to swelling or contracting of the human or animal tissue during the measurement with the pulsoximetric sensor**. In other words, if e.g. an earlobe of an ear 2, as shown in FIG. 2, would swell, than the distance between the LED 15 and

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	the photo detector 11 would increase and, what is even more critical, the beam path could divert substantially from the optical axis of the LED and the photo detector. Carlson at [0073] Comparing the clip mechanism according to FIGS. 1 and 2 and the frame 61 as shown in FIG. 10 a, it is obvious that in using a frame it is not easy to arrange or remove **the pulsoximetric sensor to or from an earlobe of an ear, if required, e.g. if a person wearing the pulsoximetric sensor** is taking a bath, a shower, etc. Therefore, it is proposed, as shown schematically in FIG. 10 b, to use a snap-in mechanism 71, which means that the clamp mechanism 63 holding **the LED 15** can be rotated e.g. in direction ot dashed line 73 around an axis 69 and removed from the frame 61 or vice versa can be arranged at the frame 61 by arranging within the axis 69 and within the snap mechanism 71. Therefore, the LSD 15 has not to be rotated within the screw connection 65 between the clamp mechanism 63 for removing the frame 61 from an earlobe of an ear. Carlson at [0074].  Figure 2 Carlson at Fig.2.

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	In FIG. 2, the ear clip 1 is shown in cross section where it can specifically be seen that the sensor is designed in form on a clip 13. The sensor or ear clip 13 furthermore includes a light source 15 which emits a light beam 8 to a light receiver 11. The light is guided or emitted through the ear skin or earlobe 2. Carlson at [0049] As already mentioned in the introduction, the sensor is working according to the oximetric principal which is known best out of the state of the art. **Optical pulsoximetry is used for non-invasive measurement, e.g. for pulsation and oxygen saturation in the human body. The light source is emitting light at two wavelengths, at 660 nm and a second wavelength within the range of 800 to 1000 nm, which means in the present case at 890 nm. Therefore, it is of course also possible to have two light emitting sources arranged, which means two LEDs.** The light receiver is determining the light transmitted through the earlobe, which means through the tissue portion of a person to be surveyed. Carlson at [0050] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at	Carlson discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. By using sensor architecture as shown in FIG. 6 c, the Signal-to-Background ratio may be increased in a range of a factor 50 to 1000. According to a further aspect of the present invention, **it is furthermore possible to use a light source modulation to temporarily modulate the optical radiation of the LED. . . .** The basic idea of using AC-Coupling or Lock-In Amplification (synchronous detection), **is**

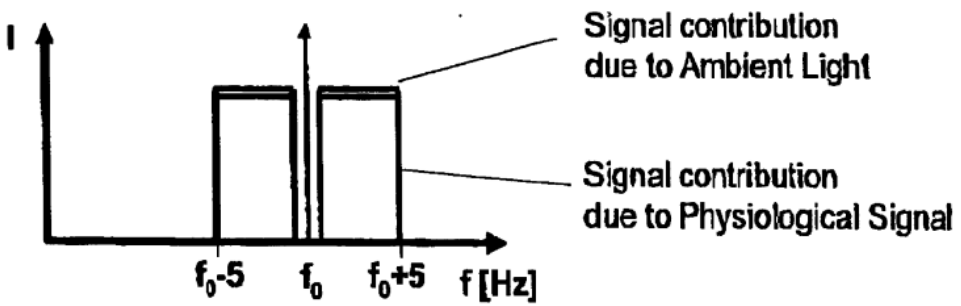
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least one of the plurality of semiconductor sources;	**to temporarily modulate the optical radiation of the LED at the carrier frequency fc in order to shift the power spectrum of the pulsoximeter signals into a higher frequency range** where environmental optical radiation is unlikely and electronic band pass filtering is technologically less stringent. AC-Coupling or Lock-In Amplification is well known out of the state of the art and is described in literature 3. Carlson at [0063-0065]  Figure 7b Carlson at Fig.7b. As a consequence, it is therefore proposed to emit light by the LEDs not as current or continuous light but as pulsed light. **The frequency is chosen in such a way that it is outside the frequency spectrum of sunlight and of ambient light which, according to FIG. 7 b, is in the range of above approximately 1000 Hz. Thus, the pulsoximeter signals are readily discriminated from electronic and parasitic contributions of environmental optical radiation outside the frequency fc+/−5 Hz increasing significantly the Signal-to-Noise and Signal-to-Background ratio. FIG. 8 shows the shift spectrum of signal to a region where there is little influence, e.g. of ambient light. F0 is the chosen frequency of the emitted light to operate the pulsoximeter sensor and the range between f0−5 Hz and f0+5 Hz is the consequence of the influence of the frequency due to physiological signal**. Therefore, as shown in FIG. 8, the frequency spectrum of signal at the photo diode does have

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	a basic signal contribution due to physiological signal. The signal contribution which is shown at the top of the signal contribution due to physiological signal and which is due to ambient light, is very small and as a consequence is approximately neglectable. Any noise or sunlight within the range of 0 to 120 Hz, while the light beam for the pulsoximetric measurement is within the range of approximately f0−5 Hz to f0+5 Hz, will not influence the measurement of the pulsoximetric sensor. F0 could be e.g., as mentioned, 1000 Hz which of course is a frequency far outside of any indoor light source, as e.g. halogen light, conventional light, etc. f0 of course can be chosen at any other frequency, as e.g. 2000 Hz or even higher. By using light source modulation, it is even possible to use an additional filter removing a certain frequency spectrum. Looking e.g. at FIG. 9, it is possible to arrange a filter band pass 51 which is e.g. removing any frequencies in the range of 0 to 120 Hz. The respective filter is shown in form of the dashed line 51. As a result, we end up by a diagram according to FIG. 9 b only showing any measurements in the range of f0−5 Hz to f0+5 Hz. Carlson at [0069]  Figure 8 Carlson at Fig.8. 11. Configuration according to claim 10, comprising a light source amplitude modulating means to modulate the frequency of the emitted light in a frequency range substantially outside of frequency of noise and/or environmental signals.

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	Carlson at Claim 11 13. Configuration according to one of the claims 10 to 12, comprising means for light source amplitude modulating or light source modulating means to shift the frequency of the emitted light in a range of above 120 Hz, preferably above 500 Hz. Carlson at Claim 13 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Carlson discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample **FIG. 8 a diagram showing power spectrum of physiological signals and ambient light with phase shifting or modulation of the light source of a sensor**. Carlson at [0045]

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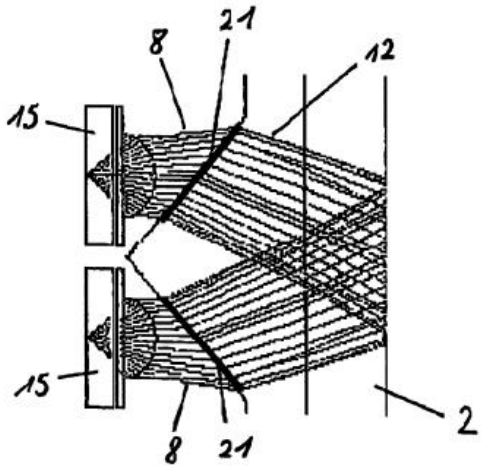
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	 Figure 8 Carlson at Fig. 8. As already mentioned in the introduction, the sensor is working according to the oximetric principal which is known best out of the state of the art. **Optical pulsoximetry is used for non-invasive measurement, e.g. for pulsation and oxygen saturation in the human body. The light source is emitting light at two wavelengths, at 660 nm and a second wavelength within the range of 800 to 1000 nm, which means in the present case at 890 nm. Therefore, it is of course also possible to have two light emitting sources arranged, which means two LEDs. The light receiver is determining the light transmitted through the earlobe, which means through the tissue portion of a person to be surveyed.** Carlson at [0050]. **The basic idea therefore is to use a beam-shaping element, such as e.g. diffractive or refractive lenses, to direct the emitted optical radiation of, e.g., the LED light source into the human or animal tissue and the photon detecting element in order to increase the optical signal power,**

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	detected by the pulsoximeter sensor, and thus increasing the Signal/Noise—and signal/Background ratio. The increase of the S/B ratio is estimated e.g. to a factor 5. Carlson at [0014] **According to the preferred embodiment of the invention, the various described optical and geometric means, such as the beam shaping element as shown in FIG. 4, the wavelength filters, the sensor architecture, and the mentioned baffles, can be combined as shown in principle and perspective view in FIG. 6 *c*. Again, light is emitted from the two LEDs 15 and is shaped by the two beam shaping elements or lenses 21 to be guided as beams 12 through the earlobe 2. After the earlobe, the double pass filter 33 is arranged to guarantee that only light in the range of approximately 660 nm and in the range of approximately 890 nm is transmitted through the filter. After the filter, any stray light, entered the sensor e.g. trough the earlobe from the side, will be trapped within the baffles 37 which are arranged in circumferential direction. Finally, a photo detecting element 35 is arranged with specific spectrum sensitivity.** Carlson at [0062] Therefore, **it is proposed, as shown in FIG. 4, to use beam shaping optics 20 to direct the emitted optical radiation 8 emitted from the two LEDs 15 to the middle of the earlobe. As it is shown clearly in FIG. 4, using the beam shaping optics 21, the two initial light beams 8 are guided in form of bundled beams 12 to a relatively small area within the middle ear 2. By using the beam shaping optics 21, of course the influence of environmental light or noise, respectively, can be reduced substantially by increasing the S/B ratio. First or all, the light beam is bundled and, in addition, the optical signal power can be increased.** Carlson at [0054] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it

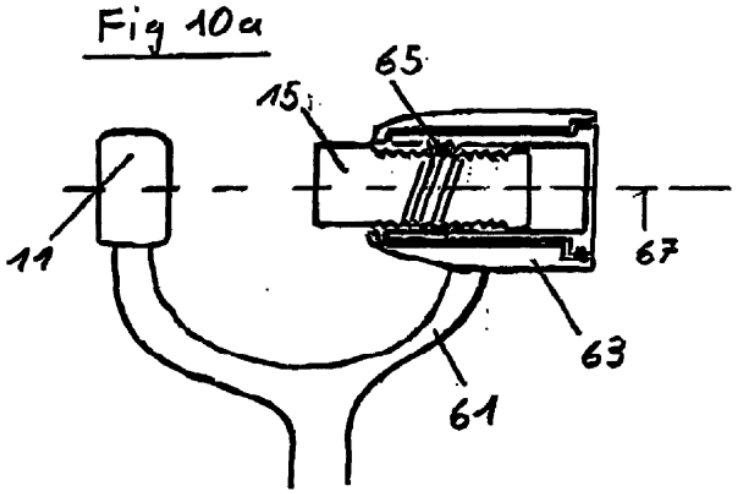
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	would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Carlson discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source **Within the main unit 7 the measured values can be compared with reference values being representative for a certain health status of the person to be surveyed**. Carlson at [0051] Of course, the sensor can also be arranged at other parts of the human body, such as e.g. at a finger or a toe. In addition, the monitoring can also be executed at animals, which means that pulsoximetric sensors can also be arranged e.g. at the ear of animals, such as e.g. cows. According to an alternative design of **the sensor, it could also be possible to arrange the light receiver in such a way so that the light reflected through the earlobe is determined. Again, according to a further alternative, it could even be possible by arranging at least two light receivers to determine the light transmitted through the earlobe and the light reflected by the earlobe.** Carlson at [0052]

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	 Figure 4 Carlson at Fig.4. Of course, it is **furthermore possible to combine wavelength filters, wavelength sensitive receivers like photodiodes,** with beam shaping optics as described with reference to FIG. 4. Carlson at [0058]

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	 Carlson at Fig.10a. In this case, of course, other means have to be provided, **so that the distance between the LED 15 and the photo detector 11 can be adjusted or adapted to the thickness of the tissue to be monitored.** Therefore, according to FIG. 10 a, it is proposed that the LED 15 is arranged within a clamping mechanism 63 and that between the clamping mechanism 63 and the LED a screw connection 65 is arranged, so that the LED 15 can be moved into the clamping mechanism or out of the clamping mechanism 63. In other words, **the distance between the LED 15 and the photo detector 11 can be adjusted along the optical axis 67 which guarantees that the beam path has always been co-linear with the optical axis 67 of the LED and the photo detector.** Carlson at [0073] The invention, as described with reference to FIG. 1 to 10, is of course not limited to the examples as shown in FIG. 1 to 9, but can be differently designed combined with other features, etc. **E.g. pulsoximetric measurements can also be done at other parts of the body like e.g. fingers or toes.** In addition, not only one light source can be used for the measurement, but also two or even more light emitting sources. It is understood that also **one, two, or more light receiving detectors can be used.**

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	Carlson at [0075] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	Carlson discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen **The measured values can be transmitted via a wire connection or wireless, e.g. within the range of radio frequency. Well known these days is wireless transmission using “Bluetooth” technology.** According to a further embodiment, the pulsoximetric sensor could be included within a hearing aid device. Carlson at [0077] Taking prior art into consideration, **the measured values can be monitored at a special unit worn by the person or patient, respectively, where e.g. a signal is generated, if the measured value is not within a predetermined range.** In other words, health problems could be detected and an alarm signal could be generated which can be transmitted to a respective person, to a medical doctor, to a hospital, etc. so that help can be organised. Furthermore, it is possible to include e.g. a so-called GPS device which at any time gives the location of the person using the pulsoximetric sensor monitoring configuration. Carlson at [0078] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of

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	the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Carlson discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **The measured values can be transmitted via a wire connection or wireless, e.g. within the range of radio frequency. Well known these days is wireless transmission using “Bluetooth” technology.** According to a further embodiment, the pulsoximetric sensor could be included within a hearing aid device. Carlson at [0077] Taking prior art into consideration, **the measured values can be monitored at a special unit worn by the person or patient, respectively, where e.g. a signal is generated, if the measured value is not within a predetermined range.** In other words, health problems could be detected and an alarm signal could be generated which can be transmitted to a respective person, to a medical doctor, to a hospital, etc. so that help can be organised. Furthermore, it is possible to include e.g. a so-called GPS device which at any time gives the location of the person using the pulsoximetric sensor monitoring configuration. Carlson at [0078] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it

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	would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	Carlson discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **The measured values can be transmitted via a wire connection or wireless, e.g. within the range of radio frequency. Well known these days is wireless transmission using “Bluetooth” technology.** According to a further embodiment, the pulsoximetric sensor could be included within a hearing aid device. Carlson at [0077] Taking prior art into consideration, **the measured values can be monitored at a special unit worn by the person or patient, respectively, where e.g. a signal is generated, if the measured value is not within a predetermined range.** In other words, health problems could be detected and an alarm signal could be generated which can be transmitted to a respective person, to a medical doctor, to a hospital, etc. so that help can be organised. Furthermore, it is possible to include e.g. a so-called GPS device which at any time gives the location of the person using the pulsoximetric sensor monitoring configuration. Carlson at [0078] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further	See claim 5 above

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comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	Carlson discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. As already mentioned in the introduction, the sensor is working according to the oximetric principal which is known best out of the state of the art. **Optical pulsoximetry is used for non-invasive measurement, e.g. for pulsation and oxygen saturation in the human body. The light source is emitting light at two wavelengths, at 660 nm and a second wavelength within the range of 800 to 1000 nm, which means in the present case at 890 nm. Therefore, it is of course also possible to have two light emitting sources arranged, which means two LEDs. The light receiver is determining the light transmitted through the earlobe, which means through the tissue portion of a person to be surveyed.** Carlson at [0059] **A further possibility for the better performance of a pulsoximetric sensor, is to arrange geometric means as e.g. so-called geometrical baffles (light trap). In FIG. 6 a, a part of a pulsoximetric sensor is shown, which means the part of the sensor after the transmitted light has passed, e.g. the earlobe of a human or animal individual. Within the mentioned sensor part 31, after e.g. a double pass filter 33, circumferential extending baffles 37 are arranged to avoid stray light to reach the photo detecting element.** Carlson at [0059] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical	See claim 5 above

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beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	Carlson discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. Pulsoximetry is a widely used standard optical technology for non-invasive monitoring of pulsation and oxygen saturation in arterial human or animal blood [1]. The method consists of measuring the absorption of reduced (Hb)—and oxidized (HbO2) haemoglobin at two optical wavelengths, where the relative absorption coefficients differ significantly, e.g. 660 nm and a second wavelength in the range of 800 to 1000 nm, preferably 890 nm or 950 nm. A concise description of the measurement method and the sensor signals is given in [2]. Carlson at [0003] The posed problem is solved by means of a configuration/method according to the invention. Proposed is a configuration for monitoring which comprises at least one of the following components: **at least one measuring sensor for the acquisition of the medical data, such as the state of the cardiovascular and pulmonary system, as e.g. pulsation frequency, oxygen saturation of blood, breathing frequency, etc. of a human being or an animal, comprising at least one light source which can emit light at least at two wavelengths, as well as at least one light receiver for determining the light transmitted through a tissue portion of the person or the animal;** at least one beam shaping optical element to direct the emitted light to a human or animal tissue and the light receiver in order to increase the optical signal power. Carlson at [0011] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Carlson, it

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	would have been obvious to one of ordinary skill in the art to combine, with the teachings of Carlson, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B4

U.S. Pat. No. 9,651,533 in view of U.S. Patent Publication No. 20120197093 to ("LeBoeuf")

As described in detail below, LeBoeuf (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in LeBoeuf. The cited portions of LeBoeuf are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of LeBoeuf. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that LeBoeuf "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found LeBoeuf does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in LeBoeuf (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in LeBoeuf anticipates and/or renders obvious the Asserted Claims of the '533 Patent

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. LeBoeuf discloses or renders obvious a measurement system. **Apparatus and methods for attenuating environmental interference are described. A wearable monitoring apparatus includes a housing configured to be attached to the body of a subject and a sensor module that includes an energy emitter that directs energy at a target region of the subject, a detector that detects an energy response signal—or physiological condition—from the subject, a filter that removes time-varying environmental interference from the energy response signal, and at least one processor that controls operations of the energy emitter, detector, and filter.** LeBoeuf at Abstract. According to some embodiments of the present invention, **a medium (e.g., physiological material of a subject), having a region of interest, is monitored via a sensor module having at least one energy emitter for interrogating the medium with energy to generate an energy response associated with the medium, at least one circuit to drive at least one energy emitter, at least one detector for detecting the energy response associated with the medium, a filter that removes time-varying environmental interference from the energy response signal, and a processor that controls operations of the energy emitter, detector, and filter**. LeBoeuf at [0005] According to some embodiments of the present invention, **a wearable monitoring apparatus includes a housing (e.g., an earpiece, earbud, etc.), and a sensor module disposed within or attached to the housing. The housing is configured to be attached to a body of a subject, for example the ear. The sensor module includes an energy emitter, a detector, a filter, and at least one processor. The energy emitter directs energy (e.g., optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, mechanical energy, magnetic energy, nuclear energy, etc.) at a target region of the subject and the detector detects an energy response signal from the subject. The energy response signal is associated with a physiological condition of the subject (e.g., heart rate, pulse pressure, respiration rate, lactic threshold, blood pressure, volume**

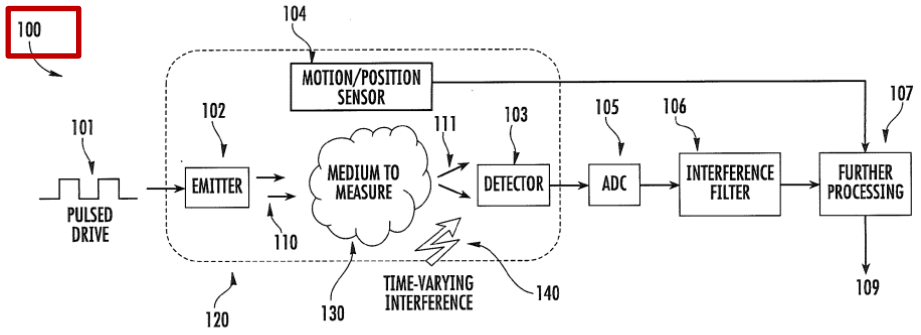
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	of blood flow through a blood vessel, blood metabolite level, blood oxygen level, size of at least one blood vessel, etc.). The filter removes or attenuates time-varying environmental interference from the energy response signal, wherein the time-varying environmental interference is caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc. LeBoeuf at [0006] **The detectors that may be incorporated into headsets, earbuds, and/or substrates (e.g., wristbands, armbands, legbands, neckbands, waistbands, anklebands, footbands, handbands, ringbands, headbands, etc.) according to some embodiments of the present invention, may be configured to detect and/or measure one or more of the following types of physiological information/conditions: heart rate, pulse rate, breathing rate, blood flow, VO2, VO2max, heartbeat signatures, cardio-pulmonary health, organ health, metabolism, electrolyte type and/or concentration, physical activity, caloric intake, caloric metabolism, blood metabolite levels or ratios, blood pH level, physical and/or psychological stress levels and/or stress level indicators, drug dosage and/or dosimetry, physiological drug reactions, drug chemistry, biochemistry, position and/or balance, body strain, neurological functioning, brain activity, brain waves, blood pressure, cranial pressure, hydration level, auscultatory information, auscultatory signals associated with pregnancy, physiological response to infection, skin and/or core body temperature, eye muscle movement, blood volume, inhaled and/or exhaled breath volume, physical exertion, exhaled breath physical and/or chemical composition, the presence and/or identity and/or concentration of viruses and/or bacteria, foreign matter in the body, internal toxins, heavy metals in the body, anxiety, fertility, ovulation, sex hormones, psychological mood, sleep patterns, hunger and/or thirst, hormone type and/or concentration, cholesterol, lipids, blood panel, bone density, organ and/or body weight, reflex response, sexual arousal, mental and/or physical alertness, sleepiness, auscultatory information, response to external stimuli, swallowing volume, swallowing rate, sickness, voice characteristics, voice tone, voice pitch, voice volume, vital signs, head tilt, allergic reactions, inflammation response, auto-immune response, mutagenic response, DNA, proteins, protein levels in the blood, water content of the blood, pheromones, internal body sounds, digestive system functioning, cellular regeneration response, healing response, stem cell regeneration response, etc** LeBoeuf at [0050]

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	The term “monitoring” refers to the act of measuring, quantifying, qualifying, estimating, sensing, calculating, interpolating, extrapolating, inferring, deducing, or any combination of these actions. More generally, “monitoring” refers to a way of getting information via one or more sensing elements. For example, “blood health monitoring” includes monitoring blood gas levels, blood hydration, and metabolite/electrolyte levels. LeBoeuf at [0099]. Embodiments of the present invention are not limited to headsets that communicate wirelessly. **In some embodiments of the present invention, headsets configured to monitor an individual's physiology and/or environment may be wired to a device that stores and/or processes data or there may be a combination of wired and wireless communications**. In some embodiments, this information may be stored on the headset itself. Furthermore, embodiments of the present invention are not limited to earbuds. In some embodiments, the invention may be employed around another part of the body, such as a digit, finger, toe, limb, wrist, ankle, around the nose or earlobe, or the like. In other embodiments, the invention may be integrated into a patch, such as a bandage that sticks on a person's body. LeBoeuf at [0106] **FIG. 1 illustrates an interference filtering apparatus/method 100, according to some embodiments of the present invention**. A medium 130, preferably physiological material of a living subject, comprises at least one target region of interest 120 which is interrogated by energy 110, preferably modulated energy, such as pulsed energy, generated by an energy emitter 102. **A pulsed driving circuit 101 is used to drive at least one energy emitter 102 at one or more pulsed frequencies to interrogate at least one target region of at least one medium 130 with the pulsed energy 110.** The energy may be in the form of electromagnetic, acoustical, mechanical, nuclear, electrical, magnetic, thermal, or other forms of energy, but typically optical energy from the electromagnetic spectrum. The energy reaching the medium 130 can interact with the medium to generate at least one energy response signal 111, such as an optical scatter signal 111 between emitted optical energy 110 and the medium 130. **The energy response 111 caused by this interaction is detected by at least one detector 103, configured to detect energy in the forms described above,**

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	but typically in the form of optical energy scattered from the medium 130. A motion/position sensor 104 may be configured to measure movement, positional changes, or inertial changes in the vicinity of the medium 130. The outputs of the detector 103 may be sent to at least one analog-to-digital convertor (ADC) 105 and the digitized output may be sent to at least one interference filter 106, which is configured to remove the effects of time-varying environmental interference 140 from the signal output of the detector 103. At least one motion/position sensor 104 may be incorporated in the interference filtering method 100 to provide a reference signal for removing the effects of motion from the extracted energy response signal 111 to produce a desired signal 109. For example, the output of the interference filter 106 may be further processed by signal extraction filter 107 to extract accurate information from the medium 130, and this signal extraction filter 107 may utilize the output of the motion/position sensor 104 to remove motion artifacts from the desired signal (the extracted energy response signal) 109. At least one signal processor (not shown) may be used to control the operations of the energy emitter 102, detector 103, filter 106, and/or other components of the interference filtering method 100. LeBoeuf at [0107] **In some embodiments of the present invention, a monitoring apparatus is configured to be a wearable monitor for monitoring at least one physiological condition of the wearer. In such an embodiment, pulsed electromagnetic energy 110 from at least one electromagnetic emitter 102, typically an optical emitter, is directed towards at least one physiological region 130, typically the ear region, of a subject. Examples of optical emitters include light-emitting diodes (LEDs), laser diodes (LDs), lamps, organic emitters (such as OLEDs), and the lik**e. **The sensor components (102, 103, and 104) may be integrated within the ear region 120 in the form-factor of an earbud** or other ear-worn form-factor such that the measurement medium 130 comprises blood vessels and/or blood flow within the ear region. The intensity of the pulsed optical energy 110 is modulated by at least one pulsed driving circuit 101 such that the intensity is time-varying with at least two states, preferably an on state and an off state. This time-varying energy generates a time-varying energy response, typically an optical interaction response, such as optical absorption, modulation, scatter, transmission, luminescence, or the like, from the physiological region 130. A first optical interaction response is obtained by at least one detector 103, typically an optical detector, when the pulsed optical energy 110 is in the on state. A second energy response, in this case a second optical interaction response, is obtained by the optical detector 103 when the pulsed optical energy 110 is in

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	the off state. (In some cases, other optical interaction responses may be collected in other modulated states of the pulsed energy 110.) The first and second energy response signals are digitized by at least one ADC 105 and the digitized signals are processed via an interference filter 106 to produce a processed energy response signal that is associated with a physiological condition of the subject, wherein the filter removes time-varying environmental interference caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc. The output of the interference filter 106 is then processed by a signal extraction filter 107 to accurately extract at least one physiological property of the subject. A motion/position sensor 104 may be configured to measure the motion/position between the medium 130 and the emitter 102, the detector 103, and/or the time-varying interference 140, for example, caused by motion of the subject. The output signal of the motion sensor 104 may provide a motion artifact reference to the signal extraction filter 107 such that the motion/position information may be selectively removed from the desired signal output. Incorporating a motion sensor in embodiments of the present invention may be particularly important because time-varying interference, such as sunlight hitting an earbud, is often modulated by motion, and monitoring and subtracting this motion from the desired output may be critical to generating an accurate physiological signal in the midst of daily life activities of the subject. LeBoeuf at [0108]  FIG. 1 LeBoeuf at Fig.1

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	Various forms of energy 110 can be used to interrogate one or more mediums 130 and to characterize those mediums by detectors 103 configured to detect the energy responses caused by the interaction of the energy 110 with the medium 130. For example, optical energy 110 can be used to interrogate a target region of skin and blood 130 to provide information regarding a physiological condition of a subject, such as a measure of blood oxygen levels of the subject by pulse oximetry. A specific example of the opto-physiological interaction between light and a physiological medium 130 comprising the skin, blood vessels, and blood of a subject is shown in the reflective optical detection configuration 200 of FIG. 2. **At least one sensor module 207, disposed within at least one housing configured to be attached to a body of a subject, may be in physical proximity to the skin of the subject, as shown in the reflective pulse oximetry setup 200 where reflected optical wavelengths 111 are measured, as opposed to measuring transmitted optical wavelengths. Optical emitter and optical detector wavelengths for pulse oximetry and photoplethysmography may include virtually any wavelength of electromagnetic radiation, but particularly useful are UV, visible, and IR wavelengths. In the illustrated embodiment, an optical source-detector assembly 201, including an optical emitter 102 and optical detectors 103, is integrated into sensor module 207 to generate optical wavelengths 110 and monitor the resulting scattered optical energy 111. The optical source-detector assembly 201 may contain one or more optical sources emitting one or more optical wavelengths, as well as one or more optical detectors detecting one or more optical wavelengths. The epidermis 212, dermis 213, and subcutaneous 214 layers of skin tissue of a human are shown in FIG. 2 for reference. The scattered optical energy 111 may be modulated in intensity by changes in physiological condition, such as: changes in blood flow in the blood vessels, changes in physical motion of the body, changes in blood metabolite levels (such as blood gases, bilirubin, glucose, lactic acid, and the like), respiration, heart rate, pulse pressure, blood pressure, and other physiological changes. In some cases, the scattered optical energy 111 may be luminescent or preferentially polarized energy from the skin, blood, blood metabolites, drugs, or other materials in the body. Thus, the energy response signal 111 may contain information associated with at least one physiological condition of the subject.** LeBoeuf at [0109] **Monitoring apparatus, according to embodiments of the present invention can be adapted to fit around various parts of the body, such as an arm, leg, neck, etc. For example, monitoring apparatus, according to embodiments of the present invention can be implemented as a**

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	substrate, such as a wristband, armband, legband, neckband, waistband, ankleband, footband, handband, ringband, headband, or the like. The substrate may be flexible and may be configured to surround all or a portion of a body of a subject. The substrate may be configured to be attached to a body of a subject adhesively, similar to a bandage. The location of a sensor module (e.g., 700, 800) may be virtually any place along the skin of a subject; however, better PPG results may be obtained when a sensor module is placed along an major artery. LeBoeuf at [0150] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	LeBoeuf discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. **The at least one processor controls operations of the energy emitter, detector, and/or filter. In some embodiments of the present invention, the at least one processor is configured to process the detected energy response signal and produce an extracted energy response signal**. LeBoeuf at [0007] In some embodiments of **the present invention, the energy emitter emits pulsed or modulated energy**. LeBoeuf at [0008]

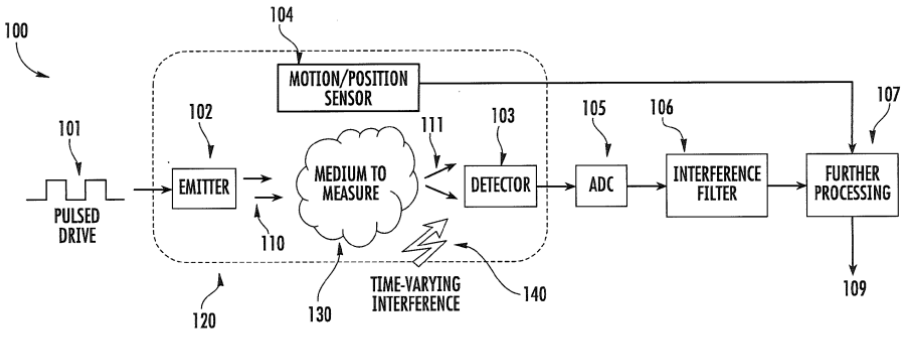
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	In some embodiments of the present invention, **the energy emitter comprises at least one optical emitter, and the detector comprises at least one optical detector. Exemplary optical emitters include, but are not limited to, laser diodes (LDs), light-emitting diodes (LEDs), and organic light-emitting diodes (OLEDs). Exemplary optical detectors include, but are not limited to, photodetectors, photodiodes, phototransistors, photoactive resistors, photomultiplier tubes, photomultiplier diodes, photodetector modules, and the like.** LeBoeuf at [0009] According to some embodiments of the present invention, **a wearable monitoring apparatus includes a substrate configured to be attached to a body of a subject, and a sensor module attached to the substrate. The substrate may be configured to surround a portion of a body, and may be flexible. For example, the substrate may be a wristband, armband, legband, neckband, waistband, ankleband, footband, handband, ringband, headband, etc. In other embodiments, the substrate is configured to be adhesively attached to the body of the subject, similar to a bandage**. LeBoeuf at [0043] **The detectors that may be incorporated into headsets, earbuds, and/or substrates (e.g., wristbands, armbands, legbands, neckbands, waistbands, anklebands, footbands, handbands, ringbands, headbands, etc.) according to some embodiments of the present invention, may be configured to detect and/or measure one or more of the following types of physiological information/conditions: heart rate, pulse rate, breathing rate, blood flow, VO2, VO2max, heartbeat signatures, cardio-pulmonary health, organ health, metabolism, electrolyte type and/or concentration, physical activity, caloric intake, caloric metabolism, blood metabolite levels or ratios, blood pH level, physical and/or psychological stress levels and/or stress level indicators, drug dosage and/or dosimetry, physiological drug reactions, drug chemistry, biochemistry, position and/or balance, body strain, neurological functioning, brain activity, brain waves, blood pressure, cranial pressure, hydration level, auscultatory information, auscultatory signals associated with pregnancy, physiological response to infection, skin and/or core body temperature, eye muscle movement, blood volume, inhaled and/or exhaled breath volume, physical exertion, exhaled breath physical and/or chemical composition, the presence and/or identity and/or concentration of viruses and/or bacteria, foreign matter in the body,**

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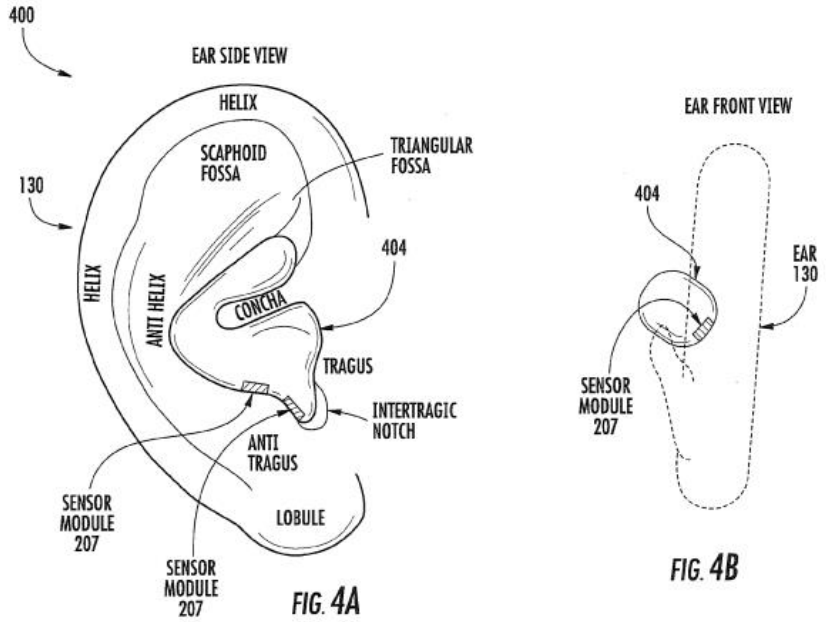
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	internal toxins, heavy metals in the body, anxiety, fertility, ovulation, sex hormones, psychological mood, sleep patterns, hunger and/or thirst, hormone type and/or concentration, cholesterol, lipids, blood panel, bone density, organ and/or body weight, reflex response, sexual arousal, mental and/or physical alertness, sleepiness, auscultatory information, response to external stimuli, swallowing volume, swallowing rate, sickness, voice characteristics, voice tone, voice pitch, voice volume, vital signs, head tilt, allergic reactions, inflammation response, auto-immune response, mutagenic response, DNA, proteins, protein levels in the blood, water content of the blood, pheromones, internal body sounds, digestive system functioning, cellular regeneration response, healing response, stem cell regeneration response, etc LeBoeuf at [0050] The human ear is an ideal location for wearable health and environmental monitors. The ear is a relatively immobile platform that does not obstruct a person's movement or vision. **Headsets located at an ear have, for example, access to the inner-ear canal and tympanic membrane (for measuring core body temperature), muscle tissue (for monitoring muscle tension), the pinna and earlobe (for monitoring blood gas levels), the region behind the ear (for measuring skin temperature and galvanic skin response), and the internal carotid artery (for measuring cardiopulmonary functioning), etc**. The ear is also at or near the point of exposure to: environmental breathable toxicants of interest (volatile organic compounds, pollution, etc.); noise pollution experienced by the ear; and lighting conditions for the eye. Furthermore, as the ear canal is naturally designed for transmitting acoustical energy, the ear provides a good location for monitoring internal sounds, such as heartbeat, breathing rate, and mouth motion. **Wireless, Bluetooth®-enabled, and/or other personal communication headsets may be configured to incorporate physiological and/or environmental sensors, according to some embodiments of the present invention.** As a specific example, Bluetooth® headsets are typically lightweight, unobtrusive devices that have become widely accepted socially. Moreover, Bluetooth® headsets are cost effective, easy to use, and are often worn by users for most of their waking hours while attending or waiting for cell phone calls. Bluetooth® headsets configured according to embodiments of the present invention are advantageous **because they provide a function for the user beyond health monitoring, such as personal communication and multimedia applications, thereby encouraging user compliance. Exemplary physiological and environmental sensors that may be incorporated into a Bluetooth® or other type of headsets**

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	include, but are not limited to accelerometers, auscultatory sensors, pressure sensors, humidity sensors, color sensors, light intensity sensors, pressure sensors, etc. LeBoeuf at [00104] **FIG. 1 illustrates an interference filtering apparatus/method 100, according to some embodiments of the present invention**. A medium 130, preferably physiological material of a living subject, comprises at least one target region of interest 120 which is interrogated by energy 110, preferably modulated energy, such as pulsed energy, generated by an energy emitter 102. **A pulsed driving circuit 101 is used to drive at least one energy emitter 102 at one or more pulsed frequencies to interrogate at least one target region of at least one medium 130 with the pulsed energy 110.** The energy may be in the form of electromagnetic, acoustical, mechanical, nuclear, electrical, magnetic, thermal, or other forms of energy, but typically optical energy from the electromagnetic spectrum. The energy reaching the medium 130 can interact with the medium to generate at least one energy response signal 111, such as an optical scatter signal 111 between emitted optical energy 110 and the medium 130. **The energy response 111 caused by this interaction is detected by at least one detector 103, configured to detect energy in the forms described above, but typically in the form of optical energy scattered from the medium 130.** A motion/position sensor 104 may be configured to measure movement, positional changes, or inertial changes in the vicinity of the medium 130. The outputs of the detector 103 may be sent to at least one analog-to-digital convertor (ADC) 105 and the digitized output may be sent to at least one interference filter 106, which is configured to remove the effects of time-varying environmental interference 140 from the signal output of the detector 103. At least one motion/position sensor 104 may be incorporated in the interference filtering method 100 to provide a reference signal for removing the effects of motion from the extracted energy response signal 111 to produce a desired signal 109. For example, the output of the interference filter 106 may be further processed by signal extraction filter 107 to extract accurate information from the medium 130, and this signal extraction filter 107 may utilize the output of the motion/position sensor 104 to remove motion artifacts from the desired signal (the extracted energy response signal) 109. At least one signal processor (not shown) may be used to control the operations of the energy emitter 102, detector 103, filter 106, and/or other components of the interference filtering method 100. LeBoeuf at [0107]

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	 FIG. 1 LeBoeuf at Fig.1 **In some embodiments of the present invention, a monitoring apparatus is configured to be a wearable monitor for monitoring at least one physiological condition of the wearer. In such an embodiment, pulsed electromagnetic energy 110 from at least one electromagnetic emitter 102, typically an optical emitter, is directed towards at least one physiological region 130, typically the ear region, of a subject. Examples of optical emitters include light-emitting diodes (LEDs), laser diodes (LDs), lamps, organic emitters (such as OLEDs), and the lik**e. **The sensor components (102, 103, and 104) may be integrated within the ear region 120 in the form-factor of an earbud** or other **ear-worn form-factor such that the measurement medium 130 comprises blood vessels and/or blood flow within the ear region**. The intensity of the pulsed optical energy 110 is modulated by at least one pulsed driving circuit 101 such that the intensity is time-varying with at least two states, preferably an on state and an off state. This time-varying energy generates a time-varying energy response, typically an optical interaction response, such as optical absorption, modulation, scatter, transmission, luminescence, or the like, from the physiological region 130. A first optical interaction response is obtained by at least one detector 103, typically an optical detector, when the pulsed optical energy 110 is in the on state. A second energy response, in this case a second optical interaction response, is obtained by the optical detector 103 when the pulsed optical energy 110 is in the off state. (In some cases, other optical interaction responses may be collected in other modulated states of the pulsed energy 110.) The first and second energy response signals are digitized by at least

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	one ADC 105 and the digitized signals are processed via an interference filter 106 to produce a processed energy response signal that is associated with a physiological condition of the subject, wherein the filter removes time-varying environmental interference caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc. The output of the interference filter 106 is then processed by a signal extraction filter 107 to accurately extract at least one physiological property of the subject. A motion/position sensor 104 may be configured to measure the motion/position between the medium 130 and the emitter 102, the detector 103, and/or the time-varying interference 140, for example, caused by motion of the subject. The output signal of the motion sensor 104 may provide a motion artifact reference to the signal extraction filter 107 such that the motion/position information may be selectively removed from the desired signal output. Incorporating a motion sensor in embodiments of the present invention may be particularly important because time-varying interference, such as sunlight hitting an earbud, is often modulated by motion, and monitoring and subtracting this motion from the desired output may be critical to generating an accurate physiological signal in the midst of daily life activities of the subject. LeBoeuf at [0108]

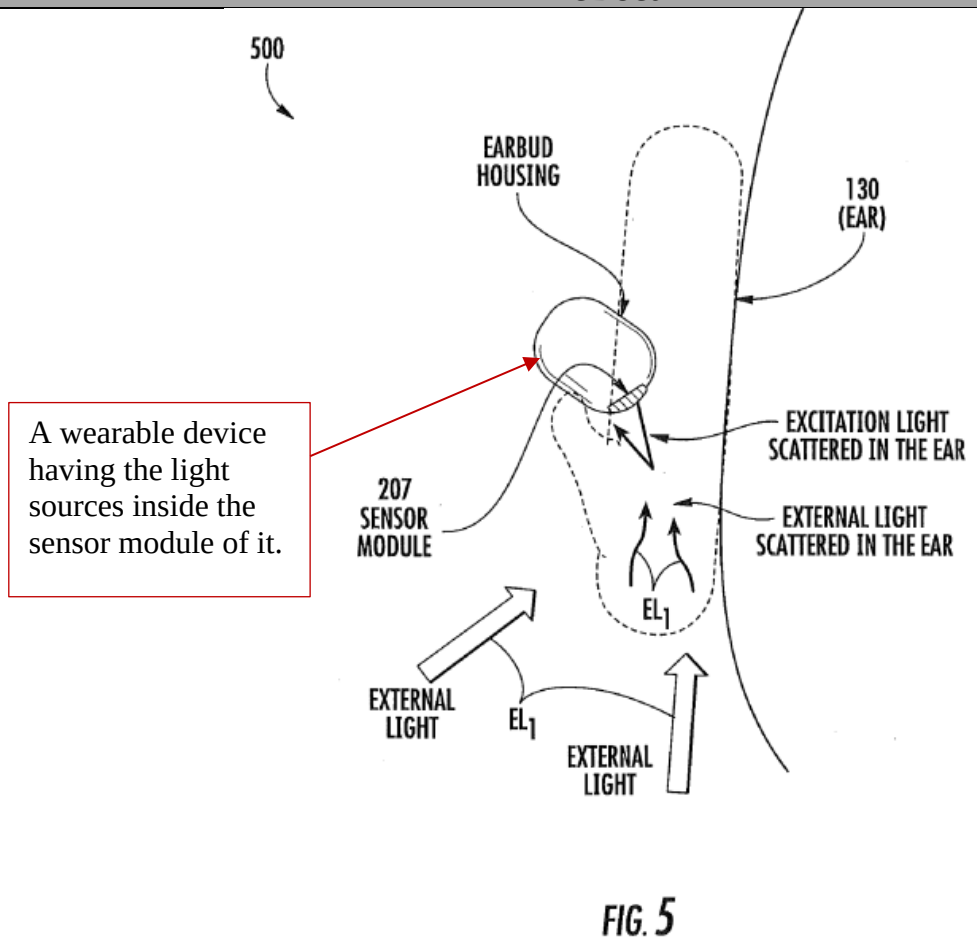
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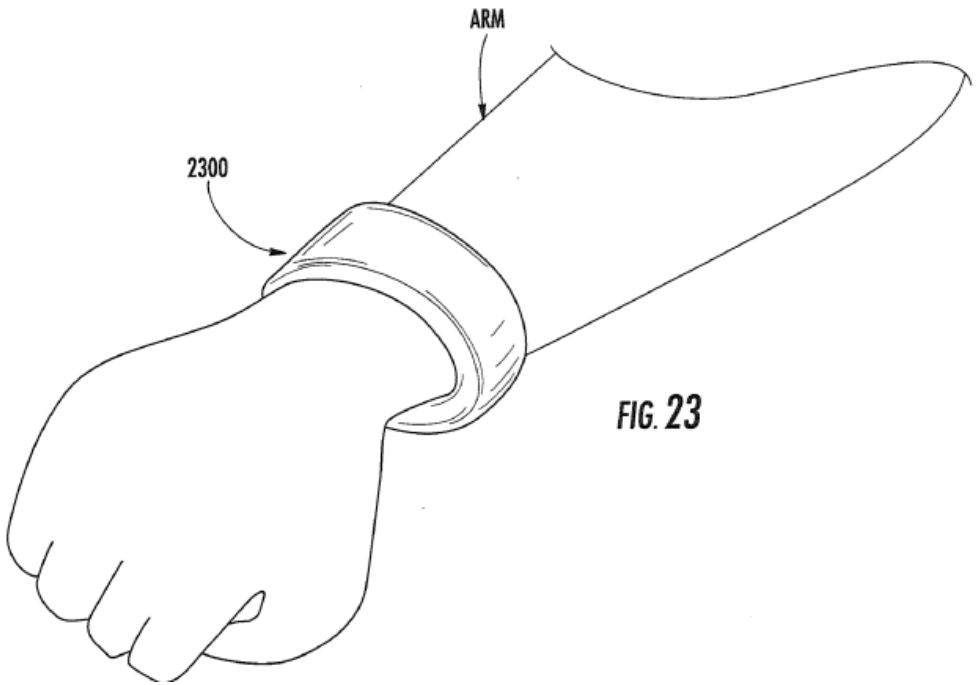
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	 LeBoeuf at fig. 4a and 4b. **Various forms of energy 110 can be used to interrogate one or more mediums 130 and to characterize those mediums by detectors 103 configured to detect the energy responses caused by the interaction of the energy 110 with the medium 130. For example, optical energy 110 can be used to interrogate a target region of skin and blood 130 to provide information regarding a physiological condition of a subject, such as a measure of blood oxygen levels of the subject by pulse oximetry. A specific example of the opto-physiological interaction between light and a physiological medium 130 comprising the skin, blood vessels, and blood of a subject is shown in the reflective optical detection configuration 200 of FIG. 2. At least one sensor module 207, disposed within at least one housing configured to be attached to a body of a subject, may be in physical proximity to the skin of the subject, as shown in the reflective pulse oximetry setup 200 where reflected optical wavelengths 111 are measured, as opposed to measuring transmitted optical wavelengths. Optical emitter and optical detector wavelengths for pulse oximetry and**

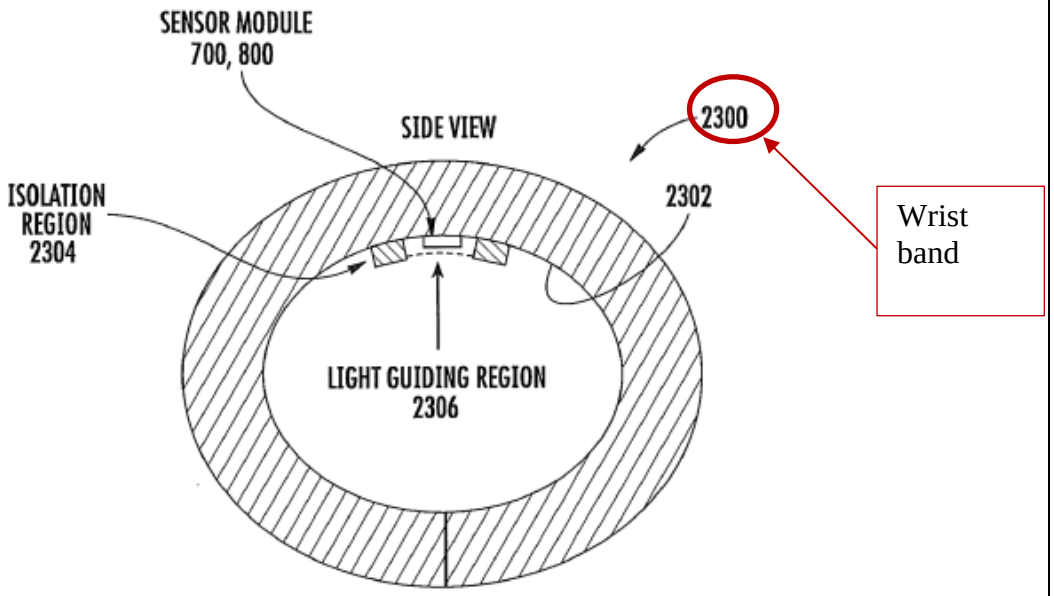
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	photoplethysmography may include virtually any wavelength of electromagnetic radiation, but particularly useful are UV, visible, and IR wavelengths. In the illustrated embodiment, **an optical source-detector assembly 201, including an optical emitter 102 and optical detectors 103,** is integrated into sensor module 207 to generate optical wavelengths 110 and monitor the resulting scattered optical energy 111. **The optical source-detector assembly 201 may contain one or more optical sources emitting one or more optical wavelengths, as well as one or more optical detectors detecting one or more optical wavelengths.** The epidermis 212, dermis 213, and subcutaneous 214 layers of skin tissue of a human are shown in FIG. 2 for reference. The scattered optical energy 111 may be modulated in intensity by changes in physiological condition, such as: changes in blood flow in the blood vessels, changes in physical motion of the body, changes in blood metabolite levels (such as blood gases, bilirubin, glucose, lactic acid, and the like), respiration, heart rate, pulse pressure, blood pressure, and other physiological changes. In some cases, the scattered optical energy 111 may be luminescent or preferentially polarized energy from the skin, blood, blood metabolites, drugs, or other materials in the body. Thus, the energy response signal 111 may contain information associated with at least one physiological condition of the subject. LeBoeuf at [0109] In real-world environments, **the energy response signal 111 collected by a wearable sensor module 207 may be corrupted by time-varying environmental interference 140 (FIG. 1). Moreover, the energy response signal 111 may be even further corrupted by motion of the subject in a time-varying environment. For example, the motion caused by running may cause motion with respect to the emitter 102, detector 103, and medium 130 (in this case tissue of the subject), and this motion may cause an unwanted signal on the detector 103. Moreover, the time-varying environmental interference 140 (FIG. 1) may be caused by, or exacerbated by, the motion of the subject. A specific example of time-varying interference in a real-world environment 300 is summarized in FIG. 3. In FIG. 3, the runner is wearing an audio headset H containing biometric monitoring technology, such as LeBoeuf's Healthset® brand technology (LeBoeuf, Inc., Raleigh, N.C.), where at least one photoplethysmography sensor module 207 (FIG. 2)** is included within a biometric audio earbud 404 as shown in FIG. 4. **The sensor module 207 may contain at least one optical emitter 102, at least one optical detector 103, and at least one processor to measure heart rate, respiration rate, pulse pressure, motion, and/or other physiological conditions near the ear region 130 of the subject**. These types of measurements may be achieved by detecting the optical

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	scatter response 111 from the ear region as summarized in FIG. 2. However, direct sunlight SL1, indirect sunlight SL2 and/or artificial light AL1 from the environment may pass into the audio headset H. Time-varying sunlight SL1, SL2 and artificial ambient light AL1 may impart time-varying optical interference 140 on the optical detector 103 embedded within the audio headset H. For example, a time-varying interference signal 140 (FIG. 1) from environmental light may impart substantial artifacts on an energy response signal 111 (FIG. 1) in many real life scenarios, such as when clouds pass through the sky, when a subject runs through shadows, when a subject runs to/from an artificial light source, and/or various thereof. These time-varying artifacts may be difficult to distinguish from the desired time-varying signals associated with time-varying physiological conditions. For example, the interference frequencies associated with a time-varying change in shadows, or the harmonics of these interference frequencies, may correspond with at least one signal frequency associated with footsteps, respiration, or heart rate, and the optical energy response 111 may contain convoluted information comprising interference signals and desired physiological signals. LeBoeuf at [0110]

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	 A wearable device having the light sources inside the sensor module of it. FIG. 5 LeBoeuf at Fig. 5 **Referring to FIGS. 23-29, an exemplary wristband monitoring apparatus 2300 is illustrated. The wristband 2300 houses a power source, circuitry, a sensor module, and electronics as described above with respect to the various earbud embodiments. As illustrated in FIG. 24, a sensor module 700, 800 is positioned on the inside surface 2302 of the wristband 2300.** The sensor module 700,

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	800 may include an isolation region 2304 that is configured to keep the sensor module 700, 800 stable with respect to the subject's wrist during use so as to reduce motion artifacts. The isolation region may be constructed out of any sturdy material, but for comfort, a foamy and/or flexible sturdy material may be utilized. Furthermore, the isolation region 2304 may further shield against environmental interference such as sunlight, external temperature, wind, and the like. LeBoeuf at [0151]  FIG. 23 LeBoeuf at fig. 23.

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	 FIG. 24 LeBoeuf at fig. 24. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	LeBoeuf discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. The term “modulated energy”, as used herein, refers to energy (e.g., optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, magnetic energy, mechanical energy, nuclear energy, etc.) that is emitted in pulses and/or that is emitted such that the amplitude, frequency, phase, or intensity is varied. A pulsed energy source modulates by effectively multiplying by a waveform that is a periodic sequence of zeros and ones. LeBoeuf at [0097] In some embodiments of the present invention, a monitoring apparatus is configured to be a wearable monitor for monitoring at least one physiological condition of the wearer. **In such an embodiment, pulsed electromagnetic energy 110 from at least one electromagnetic emitter 102, typically an optical emitter,** is directed towards at least one physiological region 130, typically the ear region, of a subject. Examples of optical emitters include light-emitting diodes (LEDs), laser diodes (LDs), lamps, organic emitters (such as OLEDs), and the like. The sensor components (102, 103, and 104) may be integrated within the ear region 120 in the form-factor of an earbud or other ear-worn form-factor such that the measurement medium 130 comprises blood vessels and/or blood flow within the ear region. **The intensity of the pulsed optical energy 110 is modulated by at least one pulsed driving circuit 101 such that the intensity is time-varying with at least two states, preferably an on state and an off state**. **This time-varying energy generates a time-varying energy response, typically an optical interaction response, such as optical absorption, modulation, scatter, transmission, luminescence, or the like, from the physiological region 130. A first optical interaction response is obtained by at least one detector 103, typically an optical detector, when the pulsed optical energy 110 is in the on state. A second energy response, in this case a second optical interaction response, is obtained by the optical detector 103 when the pulsed optical energy 110 is in the off state. (In some cases, other optical interaction responses may be collected in other modulated states of the pulsed energy 110.) The first and second energy response signals are digitized by at least one ADC 105 and the digitized signals are processed via an interference filter 106 to produce a processed energy response signal that is associated with a physiological condition of the subject, wherein the filter removes time-varying environmental interference**

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	caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc. The output of the interference filter 106 is then processed by a signal extraction filter 107 to accurately extract at least one physiological property of the subject. A motion/position sensor 104 may be configured to measure the motion/position between the medium 130 and the emitter 102, the detector 103, and/or the time-varying interference 140, for example, caused by motion of the subject. **The output signal of the motion sensor 104 may provide a motion artifact reference to the signal extraction filter 107 such that the motion/position information may be selectively removed from the desired signal output. Incorporating a motion sensor in embodiments of the present invention may be particularly important because time-varying interference, such as sunlight hitting an earbud, is often modulated by motion**, and monitoring and subtracting this motion from the desired output may be critical to generating an accurate physiological signal in the midst of daily life activities of the subject. LeBoeuf at [0108] In some embodiments of the present invention, an additional optical filter (e.g., 710, FIGS. 7 and 8) may be utilized that serves (or also serves) as an attenuation filter, such as a “neutral density filter”, gelatin filter, opaque material, or other optical attenuation filter or filtering materials. In one embodiment, **an optical filter 710 may serve as both an optical wavelength filter and an attenuation filter. Because sunlight is so powerful, it may be beneficial to reduce sunlight interference as much as possible, even if that means also reducing the amount of optical scatter 111 (FIG. 1) of interest from the medium 130 (FIG. 1). To offset this unwanted reduction in optical scatter 111, the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight.** LeBoeuf at [0123] **An exemplary filter processes samples 1910, the off/on samples 1920/1930 respectively, taken from a digitized physiological sensor signal 1911 generated by a detector (e.g., 103, FIG. 1) as shown in FIGS. 19A-19B. A pulsed emitter (e.g., 102, FIG. 1) generates a pulsed beam of light such that some samples 1920 represent signal 1911 from a detector with the emitter turned off and other samples 1930 represent signal 1911 from the detector with the emitter turned on. Both types of samples 1920 and 1930 may contain environmental noise from environmental interferants, but only emitter-on samples 1930 contain physiological information generated by**

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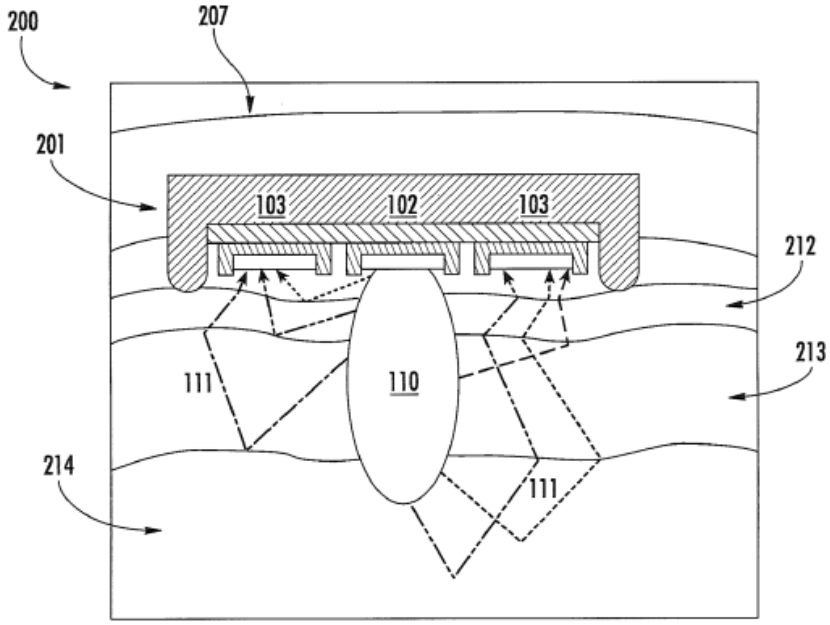
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	the emitter energy. The digitized samples taken from detector signal 1911, provided by an ADC (e.g., 105, FIG. 1), are processed by an interference filter (e.g., 106, FIG. 1) and the output of the interference filter may be directed for further processing (represented by 107, FIG. 1). LeBoeuf at [0137] These operations are summarized in FIG. 18, which is a flow chart of operations for removing environmental noise from a sensor signal via an interference filter, according to some embodiments of the present invention. **At Block 1800, at least one ADC sample is read when the emitter is on. At Block 1802, at least one ADC sample is read when the emitter is off. At Block 1804, relevant on/off samples are input to an interference filter. At Block 1806, at least one sample from the interference filter is output for further processing**. LeBoeuf at [0138] **An interference filter (e.g., 106, FIG. 1) utilized according to embodiments of the present invention, may vary in nature and complexity. For example, an interference filter may subtract temporally neighboring emitter-off samples 1920 (FIG. 19A) from temporally neighboring emitter-on samples 1930 (FIG. 19A) and output a “subtraction” signal for further processing. In this embodiment, the subtraction may involve subtracting temporally neighboring on/off samples, averaging temporally neighboring on samples and averaging temporally neighboring off samples and then subtracting the average off samples from the average on samples, or by other approaches to subtracting off signals 1920 from on signals 1930**. **When choosing a subtraction approach, it is important to consider the emitter pulsing frequency and sampling approach. For example, choosing a frequency that is too low may result in unsatisfactory subtraction, as the dynamic environmental conditions between off-states 1920 and on-states 1930 may be too abrupt for the sampling frequency, such that the physiological state of interest is not properly characterized by the interference filter**. Thus, the sampling frequency may need to be much higher than the Nyquist frequency required for characterizing the signal in a stationary environment. As a specific example, if an interference filter (e.g., 106, FIG. 1) is being used to remove sunlight interference (e.g., SL1, SL2, FIG. 3), from a photoplethysmogram 1911 (FIGS. 19A, 19B), and if the desired processed output from the final filtering is heart rate, then the Nyquist criteria for

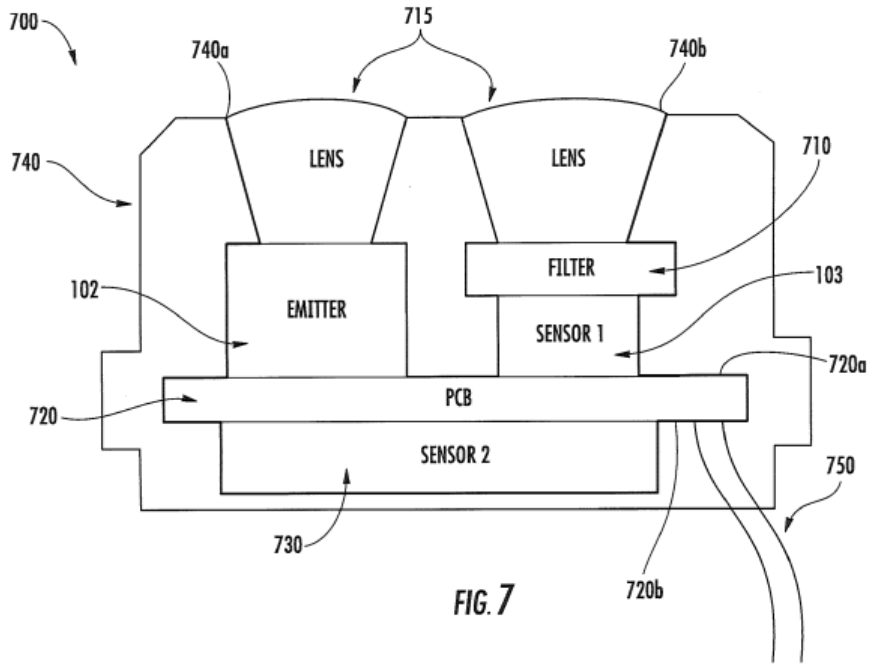
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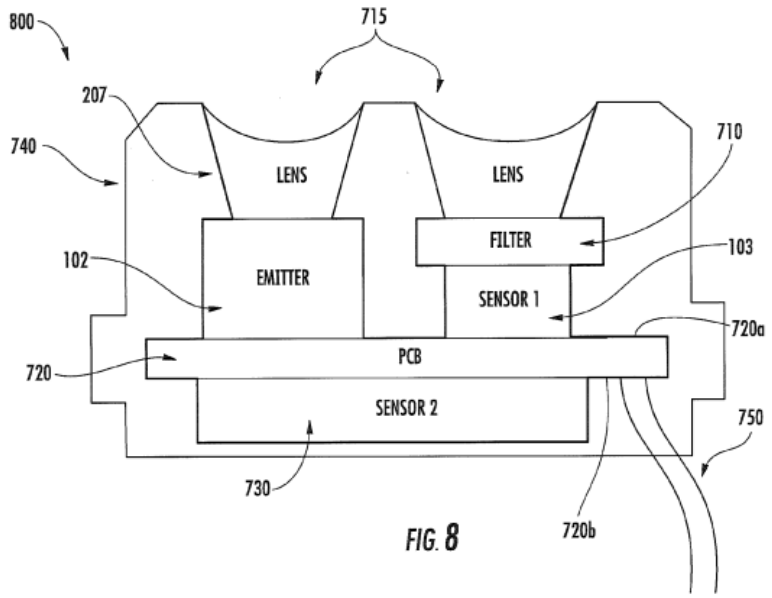
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	pulsing the emitter may be 2×fmax, where fmax is the maximum heart rate of interest, which is likely to be somewhere around 200 beats/minute (BPM) or 3.33 Hz. LeBoeuf at [0139] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	LeBoeuf discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample In some embodiments of the present invention, **the sensor module includes a lens positioned above at least one of the optical emitter and filter. The lens may include respective first and second portions configured to matingly engage respective first and second apertures in the light-opaque material**. LeBoeuf at [0016] In other embodiments of the present invention, a **first lens is positioned within the first aperture and is in optical communication with the optical emitter, and a second lens is positioned within the second aperture and is in optical communication with the optical detector. The first lens focuses light emitted by the optical emitter and the second lens focuses light toward the optical detector.** LeBoeuf at [0017] In some embodiments of the present invention, **the at least one sensor module include a lens positioned above at least one of the optical emitter and filter. The lens may include respective first and second portions configured to matingly engage respective first and second apertures in the light-opaque material.**

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	LeBoeuf at [0022] In other embodiments of the present invention, **a first lens is positioned within the first aperture and is in optical communication with the optical emitter, and a second lens is positioned within the second aperture and is in optical communication with the optical detector. The first lens focuses light emitted by the optical emitter and the second lens focuses light toward the optical detector**. LeBoeuf at [0023] In some embodiments, **multiple emitters, detectors, lenses, light guides, and/or diffusion regions may be employed within a sensor module**. LeBoeuf at [0038] **FIG. 2 illustrates a multi-wavelength reflection-mode pulse oximetry apparatus that may be utilized in accordance with some embodiments of the present invention** LeBoeuf at [0054]

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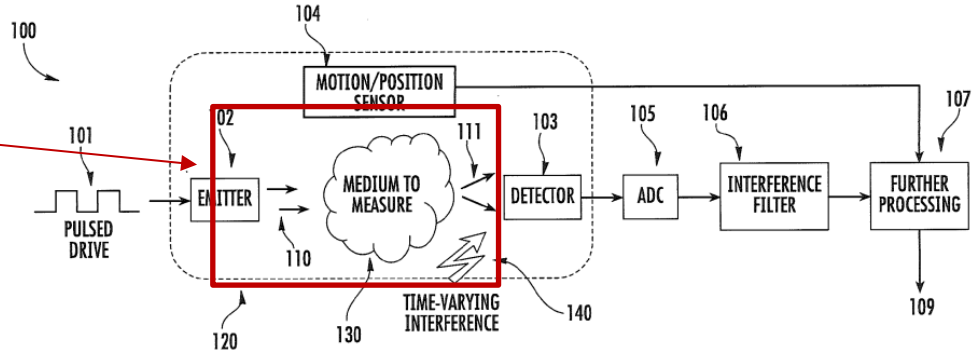
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	 FIG. 2 LeBoeuf at fig. 2. **FIG. 7 illustrates a sensor module with a convex lens configuration, according to some embodiments of the present invention**. LeBoeuf at [0060]

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	 FIG. 7 LeBoeuf at fig. 7. **FIG. 8 illustrates a sensor module with a concave lens configuration, according to some embodiments of the present invention.** LeBoeuf at [0061]

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	 FIG. 8 LeBoeuf at fig. 8. **In some embodiments of the present invention, a monitoring apparatus is configured to be a wearable monitor for monitoring at least one physiological condition of the wearer. In such an embodiment, pulsed electromagnetic energy 110 from at least one electromagnetic emitter 102, typically an optical emitter, is directed towards at least one physiological region 130, typically the ear region, of a subject. Examples of optical emitters include light-emitting diodes (LEDs), laser diodes (LDs), lamps, organic emitters (such as OLEDs), and the like. The sensor components (102, 103, and 104) may be integrated within the ear region 120 in the form-factor of an earbud or other ear-worn form-factor such that the measurement medium 130 comprises blood vessels and/or blood flow within the ear region.** The intensity of the pulsed optical energy 110 is modulated by at least one pulsed driving circuit 101 such that the intensity is time-varying with at least two states, preferably an on state and an off state. This time-varying energy generates a time-varying energy response, typically an optical interaction response, such as optical absorption,

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	modulation, scatter, transmission, luminescence, or the like, from the physiological region 130. A first optical interaction response is obtained by at least one detector 103, typically an optical detector, when the pulsed optical energy 110 is in the on state. A second energy response, in this case a second optical interaction response, is obtained by the optical detector 103 when the pulsed optical energy 110 is in the off state. (In some cases, other optical interaction responses may be collected in other modulated states of the pulsed energy 110.) The first and second energy response signals are digitized by at least one ADC 105 and the digitized signals are processed via an interference filter 106 to produce a processed energy response signal that is associated with a physiological condition of the subject, wherein the filter removes time-varying environmental interference caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc. The output of the interference filter 106 is then processed by a signal extraction filter 107 to accurately extract at least one physiological property of the subject. A motion/position sensor 104 may be configured to measure the motion/position between the medium 130 and the emitter 102, the detector 103, and/or the time-varying interference 140, for example, caused by motion of the subject. The output signal of the motion sensor 104 may provide a motion artifact reference to the signal extraction filter 107 such that the motion/position information may be selectively removed from the desired signal output. Incorporating a motion sensor in embodiments of the present invention may be particularly important because time-varying interference, such as sunlight hitting an earbud, is often modulated by motion, and monitoring and subtracting this motion from the desired output may be critical to generating an accurate physiological signal in the midst of daily life activities of the subject. LeBoeuf at [0108] **Various forms of energy 110 can be used to interrogate one or more mediums 130 and to characterize those mediums by detectors 103 configured to detect the energy responses caused by the interaction of the energy 110 with the medium 130. For example, optical energy 110 can be used to interrogate a target region of skin and blood 130 to provide information regarding a physiological condition of a subject, such as a measure of blood oxygen levels of the subject by pulse oximetry. A specific example of the opto-physiological interaction between light and a physiological medium 130 comprising the skin, blood vessels, and blood of a subject is shown in the reflective optical detection configuration 200 of FIG. 2. At least one sensor module 207, disposed within at least one housing configured to be attached to a body of a subject, may be in physical proximity to the skin of the subject, as shown in the reflective pulse oximetry setup 200**

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	where reflected optical wavelengths 111 are measured, as opposed to measuring transmitted optical wavelengths. Optical emitter and optical detector wavelengths for pulse oximetry and photoplethysmography may include virtually any wavelength of electromagnetic radiation, but particularly useful are UV, visible, and IR wavelengths. In the illustrated embodiment, **an optical source-detector assembly 201, including an optical emitter 102 and optical detectors 103, is integrated into sensor module 207 to generate optical wavelengths 110 and monitor the resulting scattered optical energy 111. The optical source-detector assembly 201 may contain one or more optical sources emitting one or more optical wavelengths, as well as one or more optical detectors detecting one or more optical wavelengths.** The epidermis 212, dermis 213, and subcutaneous 214 layers of skin tissue of a human are shown in FIG. 2 for reference. The scattered optical energy 111 may be modulated in intensity by changes in physiological condition, such as: changes in blood flow in the blood vessels, changes in physical motion of the body, changes in blood metabolite levels (such as blood gases, bilirubin, glucose, lactic acid, and the like), respiration, heart rate, pulse pressure, blood pressure, and other physiological changes. In some cases, the scattered optical energy 111 may be luminescent or preferentially polarized energy from the skin, blood, blood metabolites, drugs, or other materials in the body. Thus, the energy response signal 111 may contain information associated with at least one physiological condition of the subject. LeBoeuf at [0109] Emitter module transmitting the light on to the medium to measure.  FIG. 1 LeBoeuf at Fig. 1

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	According to some embodiments of the present invention, a sensor module 700 with an overmolded design, as shown in FIG. 7, may be employed to remedy the problems associated with sunlight leaking towards the optical detector 103. In this design, an overmold layer 740 surrounds the components of the sensor module 700 to prevent light leakage into any spot along the periphery of the sensor module 700. **The overmold layer 740 comprises a light-opaque material surrounding the optical emitter 102 and optical detector 103 such that the optical emitter 102 and optical detector 103 are not in direct optical communication with each other. The light-opaque material of the overmold layer 740 may include a first aperture 740 a in communication with the optical emitter 102, and a second aperture 740 b in communication with the optical detector 103. Thus, the only device regions having access to outside light may be the regions of the optical emitter 102 and detector 103, but these may be covered by at least one optical filter 710 tuned to a wavelength region of interest**. If utilized, the wavelength pass-band of an optical filter covering the emitter 102 should be tuned to the emitter wavelength band so that all other light is blocked. If utilized, the wavelength pass-band of the optical filter 710 covering the detector 103 should be tuned to at least one wavelength band associated with the optical scatter 111 (FIG. 1) of interest from the medium 130 (FIG. 1) so that all other light is blocked. LeBoeuf at [0116] In some embodiments of the present invention, **an optical filter for the emitter 102 and detector 103 may be the same filter, such as may be the case for optical scatter 111 (FIG. 1) detection by the detector 103 where all light other than the emitter light of interest may be blocked by the filter 710.** According to some embodiments of the present invention, the optical filter 710 covering the detector 103 is configured to block unwanted sunlight but still allow wavelengths from the optical emitter 102 to pass therethrough. In some embodiments of the present invention, the optical filter 710 over the detector 103 is configured to pass wavelengths centered around 930 nm, and the optical emitter 102 is configured to emit wavelengths centered around 930 nm. According to some embodiments of the present invention, the optical filter 710 may have a surface area greater than a surface area of the optical detector 103. In some embodiments of the present invention, the optical filter 710 overlies the optical detector 103 such that a periphery of the optical filter 710 overlaps a periphery of the optical detector 103, as shown in FIG. 7 and FIG. 8.

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	LeBoeuf at [0117] T**o guide light from the optical emitter 102 towards the skin 130 of a subject and to direct light from the skin 130 to the optical detector 103, lenses 715 may be utilized, as illustrated in FIG. 7**. The lenses 715 may be physically separated lenses (as shown in FIGS. 7 and 8) or combined or conjoined lenses. In some embodiments of the present invention, there is no optical coupling between the emitter lens 715 and detector lens 715. For this reason, a barrier region may be incorporated in the case where the lenses are combined or conjoined. Separated lenses may be isolated by at least one light opaque barrier region greater than 50 μm in thickness. Light opaque plastic, rubber, metal, or polymeric material are a few examples of good choices for the light opaque region. **The optical lenses 715 may be designed for the desired optical coupling between the skin/blood vessel region and the emitter 102 or detector 103. For example, a convex lens design (such as that of FIG. 7) placed over the emitter 102 may focus light onto the skin, and a concave lens design (such as that of FIG. 8) placed over the emitter 102 may diverge light over the skin region.** In the other direction, a convex lens design placed over the detector 103 may capture more light over a broader region and direct that light towards the detector 103, whereas a concave lens may collimate light towards the detector 103. LeBoeuf at [0118] **The optical lenses 715 may be separate from the overmold layer 740 or may be part of the overmold layer 740. For example, the overmold layer 740 may be comprised of material that is transparent to light 110 (FIG. 1) coming from the emitter 102. In such case, the lenses 715 may integral with the overmold layer 740. In other cases, the optical lenses 715 may be comprised of different material than the overmold layer 740, such that the lenses 715 may fit within the overmold layer 740 and be matingly engaged with the overmold layer 740.** LeBoeuf at [0119] **Another benefit of the overmolded design of FIGS. 7 and 8 is that it may also provide resistance to water, humidity, sweat, wind, and other environmental interferants. For example, an overmolded plastic design around the emitters 102 and detectors 103, combined with overmolded**

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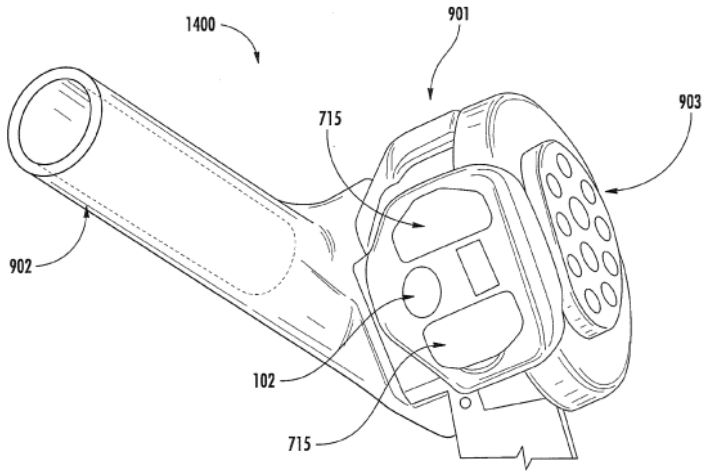
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	or glued lenses 715, may at least partially encapsulate the emitters 102 and detectors 103 and hence at least partially isolate these devices from the environment. LeBoeuf at [0121]. In some embodiments of the present invention, an additional optical filter (e.g., 710, FIGS. 7 and 8) may be utilized that serves (or also serves) as an attenuation filter, such as a “neutral density filter”, gelatin filter, opaque material, or other optical attenuation filter or filtering materials. In one embodiment, an optical filter 710 may serve as both an optical wavelength filter and an attenuation filter. Because sunlight is so powerful, it may be beneficial to reduce sunlight interference as much as possible, even if that means also reducing the amount of optical scatter 111 (FIG. 1) of interest from the medium 130 (FIG. 1). **To offset this unwanted reduction in optical scatter 111, the intensity of the optical emitter 102 may be increased to increase the ratio of physiological optical scatter 111 from blood vessels with respect to unwanted sunlight.** LeBoeuf at [0123]. **The angling of the sensor modules 700, 800 (FIGS. 7 and 8) within the earbud housing 901 may be designed to direct light towards the ear and detect light from the ear while rejecting as much environmental light (such as sunlight) as possible. As shown in FIG. 10, angling the normal “N” of the lens 715 between the perpendicular lines “A” & “B”,** where “A” is perpendicular to earth ground and “B” is parallel to earth ground, would help achieve this goal. Phrased another way, the angle “θN” between “N” and “A” or “N” and “B” would preferably be less than 90°. The lens 715 placement and angle does not obstruct the audio cavity between the speaker 910 and the earbud housing opening(s) 903, which helps couple light to the ear canal. For this reason, in some cases, angle “θN” approximating 45° may be utilized for limiting the sensor module 700 exposure to outside light while also limiting the obstruction of the audio cavity by the sensor module 700. LeBoeuf at [0124]. **The lenses 715 described herein may be comprised of any material that is at least partially transparent to the wavelengths of light generated by the emitter 102 and/or the desired wavelengths of light detected by the detector 103. In some embodiments of the present invention,**

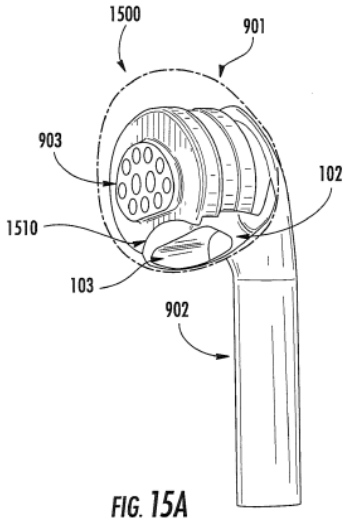
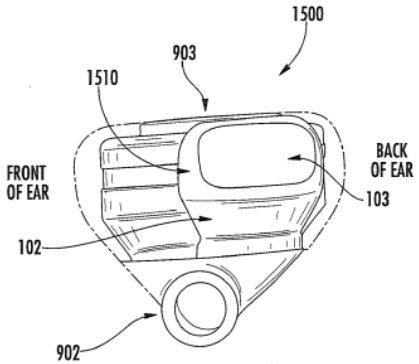
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	the lenses 715 are completely transparent to the light of interest, but in other embodiments of the present invention the lenses 715 may be configured to diffuse, attenuate, disperse, or redistribute light uniformly across the lens. For example, a lens 715 incorporating diffusing material, placed over the emitter 102, may help spread more light from the emitter more uniformly across the area of the lens such that a broader physiological region may be excited by optical radiation. Similarly, a diffusing lens configuration placed over the detector 103 may help detect light from a broader area of the body and direct that light towards the detector 103. Some plastic materials contain scattering centers or materials that tend to scatter light. For example, silicones may be used to diffuse light in a lens. Partially opaque lenses may also be used to provide diffusion or internal scattering of light within a lens. Additionally, roughened surfaces, such as roughened plastic or glass, may encourage diffuse optical scatter without greatly attenuating the intensity of light. Other methods of creating optical diffusion or scattering in light-guiding materials such as lenses may be utilized. LeBoeuf at [0125]. **At least part of the earbud housing 901 (FIG. 11) or sensor module 700 (FIG. 11) may comprise a soft material which deforms when inserted within the ear and that facilitates retention of the earbud within the ear. For example, the shape of earbud housing 901 shown in FIG. 11 may facilitate retention of the earbud 1100 within the ear because it may be shaped to mate or engage with the concha or outer ear canal of the ear.** Furthermore, **if part of the earbud 1100 comprises a soft material, such as soft plastic, polymer, silicone, or rubber, the material may deform when the earbud 1100 is inserted within the ear such that this part of the earbud 1100 mates or engages with the ear. The sensor modules of FIGS. 7 and 8 may be integrated within the earbud housing 901, such that at least a portion of the housing 901 may comprise optically transmissive material to allow light to move from the emitter 102 to the ear region or from the ear region to the detector 103**. The soft deforming material may be adjacent to the optically transmissive material or may comprise at least part of the optically transmissive material itself. For example, the lenses 715 of FIG. 9 may be comprised of optically transparent material that is also soft, such as silicone or transparent plastic, polymer, rubber, or the like. In another embodiment, a second layer of soft, yet transparent, material may cover the lenses 715. LeBoeuf at [0128].

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	An exemplary overmolding configuration of a sensor module 1201 is illustrated in FIGS. 12A-12C. **The sensor module 1201 is shown without an emitter, detector, or lenses,** but rather with recesses/apertures 1202 showing where lenses may be located. Exemplary dimensions are also presented in FIG. 12. In some embodiments of the present invention, dimensions are on the order of millimeters or less, such that the sensor module 1201 can fit within a small-sized earbud without obstructing, or minimally obstructing, the audio cavity. In the illustrated embodiment**, an emitter and detector to be used with the sensor module 1201 can be arranged in a line that is parallel with the antitragus**. This arrangement is illustrated in FIGS. 13A-13C. However, embodiments of the present invention are not limited to any particular set of dimensions or to any shape or configuration. LeBoeuf at [0129]. FIG. 14 illustrates a multi-detector earbud 1400, similar to the earbud 1300 of FIGS. 13A-13C, but where two separate optical detectors (not shown) are covered by two separate optical lenses 715. **An optical emitter 102 is located between the two optical lenses 715. Employing multiple optical detectors may provide several benefits: 1) more scattered light collection, providing stronger signal strength, 2) additional information on scattered light collection for improving physiological assessments, 3) light collection at different wavelengths for measuring blood constituents, pulse pressure, skin, color, and the like, and 4) other benefits. For example, light entering the ear may scatter throughout several blood vessels, and without multiple detectors, signal information may be lost. Additionally, blood flow scatter collected from the front of the ear may be more indicative of blood flow through the carotid artery system, whereas blood flow scatter collected from the back of the ear may be more indicative of the capillary or venous system. The difference between these two signals may be processed with algorithms to generate an assessment of pulse pressure, blood pressure, cardiac output, and the like. Lastly, collecting light at different wavelengths, and processing these signals collectively, can be used to generate assessments of blood gas levels, such as blood oxygen (SpO2) and carbon dioxide (SpCO2), blood hemoglobin types and levels, or other blood constituents and their respective concentration levels**. Multiple wavelengths may be generated by a signal multiwavelength optical emitter, multiple optical emitters, optically filtered optical emitters, or the like. In such case, multiple optical emitters 102 may be located between the two optical filters 715. LeBoeuf at [0130].

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	 FIG. 14 LeBoeuf at fig. 14. **FIGS. 15A-15B show a multi-detector earbud 1500, where two separate optical detectors 103 are covered by two separate optical lenses, at least one optical emitter is covered by at least one optical lens, and where the emitter 102 and detector 103 configuration is oriented perpendicularly to the antitragus (as that shown in FIG. 11). In FIGS. 15A-15B, the optical detectors 103, emitters 102, and lenses are not readily visible as they are surrounded, at least in part, by an optical coupling area 1510. The lenses (not shown) may cover each separate emitter 102 and detector 103 as shown in FIGS. 7 and 8. Note that in this configuration, the emitter-detector module 700, 800 of FIGS. 7 and 8 is oriented towards the back of the ear (near the back of the head)**. This arrangement may serve two purposes: 1) sunlight may be further blocked from reaching the detectors 103, as the back of the ear may serve as a shield and 2) there may be less motion artifacts convoluting the desired blood flow signals, as the detectors 103 may be oriented away from mouth-motion-prone areas located near the front of the ear. Another feature of the earbud 1500 of FIGS. 15A and 15B is that an optical coupling area 1510 is located on top of the optical emitter 102 and surrounding (but not covering) the optical detector 103. **This optical coupling area 1510 may help diffuse, scatter, and/or guide light from the optical emitter to couple with a broader area of**

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	the ear region. Having a broader coupling area may help excite more regions of the ear with optical energy 110 (FIG. 1) and reduce the chance that the optical energy may miss important blood vessels, which may be located in different regions for different persons. Thus, such a design may promote a more universal design for a biometric earbud. Without an optical coupling area 1510, the optical energy 110 from the optical emitter(s) 102 may miss blood vessels in different persons due to physiological differences that may exist between different people. Alternatively, the optical coupling area 1510 may be configured to cover the optical detector 103 area and not the optical emitter 102 area, such that more light is guided from different regions of the ear and coupled into the detector 103. Alternatively, a plurality of optical diffusion areas may be configured to cover the emitter 102 and detector 103 separately. LeBoeuf at [0131].  FIG. 15A  FIG. 15B LeBoeuf at fig. 15a and 15b.

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	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	LeBoeuf discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source **According to some embodiments of the present invention, a wearable monitoring apparatus includes a housing (e.g., an earpiece, earbud, etc.), and a sensor module disposed within or attached to the housing. The housing is configured to be attached to a body of a subject, for example the ear. The sensor module includes an energy emitter, a detector, a filter, and at least one processor.** The energy emitter directs energy (e.g., optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, mechanical energy, magnetic energy, nuclear energy, etc.) at a target region of the subject and the detector detects an energy response signal from the subject. The energy response signal is associated with a physiological condition of the subject (e.g., heart rate, pulse pressure, respiration rate, lactic threshold, blood pressure, volume of blood flow through a blood vessel, blood metabolite level, blood oxygen level, size of at least one blood vessel, etc.). The filter removes or attenuates time-varying environmental interference from the energy response signal, wherein the time-varying environmental interference is caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc. LeBoeuf at [0006] **In some embodiments of the present invention, the energy emitter emits pulsed or modulated energy.** LeBoeuf at [0008]

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	According to some embodiments of the present invention, a monitoring apparatus includes a housing configured to be attached to the ear of a subject, and a sensor module disposed within or attached to the housing. The sensor module includes an optical emitter, a detector, a motion/position sensor, a filter, and at least one processor that controls operations of the optical emitter, detector, and/or filter. The optical emitter directs optical energy at a target region of the subject and the detector detects an optical energy response signal from the subject, wherein the energy response signal is associated with a physiological condition of the subject. Light-opaque material surrounds at least part of the sensor module to prevent ambient light from interfering with the detector. Output from the motion/position sensor is associated with the motion or position between the housing and ear of the subject. The filter removes or attenuates time-varying environmental interference from the optical energy response signal, wherein the time-varying environmental interference is caused by one or more of the following: sunlight, ambient light, airflow, and temperature LeBoeuf at [0012] **According to other embodiments of the present invention, an earbud for a headset includes a housing that is configured to be positioned within an ear of a subject, a speaker, and at least one sensor module disposed within or attached to the housing. The at least one sensor module includes a printed circuit board (PCB) having opposite first and second sides, an optical emitter attached to at least one side of the PCB that directs electromagnetic radiation at a target region of the ear, an optical detector attached to at least one side of the PCB adjacent to the optical emitter that detects an energy response signal associated with a physiological condition of the subject from the subject, and an optical filter overlying at least a portion of the optical detector, wherein the optical filter is configured to attenuate (e.g., reduce or block) light at one or more selected wavelengths**. A filter may be included that removes time-varying environmental interference from the energy response signal. Time-varying environmental interference may be caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc. The at least one sensor module may include at least one processor that controls operations of the optical emitter, optical detector, and/or filter. LeBoeuf at [0019]

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	According to other embodiments of the present invention, a method of monitoring at least one physiological property of a subject includes directing pulsed energy at a target region of the subject via an energy emitter, obtaining a first energy response signal from the subject when the emitter is on, obtaining a second energy response signal from the subject when the emitter is off, and processing the first and second energy response signals via an interference filter to produce a processed energy response signal that is associated with a physiological condition (e.g., heart rate, pulse pressure, respiration rate, lactic threshold, blood pressure, volume of blood flow through a blood vessel, blood metabolite level, blood oxygen level, size of at least one blood vessel, etc.) of the subject, wherein the filter removes or attenuates time-varying environmental interference caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc. Directing pulsed energy at a target region may include directing energy selected from the group consisting of optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, magnetic energy, mechanical energy, nuclear energy, etc. LeBoeuf at [0033] **In some embodiments of the present invention, the geometrical configuration of an emitter and detector may be oriented to maximize the collection of the energy response signal associated with physiological conditions and to minimize the collection of the unwanted scattered light response.** LeBoeuf at [0037] **The sensor module includes an energy emitter, a detector, a filter, and at least one processor. The energy emitter directs energy (e.g., optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, mechanical energy, magnetic energy, nuclear energy, etc.) at a target region of the subject and the detector detects an energy response signal from the subject. The energy response signal is associated with a physiological condition of the subject (e.g., heart rate, pulse pressure, respiration rate, lactic threshold, blood pressure, volume of blood flow through a blood vessel, blood metabolite level, blood oxygen level, size of at least one blood vessel, etc.).** The filter removes or attenuates time-varying environmental interference from the energy response signal, **wherein the time-varying environmental interference is caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc.**

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	LeBoeuf at [0044] **In some embodiments of the present invention, the energy emitter emits pulsed or modulated energy.** LeBoeuf at [0046] **The term “modulated energy”, as used herein, refers to energy (e.g., optical energy, acoustic energy, ultrasonic energy, electromagnetic radiation, electrical energy, magnetic energy, mechanical energy, nuclear energy, etc.) that is emitted in pulses and/or that is emitted such that the amplitude, frequency, phase, or intensity is varied. A pulsed energy source modulates by effectively multiplying by a waveform that is a periodic sequence of zeros and ones.** LeBoeuf at [0097] FIG. 1 illustrates an interference filtering apparatus/method 100, according to some embodiments of the present invention. **A medium 130, preferably physiological material of a living subject, comprises at least one target region of interest 120 which is interrogated by energy 110, preferably modulated energy, such as pulsed energy, generated by an energy emitter 102**. A pulsed driving circuit 101 is used to drive at least one energy emitter 102 at one or more pulsed frequencies to interrogate at least one target region of at least one medium 130 with the pulsed energy 110. The energy may be in the form of electromagnetic, acoustical, mechanical, nuclear, electrical, magnetic, thermal, or other forms of energy, but typically optical energy from the electromagnetic spectrum. The energy reaching the medium 130 can interact with the medium to generate at least one energy response signal 111, such as an optical scatter signal 111 between emitted optical energy 110 and the medium 130. **The energy response 111 caused by this interaction is detected by at least one detector** 103, configured to detect energy in the forms described above, but typically in the form of optical energy scattered from the medium 130. A motion/position sensor 104 may be configured to measure movement, positional changes, or inertial changes in the vicinity of the medium 130. **The outputs of the detector 103 may be sent to at least one analog-to-digital convertor (ADC) 105 and the digitized output may be sent to at least one interference filter 106, which is configured to remove the effects of time-varying environmental interference 140 from the signal output of the detector 103. At least one motion/position sensor 104 may be incorporated in the interference**

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	filtering method 100 to provide a reference signal for removing the effects of motion from the extracted energy response signal 111 to produce a desired signal 109. For example, the output of the interference filter 106 may be further processed by signal extraction filter 107 to extract accurate information from the medium 130, and this signal extraction filter 107 may utilize the output of the motion/position sensor 104 to remove motion artifacts from the desired signal (the extracted energy response signal) 109. At least one signal processor (not shown) may be used to control the operations of the energy emitter 102, detector 103, filter 106, and/or other components of the interference filtering method 100. LeBoeuf at [0107] In some embodiments of the present invention, a monitoring apparatus is configured to be a wearable monitor for monitoring at least one physiological condition of the wearer. In such an embodiment, pulsed electromagnetic energy 110 from at least one electromagnetic emitter 102, typically an optical emitter, is directed towards at least one physiological region 130, typically the ear region, of a subject. Examples of optical emitters include light-emitting diodes (LEDs), laser diodes (LDs), lamps, organic emitters (such as OLEDs), and the like. The sensor components (102, 103, and 104) may be integrated within the ear region 120 in the form-factor of an earbud or other ear-worn form-factor such that the measurement medium 130 comprises blood vessels and/or blood flow within the ear region. The intensity of the pulsed optical energy 110 is modulated by at least one pulsed driving circuit 101 such that the intensity is time-varying with at least two states, preferably an on state and an off state. This time-varying energy generates a time-varying energy response, typically an optical interaction response, such as optical absorption, modulation, scatter, transmission, luminescence, or the like, from the physiological region 130. **A first optical interaction response is obtained by at least one detector 103, typically an optical detector, when the pulsed optical energy 110 is in the on state.** A second energy response, in this case a second optical interaction response, is obtained by the optical detector 103 when the pulsed optical energy 110 is in the off state. (In some cases, other optical interaction responses may be collected in other modulated states of the pulsed energy 110.) **The first and second energy response signals are digitized by at least one ADC 105 and the digitized signals are processed via an interference filter 106 to produce a processed energy response signal that is associated with a physiological condition of the subject**, wherein the filter removes time-varying environmental interference caused by an interferant, such as sunlight, ambient light, airflow, temperature, etc. The output of the interference filter 106 is then processed by a signal extraction filter

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	107 to accurately extract at least one physiological property of the subject. A motion/position sensor 104 may be configured to measure the motion/position between the medium 130 and the emitter 102, the detector 103, and/or the time-varying interference 140, for example, caused by motion of the subject. The output signal of the motion sensor 104 may provide a motion artifact reference to the signal extraction filter 107 such that the motion/position information may be selectively removed from the desired signal output. Incorporating a motion sensor in embodiments of the present invention may be particularly important because time-varying interference, such as sunlight hitting an earbud, is often modulated by motion, and monitoring and subtracting this motion from the desired output may be critical to generating an accurate physiological signal in the midst of daily life activities of the subject. LeBoeuf at [0108] **Various forms of energy 110 can be used to interrogate one or more mediums 130 and to characterize those mediums by detectors 103 configured to detect the energy responses caused by the interaction of the energy 110 with the medium 130. For example, optical energy 110 can be used to interrogate a target region of skin and blood 130 to provide information regarding a physiological condition of a subject, such as a measure of blood oxygen levels of the subject by pulse oximetry.** A specific example of the opto-physiological interaction between light and a physiological medium 130 comprising the skin, blood vessels, and blood of a subject is shown in the reflective optical detection configuration 200 of FIG. 2. At least one sensor module 207, disposed within at least one housing configured to be attached to a body of a subject, may be in physical proximity to the skin of the subject, as shown in the reflective pulse oximetry setup 200 where reflected optical wavelengths 111 are measured, as opposed to measuring transmitted optical wavelengths. Optical emitter and optical detector wavelengths for pulse oximetry and photoplethysmography may include virtually any wavelength of electromagnetic radiation, but particularly useful are UV, visible, and IR wavelengths**.** In the illustrated embodiment, **an optical source-detector assembly 201, including an optical emitter 102 and optical detectors 103, is integrated into sensor module 207 to generate optical wavelengths 110 and monitor the resulting scattered optical energy 111. The optical source-detector assembly 201 may contain one or more optical sources emitting one or more optical wavelengths, as well as one or more optical detectors detecting one or more optical wavelengths.** The epidermis 212, dermis 213, and subcutaneous 214 layers of skin tissue of a human are shown in FIG. 2 for reference. The scattered optical energy 111 may be modulated in intensity by changes in physiological condition, such as: changes in blood flow in the blood vessels, changes in

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	physical motion of the body, changes in blood metabolite levels (such as blood gases, bilirubin, glucose, lactic acid, and the like), respiration, heart rate, pulse pressure, blood pressure, and other physiological changes. In some cases, the scattered optical energy 111 may be luminescent or preferentially polarized energy from the skin, blood, blood metabolites, drugs, or other materials in the body. Thus, the energy response signal 111 may contain information associated with at least one physiological condition of the subject. LeBoeuf at [0109] An exemplary filter processes samples 1910, **the off/on samples 1920/1930 respectively, taken from a digitized physiological sensor signal 1911 generated by a detector (e.g., 103, FIG. 1) as shown in FIGS. 19A-19B. A pulsed emitter (e.g., 102, FIG. 1) generates a pulsed beam of light such that some samples 1920 represent signal 1911 from a detector with the emitter turned off and other samples 1930 represent signal 1911 from the detector with the emitter turned on. Both types of samples 1920 and 1930 may contain environmental noise from environmental interferants, but only emitter-on samples 1930 contain physiological information generated by the emitter energy. The digitized samples taken from detector signal 1911, provided by an ADC (e.g., 105, FIG. 1), are processed by an interference filter (e.g., 106, FIG. 1) and the output of the interference filter may be directed for further processing (represented by 107, FIG. 1).** LeBoeuf at [0137] **These operations are summarized in FIG. 18, which is a flow chart of operations for removing environmental noise from a sensor signal via an interference filter, according to some embodiments of the present invention. At Block 1800, at least one ADC sample is read when the emitter is on. At Block 1802, at least one ADC sample is read when the emitter is off. At Block 1804, relevant on/off samples are input to an interference filter. At Block 1806, at least one sample from the interference filter is output for further processing.** LeBoeuf at [0138] An interference filter (e.g., 106, FIG. 1) utilized according to embodiments of the present invention, may vary in nature and complexity. For example, an interference filter may subtract temporally

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	neighboring emitter-off samples 1920 (FIG. 19A) from temporally neighboring emitter-on samples 1930 (FIG. 19A) and output a “subtraction” signal for further processing. **In this embodiment, the subtraction may involve subtracting temporally neighboring on/off samples, averaging temporally neighboring on samples and averaging temporally neighboring off samples and then subtracting the average off samples from the average on samples, or by other approaches to subtracting off signals 1920 from on signals 1930. When choosing a subtraction approach, it is important to consider the emitter pulsing frequency and sampling approach. For example, choosing a frequency that is too low may result in unsatisfactory subtraction, as the dynamic environmental conditions between off-states 1920 and on-states 1930 may be too abrupt for the sampling frequency, such that the physiological state of interest is not properly characterized by the interference filter. Thus, the sampling frequency may need to be much higher than the Nyquist frequency required for characterizing the signal in a stationary environment. As a specific example, if an interference filter (e.g., 106, FIG. 1) is being used to remove sunlight interference (e.g., SL1, SL2, FIG. 3), from a photoplethysmogram 1911 (FIGS. 19A, 19B), and if the desired processed output from the final filtering is heart rate, then the Nyquist criteria for pulsing the emitter may be 2×fmax, where fmax is the maximum heart rate of interest, which is likely to be somewhere around 200 beats/minute (BPM) or 3.33 Hz.** LeBoeuf at [0139] However, a person running through alternating shadows may generate a sunlight interference frequency greater than 10 Hz. In such case, it may be desirable to select a sampling frequency greater than twice the sunlight interference frequency, which in this case would be greater than 20 Hz. **Samples that are temporally neighboring (located close to each other in time) may be averaged in this case to help remove noise associated with unintended transients. For example, the off samples 1920 (FIGS. 19A, 19B) that come before, and/or after, a given on sample 1930 (FIGS. 19A, 19B) may be averaged and then that average may be subtracted from the on sample 1930 (or average of the on samples), and this final result may be passed along for further processing.** LeBoeuf at [0140] As another example, a batch of data may be defined to consist of: 1) a set number of on/off optical detector samples, for instance 6 interleaved on/off samples, 2) a set number of motion sensor samples,

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	for instance 3 samples (one for each on/off optical sample), and 3) a time delay. The time delay may be adjusted to generate the desired batch rate or batch frequency. The 6 on/off optical samples may be input to a multi-tap filter, for instance an M-tap weighted sum filter, and the output may be defined as 1 output per batch for the interference filter. If the optical on/off samples are extended to fill the whole batch period by “N” samples, then the decimation factor is “N”, and the effective sample rate is N*batch rate. The parameters for adjustment in this filter may then be N and M, where M is the number of taps in the filter. **The batch rate may be chosen to avoid aliasing of interfering harmonics from the desired physical condition monitored, such as the heart rate. For example, batch rate may be chosen as 10*HRmax, where HRmax is the maximum heart rate to be measured. The batch rate may dominate the MIPS (million instructions per second) used by a signal processor, such as a DSP (digital signal processor), since it affects the spectral transform of the desired output signal. In this filtering embodiment, to minimize aliasing from interfering sunlight-shadow changes on the desired heart rate output signal (especially for running or cycling through shadows), a increasing the N and/or M may be preferred.** LeBoeuf at [0141] It **should be noted from FIG. 21 that interference filter 2000 may reject more unwanted sunlight than less complex filters. Because the dominant sunlight noise frequencies 2150 may be located at lower frequencies, and because the modulated heart rate signal frequency 2160 may be located at a much higher frequency, most or all of the sunlight noise 2150 may be rejected by the interference filter 2130. Then through demodulation in further-processing (e.g., 107, FIG. 1), the heart rate signal may be returned to the baseband so that real-time heart rate may be extracted.** LeBoeuf at [0146] An interference filtering method, according to some embodiments of the present invention, may employ a motion/position sensor (e.g., 104, FIG. 1) to further remove interference from a desired physiological signal (e.g., 109, FIG. 1). For the case of sunlight interference (e.g., 140, FIG. 1) on an earbud sensor module (e.g., 207, FIG. 2), outdoor sunlight may more strongly illuminate an ear and detector 103 in the sensor module 207 than the emitter 102 in the sensor module 207. While an interference filter (e.g., 2130, FIG. 21) may effectively remove the baseband frequencies of this interference, harmonics caused by motion-induced sunlight noise may dominate the digitized signal

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	near the frequencies of the modulated desired information (e.g., 2160, FIG. 21). The step rate of a person running or jogging may be the strongest component of this interference. Moreover, because a person running or jogging may be moving through varying sunlight intensity, the interference signal may be a convolution of motion-coupled-sunlight changes in time. A technique for removing sunlight interference, according to some embodiments of the present invention, utilizes a motion or position sensor (e.g., 104, FIG. 1), such as an inertial sensor, accelerometer, pedometer, gyroscope, microelectromechanical sensor, capacitive sensor, inductive sensor, optical motion sensor, or the like. **The step rate may be measured as the peak frequency in the spectrum of the signal coming from motion/position sensor 104 or as the frequency of the spectral peak of the signal coming from the motion/position sensor 104. For example, the processed spectrum may employ differentiation or integration to generate a processed motion/position signal, and the peak frequency of this processed spectrum may be more indicative of the step rate**. **Harmonics and aliased harmonics of the step rate may determine the frequencies of interference to ignore in the desired-information spectrum. For example, the emitter pulse rate minus eight times the step rate (aliased 8th harmonic) may be the frequency of strong interference in the frequency space of the modulated heart rate (e.g., 2160, FIG. 21), and frequencies within a pre-deter**mined range may be set to zero in the desired-information spectrum. LeBoeuf at [0147] It should be noted that a motion/position sensor (e.g., 104, FIG. 1) utilized in accordance with some embodiments of the present invention may come from a broad range of sensors: inertial sensor, accelerometer, pedometer, gyroscope, microelectromechanical sensor, capacitive sensor, electrical sensor, inductive sensor, optical motion sensor, or the like. This is because many types of sensors may be either intentionally or unintentionally sensitive to motion and/or position. However, in some embodiments of the present invention, a sensor 104 (FIG. 1) and/or processing algorithm are utilized that can identify motion signals from physiological, environmental, or other signals not directly associated with motion. In some embodiments of the present invention, at least one optical detector (e.g., 103, FIG. 1) may also serve as a motion sensor. **Motion-related changes in scattered light (e.g., 111, FIG. 1) may be several times greater than blood-flow related changes in scattered light. Thus, the output of at least one detector 103 may be processed with a digital filter, such as a spectral filter, adaptive filter, threshold filter, or the like, to identify only motion-related signals and remove these signals from the desired response (e.g., 109, FIG. 1). Such processing may**

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	identify motion-related signals from physiological-related signals. In some embodiments of the present invention, by employing multiple optical detectors (e.g., 102, FIG. 1), motion-related signals may be identified from physiological-related signals by processing signals from the multiple detectors using an algorithm, such as a spectral algorithm. An example of a spectral processing algorithm for identifying motion-related signals, according to some embodiments of the present invention, is to generate a spectral representation of all signals in all detectors (e.g., 102, FIG. 1), identify key frequencies in each signal, and subtract, reduce, or remove all frequencies in common with each detector output. This type of filtering technique may work well because physiological signals may generate similar spectral peaks for all detectors (e.g., 102, FIG. 1) but motion signals may generate dissimilar spectral peaks in at least one detector (e.g., 103, FIG. 1). Another example of processing the detectors (e.g., 102, FIG. 1) to identify and remove motion-related signals is to position at least one detector in a location that does not “see” optical scatter (e.g., 111, FIG. 1) from the body/ear region but instead sees optical scatter from the earbud housing (e.g., 901, FIGS. 9A, 9B) or other material that may move in synchronization with the body. For example, the secondary sensor 730 (FIG. 7) may be an optical detector that measures light scattered from the earbud itself; because the sensor 730 may be facing the earbud and not the ear, only light scatter from the earbud may be detected. LeBoeuf at [0148] **FIGS. 22A-22D are graphs of a processed heart rate signal output 109 of an earbud module (e.g., earbud module 207, 700, FIGS. 2, 7) employing two different filter configurations, according to some embodiments of the present invention. The graphs illustrated in FIGS. 22A-22D were generated from data collected from a user wearing an earbud (e.g., 404, FIGS. 4A, 4B) during an outdoor run. FIGS. 22A and 22C show relative spectrograms of frequency vs. time, where the strongest spectral signals show the brightest relative intensities. FIGS. 22B and 22D show the estimates of step rate 2210 and heart rate 2220 following further processing 107 to extract the desired frequencies of interest. FIG. 22A shows the spectrogram of the digitized sensor output from an optical detector (e.g., 103, FIG. 1) following the ADC process (e.g., 105, FIG. 1) without employing an interference filter (e.g., 106, FIG. 1). FIG. 22C shows the spectrogram of the same digitized sensor output of FIG. 22A following signal processing via the interference filter 2130 of FIG. 21. FIG. 22A shows a great deal of broadband noise from sunlight, the strongest signal appears to be the step rate signal 2210, and the heart rate spectrum 2220 appears very faint with**

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	respect to the step rate signal. In contrast, FIG. 22C shows substantially less broadband noise from sunlight, the strongest signal appears to be the heart rate signal 2220, and the step rate signal 2210 appears very faint with respect to the heart rate signal. Through further filtering (e.g., 107, FIG. 1), the heart rate 2220 and step rate 2210 may be extracted, as shown in FIGS. 22B and 22D. FIG. 22B shows that the estimated heart rate signal 2200 is incorrect and does not match that of the spectrogram illustrated in FIG. 22A. In contrast, FIG. 22D shows that the estimated heart rate signal 2200 is correct and does match that of the spectrogram illustrated in FIG. 22C. Namely, the advanced interference filter 2130 is able to remove enough unwanted sunlight interference that the heart rate spectrum may be more easily extracted by spectral algorithms 107 (FIG. 1) designed to pick out the strongest frequency as heart rate. LeBoeuf at [0149] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	LeBoeuf discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen **The method of claim 26, further comprising transmitting the processed energy response signal to a remote device.** LeBoeuf at Caim 30. **In some embodiments of the present invention, the processed energy response signal is transmitted to a remote device, for example wirelessly transmitted.** LeBoeuf at [0035]

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	Embodiments of the present invention are not limited to headsets that communicate wirelessly. **In some embodiments of the present invention, headsets configured to monitor an individual's physiology and/or environment may be wired to a device that stores and/or processes data or there may be a combination of wired and wireless communications**. In some embodiments, this information may be stored on the headset itself. Furthermore, embodiments of the present invention are not limited to earbuds. In some embodiments, the invention may be employed around another part of the body, such as a digit, finger, toe, limb, wrist, ankle, around the nose or earlobe, or the like. In other embodiments, the invention may be integrated into a patch, such as a bandage that sticks on a person's body. LeBoeuf at [0106] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	LeBoeuf discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **The method of claim 26, further comprising transmitting the processed energy response signal to a remote device.** LeBoeuf at Caim 30. **In some embodiments of the present invention, the processed energy response signal is transmitted to a remote device, for example wirelessly transmitted.**

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	LeBoeuf at [0035] Embodiments of the present invention are not limited to headsets that communicate wirelessly. **In some embodiments of the present invention, headsets configured to monitor an individual's physiology and/or environment may be wired to a device that stores and/or processes data or there may be a combination of wired and wireless communications**. In some embodiments, this information may be stored on the headset itself. Furthermore, embodiments of the present invention are not limited to earbuds. In some embodiments, the invention may be employed around another part of the body, such as a digit, finger, toe, limb, wrist, ankle, around the nose or earlobe, or the like. In other embodiments, the invention may be integrated into a patch, such as a bandage that sticks on a person's body. LeBoeuf at [0106] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	LeBoeuf discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **The method of claim 26, further comprising transmitting the processed energy response signal to a remote device.** LeBoeuf at Caim 30. **In some embodiments of the present invention, the processed energy response signal is transmitted to a remote device, for example wirelessly transmitted.**

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	LeBoeuf at [0035] Embodiments of the present invention are not limited to headsets that communicate wirelessly. **In some embodiments of the present invention, headsets configured to monitor an individual's physiology and/or environment may be wired to a device that stores and/or processes data or there may be a combination of wired and wireless communications**. In some embodiments, this information may be stored on the headset itself. Furthermore, embodiments of the present invention are not limited to earbuds. In some embodiments, the invention may be employed around another part of the body, such as a digit, finger, toe, limb, wrist, ankle, around the nose or earlobe, or the like. In other embodiments, the invention may be integrated into a patch, such as a bandage that sticks on a person's body. LeBoeuf at [0106] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	See claim 5 above LeBoeuf discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. **According to some embodiments of the present invention, a sensor module includes a printed circuit board (PCB), in some cases having opposite first and second sides, an optical emitter attached to at least one side of the PCB, an optical detector attached to at least one side of the PCB adjacent to the optical emitter, an optical filter overlying at least a portion of the optical detector, and light-opaque material adjacent to the optical detector. The optical filter is**

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	configured to attenuate (e.g., reduce or block) light at one or more selected wavelengths, and the light-opaque material prevents ambient light from interfering with the optical detector. LeBoeuf at [0013] **In some embodiments of the present invention, the optical filter has a surface area greater than a surface area of the optical detector, and the optical filter overlies the optical detector such that a periphery of the optical filter overlaps a periphery of the optical detector.** LeBoeuf at [0014] The sensor module of claim 34, **wherein the optical filter has a surface area greater than a surface area of the optical detector, and wherein the optical filter overlies the optical detector such that a periphery of the optical filter overlaps a periphery of the optical detector.** LeBoeuf at claim 34 FIG. 1 illustrates an interference filtering apparatus/method 100, according to some embodiments of the present invention. A medium 130, preferably physiological material of a living subject, comprises at least one target region of interest 120 which is interrogated by energy 110, preferably modulated energy, such as pulsed energy, generated by an energy emitter 102. A pulsed driving circuit 101 is used to drive at least one energy emitter 102 at one or more pulsed frequencies to interrogate at least one target region of at least one medium 130 with the pulsed energy 110. The energy may be in the form of electromagnetic, acoustical, mechanical, nuclear, electrical, magnetic, thermal, or other forms of energy, but typically optical energy from the electromagnetic spectrum. The energy reaching the medium 130 can interact with the medium to generate at least one energy response signal 111, such as an optical scatter signal 111 between emitted optical energy 110 and the medium 130. The energy response 111 caused by this interaction is detected by at least one detector 103, configured to detect energy in the forms described above, but typically in the form of optical energy scattered from the medium 130. A motion/position sensor 104 may be configured to measure movement, positional changes, or inertial changes in the vicinity of the medium 130. **The outputs of the detector 103 may be sent to at least one analog-to-digital convertor (ADC) 105 and the digitized output may be sent to at least one interference filter 106, which is configured to remove the effects of time-varying environmental interference 140 from the signal output of the detector 103. At least one**

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	motion/position sensor 104 may be incorporated in the interference filtering method 100 to provide a reference signal for removing the effects of motion from the extracted energy response signal 111 to produce a desired signal 109. For example, the output of the interference filter 106 may be further processed by signal extraction filter 107 to extract accurate information from the medium 130, and this signal extraction filter 107 may utilize the output of the motion/position sensor 104 to remove motion artifacts from the desired signal (the extracted energy response signal) 109. At least one signal processor (not shown) may be used to control the operations of the energy emitter 102, detector 103, filter 106, and/or other components of the interference filtering method 100. LeBoeuf at [0107] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	See claim 5 above LeBoeuf discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. The apparatus of claim 1, wherein the housing is configured to be positioned within an ear of a subject, wherein the sensor module comprises a printed circuit board (PCB) having opposite first and second sides, wherein the energy emitter comprises an optical emitter attached to the first side of the PCB, wherein the optical emitter directs electromagnetic radiation at a target region of the ear, **wherein the detector comprises an optical detector attached to the first side of the PCB adjacent to the optical emitter, and wherein the filter comprises an optical filter overlying at least a portion of the optical**

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	detector, wherein the optical filter is configured to attenuate light at one or more selected wavelengths. LeBoeuf at claim 11 According to other embodiments of the present invention, an earbud for a headset includes a housing that is configured to be positioned within an ear of a subject, a speaker, and at least one sensor module disposed within or attached to the housing. **The at least one sensor module includes a printed circuit board (PCB) having opposite first and second sides, an optical emitter attached to at least one side of the PCB that directs electromagnetic radiation at a target region of the ear, an optical detector attached to at least one side of the PCB adjacent to the optical emitter that detects an energy response signal associated with a physiological condition of the subject from the subject, and an optical filter overlying at least a portion of the optical detector, wherein the optical filter is configured to attenuate (e.g., reduce or block) light at one or more selected wavelengths**. A filter may be included that removes time-varying environmental interference from the energy response signal. Time-varying environmental interference may be caused by one or more of the following: sunlight, ambient light, airflow, temperature, etc. The at least one sensor module may include at least one processor that controls operations of the optical emitter, optical detector, and/or filter. LeBoeuf at [0019] Various forms of energy 110 can be used to interrogate one or more mediums 130 and to characterize those mediums by detectors 103 configured to detect the energy responses caused by the interaction of the energy 110 with the medium 130. For example, optical energy 110 can be used to interrogate a target region of skin and blood 130 to provide information regarding a physiological condition of a subject, such as a measure of blood oxygen levels of the subject by pulse oximetry. A specific example of the opto-physiological interaction between light and a physiological medium 130 comprising the skin, blood vessels, and blood of a subject is shown in the reflective optical detection configuration 200 of FIG. 2. **At least one sensor module 207, disposed within at least one housing configured to be attached to a body of a subject, may be in physical proximity to the skin of the subject, as shown in the reflective pulse oximetry setup 200 where reflected optical wavelengths 111 are measured, as opposed to measuring transmitted optical wavelengths. Optical emitter and optical detector wavelengths for pulse oximetry and photoplethysmography may include virtually any**

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	wavelength of electromagnetic radiation, but particularly useful are UV, visible, and IR wavelengths. In the illustrated embodiment, an optical source-detector assembly 201, including an optical emitter 102 and optical detectors 103, is integrated into sensor module 207 to generate optical wavelengths 110 and monitor the resulting scattered optical energy 111. The optical source-detector assembly 201 may contain one or more optical sources emitting one or more optical wavelengths, as well as one or more optical detectors detecting one or more optical wavelengths. The epidermis 212, dermis 213, and subcutaneous 214 layers of skin tissue of a human are shown in FIG. 2 for reference. The scattered optical energy 111 may be modulated in intensity by changes in physiological condition, such as: changes in blood flow in the blood vessels, changes in physical motion of the body, changes in blood metabolite levels (such as blood gases, bilirubin, glucose, lactic acid, and the like), respiration, heart rate, pulse pressure, blood pressure, and other physiological changes. In some cases, the scattered optical energy 111 may be luminescent or preferentially polarized energy from the skin, blood, blood metabolites, drugs, or other materials in the body. Thus, the energy response signal 111 may contain information associated with at least one physiological condition of the subject. LeBoeuf at [0019] FIG. 14 illustrates a multi-detector earbud 1400, similar to the earbud 1300 of FIGS. 13A-13C, but where two separate optical detectors (not shown) are covered by two separate optical lenses 715. An optical emitter 102 is located between the two optical lenses 715. **Employing multiple optical detectors may provide several benefits: 1) more scattered light collection, providing stronger signal strength, 2) additional information on scattered light collection for improving physiological assessments, 3) light collection at different wavelengths for measuring blood constituents, pulse pressure, skin, color, and the like, and 4) other benefits. For example, light entering the ear may scatter throughout several blood vessels, and without multiple detectors, signal information may be lost.** Additionally, blood flow scatter collected from the front of the ear may be more indicative of blood flow through the carotid artery system, whereas blood flow scatter collected from the back of the ear may be more indicative of the capillary or venous system. **The difference between these two signals may be processed with algorithms to generate an assessment of pulse pressure, blood pressure, cardiac output, and the like. Lastly, collecting light at different wavelengths, and processing these signals collectively, can be used to generate assessments of blood gas levels, such as blood oxygen (SpO2) and carbon dioxide (SpCO2), blood hemoglobin**

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	types and levels, or other blood constituents and their respective concentration levels. Multiple wavelengths may be generated by a signal multiwavelength optical emitter, multiple optical emitters, optically filtered optical emitters, or the like. In such case, multiple optical emitters 102 may be located between the two optical filters 715. LeBoeuf at [0130] One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by LeBoeuf, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of LeBoeuf, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B5

U.S. Pat. No. 9,651,533 in view of U.S. Patent No. 9,241,676 to Daniel Lisogurski ("Lisogurski")

As described in detail below, Lisogurski (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

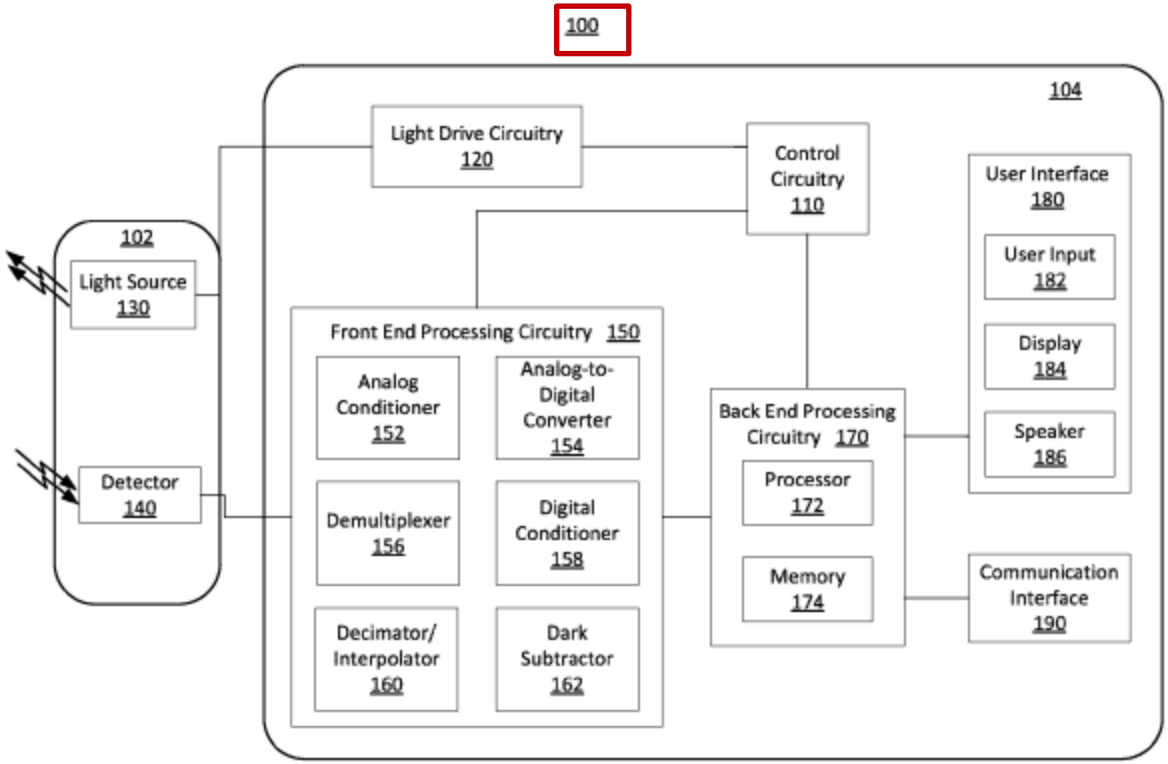
The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Lisogurski. The cited portions of Lisogurski are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Lisogurski. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Lisogurski "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Lisogurski does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Lisogurski (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Lisogurski anticipates and/or renders obvious the Asserted Claims of the '533 Patent

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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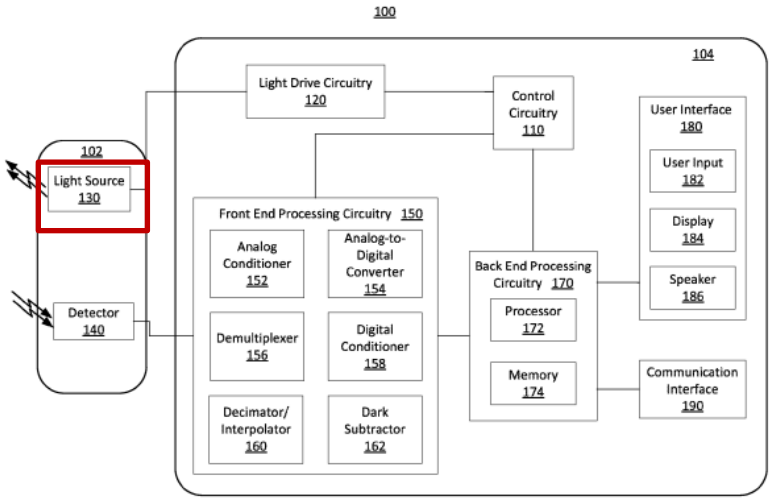
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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Lisogurski discloses or renders obvious a measurement system. **Systems and methods are provided for** optimizing power consumption in **an optical physiological monitoring system**. The system may vary light drive signal parameters to reduce power consumption or vary power use. The system may vary parameters in a technique correlated to cardiac pulse cycles. In some embodiments, reducing power consumption may allow for increased battery life in portable systems or increased portability. In some embodiments, varying light output during a cardiac cycle may reduce heating effects of the emitters. Parameters that may be varied include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof. The generated signals may be used to determined physiological parameters such as blood oxygen saturation, hemoglobin, blood pressure, pulse rate, other suitable parameters, or any combination thereof. Lisogurski at 1:10-25. **A physiological monitoring system may use photonic signals to determine physiological parameters**. The system may vary parameters of a light drive signal used to generate the photonic signal from a light source such that power consumption is reduced or optimized. Parameters may include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof. In some embodiments, the system may use information from a first light source to generate a light drive signal for a second light source. In some embodiments, the system may vary parameters in a way substantially synchronous with physiological pulses, for example, cardiac pulses. In some embodiments, the system may vary parameters in response to an external trigger. Lisogurski at Abstract.

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	 FIG. 1 Lisogurski at Fig. 1. **FIG. 1 is a block diagram of an illustrative physiological monitoring system 100** in accordance with some embodiments of the present disclosure. System 100 may include a sensor 102 and a monitor 104 for generating and processing physiological signals of a subject. In some embodiments, sensor 102 and monitor 104 may be part of an oximeter. Lisogurski at 10:42-47.

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	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Lisogurski discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. The present disclosure is directed towards power optimization in a medical device. **A physiological monitoring system** may monitor one or more physiological parameters of a patient, typically using one or more physiological sensors. **The system may include, for example, a light source** and a photosensitive detector. Providing a light drive signal to the light source may account for a significant portion of the system's total power consumption. Thus, it may be desirable to reduce the power consumption of the light source, while still enabling high quality physiological parameters to be determined. The system may reduce the power consumption by modulating parameters associated with the light drive signal in techniques correlated to the cardiac cycle or other cyclical physiological activity. For example, the system may decrease brightness during a particular portion of the cardiac cycle. It may also be desirable to reduce the power consumption by the light drive signal to reduce heating effects caused by an emitter. Lisogurski at 3:43-60.

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	 FIG. 1 Lisogurski at Fig. 1. **FIG. 1 is a block diagram of an illustrative physiological monitoring system 100** in accordance with some embodiments of the present disclosure. System 100 may include a sensor 102 and a monitor 104 for generating and processing physiological signals of a subject. In some embodiments, sensor 102 and monitor 104 may be part of an oximeter. Lisogurski at 10:42-47. **Sensor 102 of physiological monitoring system 100 may include light source 130** and detector 140. **Light source 130 may be configured to emit photonic signals having one or more wavelengths of light (e.g., Red and IR) into a subject's tissue**. **For example, light source 130 may include a Red light emitting light source and an IR light emitting light source, e.g., Red and IR light emitting diodes (LEDs), for emitting light into the tissue of a subject to generate physiological signals**. In one embodiment, **the Red wavelength may be between** about 600 nm and **about 700 nm,** and **the IR wavelength may be between about 800 nm and about 1000 nm.** It will be understood that light source 130 may include any number of light sources with any suitable characteristics. In embodiments where an array of sensors is used in place of single sensor 102, each sensor may be configured to emit

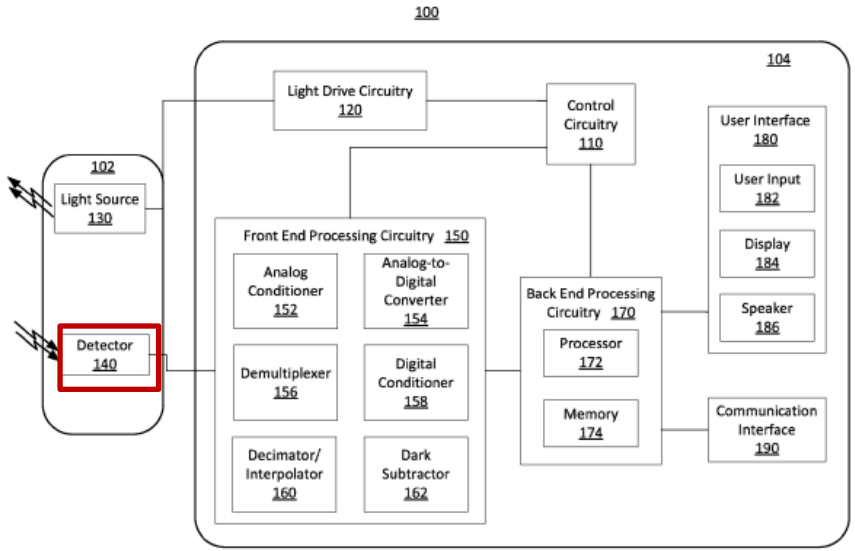
’533 Patent	Lisogurski
	a single wavelength. For example, a first sensor may emit only a Red light while a second may emit only an IR light. Lisogurski at 10:48-64. In step 402, the system may generate a first light drive signal. The light drive signal may be used by a light source to emit a photonic signal. **The light source may be one or more LEDs, laser diodes, other suitable device, or any combination thereof. For example, the light source may include light source 130 of FIG. 1** or light source 316 of FIG. 3. In some embodiments, **the light source may include LEDs of multiple wavelengths, for example, a red LED and an IR led.** In some embodiments, **the light source may include multiple LEDs of the same wavelength, multiple LEDs of different wavelengths, any other suitable arrangement**, or any combination thereof. In some embodiments, the light source may include a fiber optic or other light pipe to communicate light from one location to another. In some embodiments, the light drive signal may include or be a component of a cardiac cycle modulation. For example, the first light drive signal may be configured to activate one LED to emit a photonic signal and not activate other LEDs, such that some physiological parameters may be determined, but with lower power consumption than when the other LEDs are illuminated. Lisogurski at 19:20-39. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of	Lisogurski discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. **Systems and methods are provided for** optimizing power consumption in **an optical physiological monitoring system**. The system may vary light drive signal parameters to reduce power consumption

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semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	or vary power use. The system may vary parameters in a technique correlated to cardiac pulse cycles. In some embodiments, reducing power consumption may allow for increased battery life in portable systems or increased portability. In some embodiments, varying light output during a cardiac cycle may reduce heating effects of the emitters. Parameters that may be varied include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof. The generated signals may be used to determined physiological parameters such as blood oxygen saturation, hemoglobin, blood pressure, pulse rate, other suitable parameters, or any combination thereof. Lisogurski at 1:10-25. **A physiological monitoring system may use photonic signals to determine physiological parameters**. The system may vary parameters of a light drive signal used to generate the photonic signal from a light source such that power consumption is reduced or optimized. Parameters may include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof. In some embodiments, the system may use information from a first light source to generate a light drive signal for a second light source. In some embodiments, the system may vary parameters in a way substantially synchronous with physiological pulses, for example, cardiac pulses. In some embodiments, the system may vary parameters in response to an external trigger. Lisogurski at Abstract. It will also be understood that modulation of the light drive signal (i.e., the “on” and “off” states illustrated by light drive signal **1010**) is merely exemplary and may include modulation of parameters including drive current or light brightness, duty cycle, firing rate, modulation parameters, other suitable parameters, or any combination thereof. It will also be understood that the “on” and “off” states are merely exemplary and that the system may use any suitable variations of discrete and/or continuous modulations. For example, discrete modulations may include drive signals with one or more step functions. Continuous modulations may include sinusoidal waveforms. Lisogurski at 27:44-55. In some embodiments, the system may alter the cardiac cycle modulation technique based on the level of noise, ambient light, other suitable reasons, or any combination thereof. **The system may receive,**

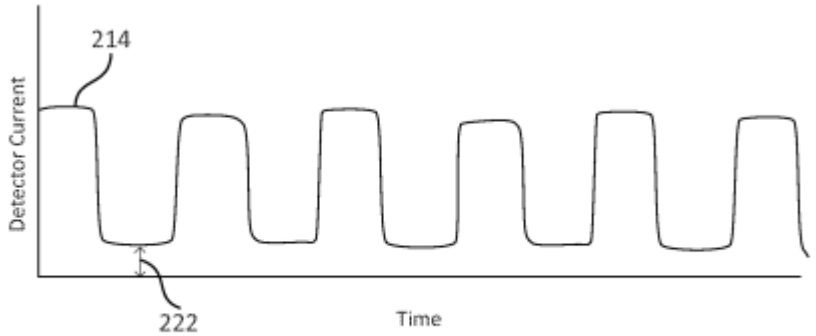
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	for example, an increased level of background noise in the signal due to patient motion. **The system may increase the brightness of the light sources in response to the noise to improve the signal-to-noise ratio**. In some embodiments, the system may increase brightness throughout the cardiac cycle because the system may require increased signal amplitudes to differentiate between fiducial and other points of interest related to physiological parameters and those related to noise or motion. 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. Lisogurski at 9:46-60. In step 402, the system may generate a first light drive signal. The light drive signal may be used by a light source to emit a photonic signal. **The light source may be one or more LEDs, laser diodes, other suitable device, or any combination thereof.** For example, the light source may include light source 130 of FIG. 1 or light source 316 of FIG. 3. In some embodiments, the light source may include LEDs of multiple wavelengths, for example, a red LED and an IR led. Lisogurski at 19:20-27. In step 404, the system may receive a light signal. **The light may be received using a sensor, for example, detector 140 of FIG. 1 or detector 318 of FIG. 3.** The light signal may be attenuated by the subject. The received light signal may in part include light from the first photonic signal. For example, the system may emit light that is reflected by the subject or transmitted through the subject. The interaction of the emitted light with the subject may cause the light to become attenuated. In some embodiments, the attenuation of the light may depend on the wavelength of the light and the tissue with which the light interacts. For example, particular wavelengths of light may be attenuated more strongly by oxyhemoglobin than other wavelengths. **In some embodiments, the system may amplify the received signal using front end processor circuitry**. In some embodiments, the gain may be modulated using a technique correlated to the cardiac cycle modulation. **The gain of the amplifier may be adjusted based on the emitted light brightness**, historical information related to the brightness of prior received attenuated signals, other suitable information, or any combination thereof, so that the amplified signal matches the range of the analog-to-digital converter and thus increases resolution. In some embodiments, the system may account for the gain using hardware, software, or any combination thereof, such that the original intensity information is retained.

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	Lisogurski at 19:40-64. However, if the **contribution of ambient light is large relative to the contribution of light from a light source, the total analog gain applied to the detection current may need to be reduced to avoid saturating analog-to-digital converter 154**. When the analog gain is reduced, the portion of the signal corresponding to the light source may map to a smaller number of analog-to-digital conversion bits. Thus, **more ambient light noise in the input of analog-to-digital converter 154 may results in fewer bits of resolution for the portion of the signal from the light source**. **This may have a detrimental effect on the signal-to-noise ratio of the detection signal. Accordingly, passive or active filtering or signal modification techniques may be employed to reduce the effect of ambient light on the detection signal that is applied to analog-to-digital converter 154, and thereby reduce the contribution of the noise component to the converted digital signal.** Lisogurski at 14:40-55. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Lisogurski discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample **Sensor 102 of physiological monitoring system 100 may include light source 130** and detector 140. **Light source 130 may be configured to emit photonic signals having one or more wavelengths of light (e.g., Red and IR) into a subject's tissue**. For example, **light source 130 may include a Red light emitting light source and an IR light emitting light source, e.g., Red and IR light emitting diodes (LEDs), for emitting light into the tissue of a subject to generate physiological signals.** In one embodiment, the Red wavelength may be between about 600 nm and about 700 nm, and the IR wavelength may be between about 800 nm and about 1000 nm. It will be understood that light source

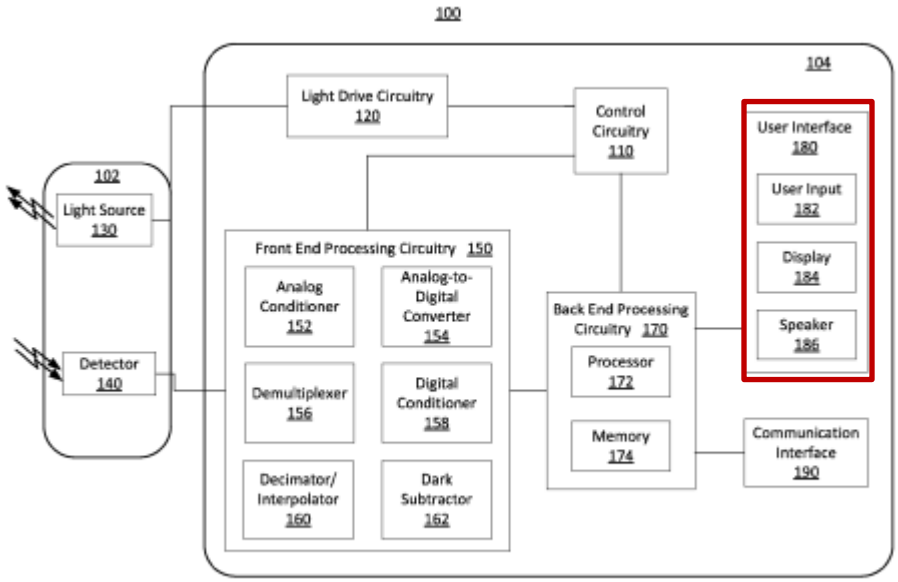
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	130 may include any number of light sources with any suitable characteristics. In embodiments where an array of sensors is used in place of single sensor 102, each sensor may be configured to emit a single wavelength. For example, a first sensor may emit only a Red light while a second may emit only an IR light. Lisogurski at 10:48-64. In step 402, the system may generate a first light drive signal. The light drive signal may be used by a light source to emit a photonic signal. **The light source may be one or more LEDs, laser diodes, other suitable device, or any combination thereof.** For example, the light source may include light source 130 of FIG. 1 or light source 316 of FIG. 3. In some embodiments, the light source may include LEDs of multiple wavelengths, for example, a red LED and an IR led. In some embodiments, the light source may include multiple LEDs of the same wavelength, multiple LEDs of different wavelengths, any other suitable arrangement, or any combination thereof. In some embodiments, the light source may include a fiber optic or other light pipe to communicate light from one location to another. In some embodiments, the light drive signal may include or be a component of a cardiac cycle modulation. For example, the first light drive signal may be configured to activate one LED to emit a photonic signal and not activate other LEDs, such that some physiological parameters may be determined, but with lower power consumption than when the other LEDs are illuminated. Lisogurski at 19:20-39. In an embodiment, **the subject may be a medical patient** and display 184 may exhibit a list of values which may generally apply to the patient, such as, for example, age ranges or medication families, which the user may select using user input 182. Lisogurski at 15:26-30. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it

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	would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Lisogurski discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source The present disclosure is directed towards power optimization in a medical device. **A physiological monitoring system** may monitor one or more physiological parameters of a patient, typically using one or more physiological sensors. **The system may include, for example,** a light source and **a photosensitive detector**. Lisogurski at 3:43-46.  FIG. 1 Lisogurski at Fig. 1. **FIG. 1 is a block diagram of an illustrative physiological monitoring system 100** in accordance with some embodiments of the present disclosure. **System 100 may include a sensor 102** and a

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	monitor 104 for generating and processing physiological signals of a subject. In some embodiments, sensor 102 and monitor 104 may be part of an oximeter. Lisogurski at 10:42-47. In some embodiments, **detector 140 may be configured to detect the intensity of light at the Red and IR wavelengths**. In some embodiments, an array of sensors may be used and each sensor in the array may be configured to detect an intensity of a single wavelength. In operation, **light may enter detector 140 after passing through the subject's tissue**. **Detector 140 may convert the intensity of the received light into an electrical signal. The light intensity may be directly related to the absorbance and/or reflectance of light in the tissue.** That is, when more light at a certain wavelength is absorbed or reflected, less light of that wavelength is received from the tissue by detector 140. After converting the received light to an electrical signal, detector 140 may send the detection signal to monitor 104, where the detection signal may be processed and physiological parameters may be determined (e.g., based on the absorption of the Red and IR wavelengths in the subject's tissue). In some embodiments, the detection signal may be preprocessed by sensor 102 before being transmitted to monitor 104. Lisogurski at 11:9-27. System 310 may include sensor unit 312 and monitor 314. In some embodiments, sensor unit 312 may be part of an oximeter. Sensor unit 312 may include one or more light source 316 for emitting light at one or more wavelengths into a subject's tissue. **One or more detector 318 may also be provided in sensor unit 312 for detecting the light that is reflected by or has traveled through the subject's tissue.** Any suitable configuration of light source 316 and detector 318 may be used. In an embodiment, sensor unit 312 may include multiple light sources and detectors, which may be spaced apart. Lisogurski at 17:35-45. Referring back to FIG. 1, front end processing circuitry 150 may receive a detection signal from detector 140 and provide one or more processed signals to back end processing circuitry 170. The term “detection signal,” as used herein, may refer to any of the signals generated within front end processing circuitry 150 as it processes the **output signal of detector 140**. Front end processing circuitry 150 may

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	perform various analog and digital processing of the detector signal. One suitable detector signal that may be received by front end processing circuitry 150 is shown in FIG. 2B. Lisogurski at 12:42-51. **Control circuitry 110 may be coupled to light drive circuitry 120, front end processing circuitry 150, and back end processing circuitry 170, and may be configured to control the operation of these components**. In some embodiments, **control circuitry 110 may be configured to provide timing control signals to coordinate their operation**. For example, **light drive circuitry 120 may generate a light drive signal, which may be used to turn on and off the light source 130, based on the timing control signals. The front end processing circuitry 150 may use the timing control signals to operate synchronously with light drive circuitry 120**. For example, front end processing circuitry 150 may synchronize the operation of an analog-to-digital converter and a demultiplexer with the light drive signal based on the timing control signals. In addition, the back end processing circuitry 170 may use the timing control signals to coordinate its operation with front end processing circuitry 150. Lisogurski at 11:33-49.  FIG. 2B Lisogurski at Fig. 2B.

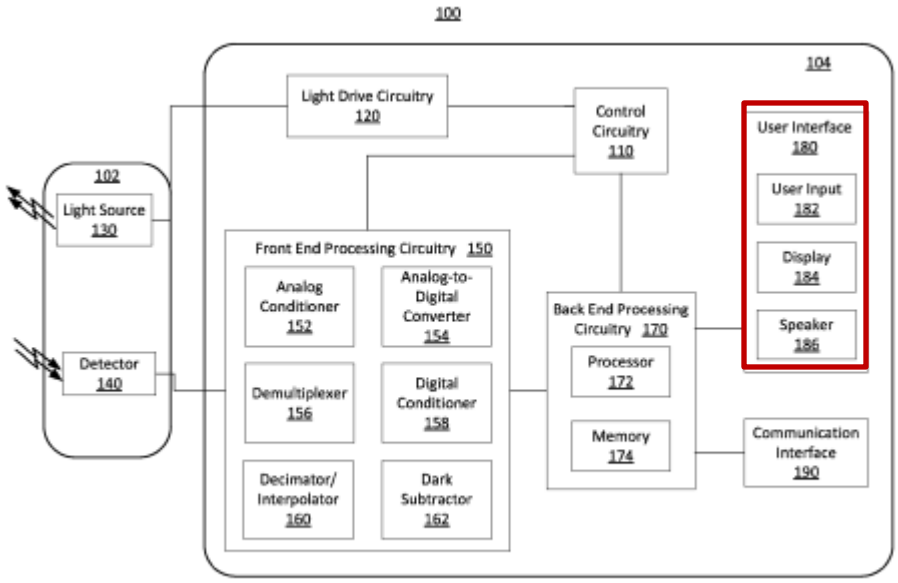
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	FIG. 2B shows an illustrative plot of detector signal 214 that may be generated by a sensor in accordance with some embodiments of the present disclosure. The peaks of detector current waveform 214 may represent current signals provided by a detector, such as detector 140 of FIG. 1, when light is being emitted from a light source. The amplitude of detector current waveform 214 may be proportional to the light incident upon the detector. **The peaks of detector current waveform 214 may be synchronous with light “on” periods driving one or more emitters of a light source, such as light source 130 of FIG. 1. For example, detector current waveform 214 may be generated in response to a light source being driven by the light drive signal** of FIG. 2A. The valleys of detector current waveform 214 may be synchronous with periods of time during which no light is being emitted by the light source. While no light is being emitted by a light source during the valleys, detector current waveform 214 may not fall all of the way to zero. Rather, dark current 222 may be present in the detector waveform. Since dark current 222 may interfere with accurate determinations of physiological characteristics, dark current 222 may be removed as discussed in more detail below. Lisogurski at 12:52-13:6. As used herein, the terms “on” and “off” are merely exemplary and may not necessarily refer to a fully on or off state. **For example, “on” and “off” may refer to switching power or other components, high and low brightness output states, high and low values within a continuous modulation, high and low values of electrical current provided to an emitter, high and low values of a duty cycle, high and low values of a decimation ratio (i.e., how often an emitter is switched on), any other suitable relatively distinct states, or any combination thereof**. In some embodiments, “on” and “off” states may relate to high and low values of a variable that varies with multiple discrete steps. For example, an emitter brightness may be provided by the system as off, low, medium, and high. In this example, an “off” state may refer to off or low emission and “on” may refer to medium or high. In another example, “off” may refer to an off state and “on” may refer to a low, medium, or high output depending on a second input or system variable. Lisogurski at 8:27-44. In an embodiment, **the subject may be a medical patient** and display 184 may exhibit a list of values which may generally apply to the patient, such as, for example, age ranges or medication families, which the user may select using user input 182.

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	Lisogurski at 15:26-30. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	Lisogurski discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen  FIG. 1 Lisogurski at Fig. 1.

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	User interface 180 may include user input 182, display 184, and speaker 186. User input 182 may include any type of user input device such as a keyboard, a mouse, a touch screen, buttons, switches, a microphone, a joy stick, a touch pad, or any other suitable input device. The inputs received by user input 182 can include information about the subject, such as age, weight, height, diagnosis, medications, treatments, and so forth. In an embodiment, the subject may be a medical patient and display 184 may exhibit a list of values which may generally apply to the patient, such as, for example, age ranges or medication families, which the user may select using user input 182**. Additionally, display 184 may display, for example, an estimate of a subject's blood oxygen saturation generated by monitor 104 (referred to as an “SpO2” measurement), pulse rate information, respiration rate information, blood pressure, any other parameters, and any combination thereof. Display 184 may include any type of display such as a cathode ray tube display, a flat panel display such a liquid crystal display or plasma display, or any other suitable display device. Speaker 186 within user interface 180 may provide an audible sound that may be used in various embodiments, such as for example, sounding an audible alarm in the event that a patient's physiological parameters are not within a predefined normal range.** Lisogurski at 15:19-42. **Communication interface 190 may enable monitor 104 to exchange information with external devices. Communications interface 190 may include any suitable hardware, software, or both, which may allow monitor 104 to communicate with electronic circuitry, a device, a network, a server or other workstations, a display, or any combination thereof. Communications interface 190 may include one or more receivers, transmitters, transceivers, antennas, plug-in connectors, ports, communications buses, communications protocols, device identification protocols, any other suitable hardware or software, or any combination thereof. Communications interface 190 may be configured to allow wired communication (e.g., using USB, RS-232 or other standards), wireless communication (e.g., using WiFi, IR, WiMax, BLUETOOTH, UWB, or other standards), or both. For example, communications interface 190 may be configured using a universal serial bus (USB) protocol (e.g., USB 2.0, USB 3.0), and may be configured to couple to other devices (e.g., remote memory devices storing templates) using a four-pin USB standard Type-A connector (e.g., plug and/or socket) and cable. In some embodiments, communications interface 190 may include an internal bus such as, for example, one or more slots for insertion of expansion cards**.

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	Lisogurski at 15:43-65. **Back end processing circuitry 170 may include processor 172 and memory 174. Processor 172 may be adapted to execute software, which may include an operating system and one or more applications, as part of performing the functions described herein. Processor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may determine one or more physiological parameters based on the received physiological signals. Memory 174 may include any suitable computer-readable media capable of storing information that can be interpreted by processor 172. This information may be data or may take the form of computer-executable instructions, such as software applications, that cause the microprocessor to perform certain functions and/or computer-implemented methods.** Depending on the embodiment, such computer-readable media may include computer storage media and communication media. Computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. Computer storage media may include, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, DVD, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by components of the system. Back end processing circuitry 170 may be communicatively coupled with use interface 180 and communication interface 190. Lisogurski at 14:56-15:18. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Lisogurski discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link  FIG. 1 Lisogurski at Fig. 1. **User interface 180 may include user input 182, display 184, and speaker 186. User input 182 may include any type of user input device such as a keyboard, a mouse, a touch screen, buttons, switches, a microphone, a joy stick, a touch pad, or any other suitable input device**. The inputs received by user input 182 can include information about the subject, such as age, weight, height, diagnosis, medications, treatments, and so forth. In an embodiment, the subject may be a medical patient and display 184 may exhibit a list of values which may generally apply to the patient, such as, for example, age ranges or medication families, which the user may select using user input 182**.**

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	Additionally, display 184 may display, for example, an estimate of a subject's blood oxygen saturation generated by monitor 104 (referred to as an “SpO2” measurement), pulse rate information, respiration rate information, blood pressure, any other parameters, and any combination thereof. Display 184 may include any type of display such as a cathode ray tube display, a flat panel display such a liquid crystal display or plasma display, or any other suitable display device. Speaker 186 within user interface 180 may provide an audible sound that may be used in various embodiments, such as for example, sounding an audible alarm in the event that a patient's physiological parameters are not within a predefined normal range. Lisogurski at 15:19-42. **Back end processing circuitry 170 may include processor 172 and memory 174. Processor 172 may be adapted to execute software, which may include an operating system and one or more applications, as part of performing the functions described herein. Processor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may determine one or more physiological parameters based on the received physiological signals. Memory 174 may include any suitable computer-readable media capable of storing information that can be interpreted by processor 172. This information may be data or may take the form of computer-executable instructions, such as software applications, that cause the microprocessor to perform certain functions and/or computer-implemented methods.** Depending on the embodiment, such computer-readable media may include computer storage media and communication media. Computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. Computer storage media may include, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, DVD, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by components of the system. Back end processing circuitry 170 may be communicatively coupled with use interface 180 and communication interface 190. Lisogurski at 14:56-15:18.

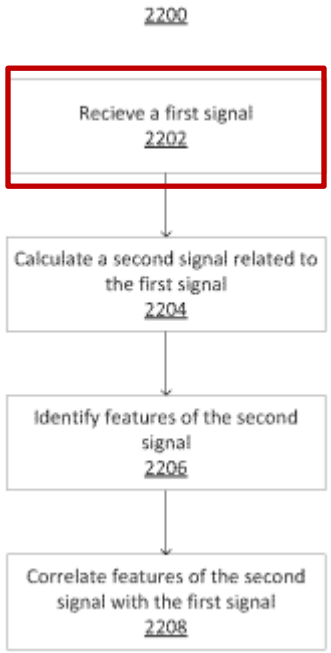
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	Communication interface 190 may enable monitor 104 to exchange information with external devices. Communications interface 190 may include any suitable hardware, software, or both, which may allow monitor 104 to communicate with electronic circuitry, a device, a network, a server or other workstations, a display, or any combination thereof. Communications interface 190 may include one or more receivers, transmitters, transceivers, antennas, plug-in connectors, ports, communications buses, communications protocols, device identification protocols, any other suitable hardware or software, or any combination thereof. Communications interface 190 may be configured to allow wired communication (e.g., using USB, RS-232 or other standards), wireless communication (e.g., using WiFi, IR, WiMax, BLUETOOTH, UWB, or other standards), or both. For example, communications interface 190 may be configured using a universal serial bus (USB) protocol (e.g., USB 2.0, USB 3.0), and may be configured to couple to other devices (e.g., remote memory devices storing templates) using a four-pin USB standard Type-A connector (e.g., plug and/or socket) and cable. In some embodiments, communications interface 190 may include an internal bus such as, for example, one or more slots for insertion of expansion cards. Lisogurski at 15:43-65. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to	Lisogurski discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **Back end processing circuitry 170 may include processor 172 and memory 174. Processor 172 may be adapted to execute software, which may include an operating system and one or more applications, as part of performing the functions described herein. Processor 172 may receive and process physiological signals received from front end processing circuitry 150. For example,**

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generate processed data and to store the processed data.	**processor 172 may determine one or more physiological parameters based on the received physiological signals. Memory 174 may include any suitable computer-readable media capable of storing information that can be interpreted by processor 172. This information may be data or may take the form of computer-executable instructions, such as software applications, that cause the microprocessor to perform certain functions and/or computer-implemented methods.** Depending on the embodiment, such computer-readable media may include computer storage media and communication media. Computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. Computer storage media may include, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, DVD, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by components of the system. Back end processing circuitry 170 may be communicatively coupled with use interface 180 and communication interface 190. Lisogurski at 14:56-15:18. **Communication interface 190 may enable monitor 104 to exchange information with external devices. Communications interface 190 may include any suitable hardware, software, or both, which may allow monitor 104 to communicate with electronic circuitry, a device, a network, a server or other workstations, a display, or any combination thereof. Communications interface 190 may include one or more receivers, transmitters, transceivers, antennas, plug-in connectors, ports, communications buses, communications protocols, device identification protocols, any other suitable hardware or software, or any combination thereof. Communications interface 190 may be configured to allow wired communication (e.g., using USB, RS-232 or other standards), wireless communication (e.g., using WiFi, IR, WiMax, BLUETOOTH, UWB, or other standards), or both. For example, communications interface 190 may be configured using a universal serial bus (USB) protocol (e.g., USB 2.0, USB 3.0), and may be configured to couple to other devices (e.g., remote memory devices storing templates) using a four-pin USB standard Type-A connector (e.g., plug and/or socket) and cable. In some embodiments, communications interface 190 may include an internal bus such as, for example, one or more slots for insertion of expansion cards**

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	Lisogurski at 15:43-65. In step 410, the system may determine a physiological parameter using information from the attenuated photonic signals. The physiological parameter may be determined using any suitable hardware technique, software technique, or combination thereof. In some embodiments, processing equipment remote to the system may be used to determine physiological parameters. **The system may display the determined physiological parameter using a local display (e.g., display 320 of FIG. 3 or display 328 of FIG. 3), display them on a remote display, publish the data to a server or website, make the parameters available to a user by any other suitable technique, or any combination thereof**. Lisogurski at 20:49-60. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	See claim 5 above Lisogurski discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.

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	 Lisogurski at Fig. 22. In step 2202, the system may receive a signal. **The signal may be, for example, an attenuated photonic signal. The signal may have been detected by a detector. The detected signal may be processed by processing equipment including, for example, digitizers, filters, decimators, interpolators, other suitable processing equipment, or any combination thereof. In some embodiments, the system may amplify the received signal using front end processor circuitry. The gain of the amplifier may be adjusted based on the emitted light brightness, historical information related to the brightness of prior received attenuated signals, other suitable information, or any combination thereof, so that the amplified signal matches the range of the analog-to-digital converter and thus increases resolution. In some embodiments, the system may account for the gain using hardware, software, or any combination thereof, such that the original intensity information is retained**.

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	Lisogurski at 38:59-39:8 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	See claim 5 above Lisogurski discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. **Sensor 102 of physiological monitoring system 100 may include light source 130 and detector 140. Light source 130 may be configured to emit photonic signals having one or more wavelengths of light (e.g., Red and IR) into a subject's tissue. For example, light source 130 may include a Red light emitting light source and an IR light emitting light source, e.g., Red and IR light emitting diodes (LEDs), for emitting light into the tissue of a subject to generate physiological signals. In one embodiment, the Red wavelength may be between about 600 nm and about 700 nm, and the IR wavelength may be between about 800 nm and about 1000 nm. It will be understood that light source 130 may include any number of light sources with any suitable characteristic**s. In embodiments where an array of sensors is used in place of single sensor 102, each sensor may be configured to emit a single wavelength. For example, a first sensor may emit only a Red light while a second may emit only an IR light. Lisogurski at 10:48-64 In some applications, **the photonic signal interacting with the tissue is selected to be of one or more wavelengths that are attenuated by the blood in an amount representative of the blood constituent concentration**. Red and infrared (IR) wavelengths may be used because it has been

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	observed that highly oxygenated blood will absorb relatively less red light and more IR light than blood with a lower oxygen saturation. **By comparing the intensities of two wavelengths at different points in the pulse cycle, it is possible to estimate the blood oxygen saturation of hemoglobin in arterial blood**. Lisogurski at 4:42-51 **The system may process data to determine physiological parameters using techniques well known in the art. For example, the system may determine blood oxygen saturation using two wavelengths of light and a ratio-of-ratios calculation. The system also may identify pulses and determine pulse amplitude, respiration, blood pressure, other suitable parameters, or any combination thereof, using any suitable calculation techniques. In some embodiments, the system may use information from external sources (e.g., tabulated data, secondary sensor devices) to determine physiological parameters**. Lisogurski at 4:42-51 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Lisogurski, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Lisogurski, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B6

U.S. Pat. No. 9,651,533 in view of U.S. Patent No. 9,596,990 to James Park ("Park")

As described in detail below, Park (individually or collectively) anticipates and/or renders obvious claim 5,11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Park. The cited portions of Park are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Park. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Park "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Park does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Park (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Park anticipates and/or renders obvious the Asserted Claims of the '533 Patent

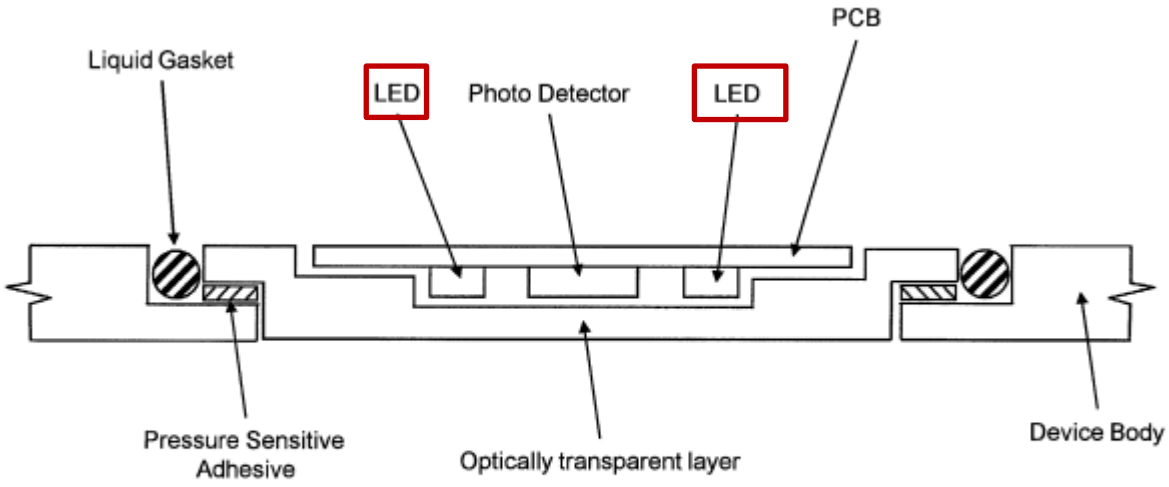
This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Park discloses or renders obvious a measurement system. The present inventions, in one aspect, are **directed to portable biometric monitoring device including a housing having a physical size and shape that is adapted to couple to the user's body, at least one band to secure the monitoring device to the user, a physiological sensor, disposed in the housing, to generate data which is representative of a physiological condition of the user data. The physiological sensor may include a light source to generate and output light having at least a first wavelength, and a photodetector to detect scattered light (e.g., from the user).** A light pipe is disposed in the housing and optically coupled to the light source directs/transmits light therefrom along a predetermined path to an outer surface of the housing. Processing circuitry calculates a heart rate of the user using data which is representative of the scattered light Park at Abstract. In one exemplary embodiment, the portable **biometric monitoring device includes an optical sensor to detect, sense, sample and/or generate data that may be used to determine information representative of, for example, stress (or level thereof), blood pressure and/or heart rate of a user.** (See, for example, FIGS. 2-7 and 17-23). In this embodiment, **the biometric monitoring device includes an optical sensor having one or more light sources (LED, laser, etc.) to emit or output light into the user's body and/or light detectors (photodiodes, phototransistors, etc.) to sample, measure and/or detect a response or reflection and provide data used to determine data which is representative of stress (or level thereof), blood pressure and/or heart rate of a user (e.g., using photoplethysmography—“PPG”).** Park at 6:42-55 In one exemplary embodiment, **a user's heart rate measurement may be triggered by criteria determined by one or more sensors (or processing circuitry connected to them). For instance, when data from the motion sensor(s) indicates a period of stillness or little motion, the biometric monitoring device may trigger, acquire and/or obtain a heart rate measurement or data**. (See, for example, FIGS. 15, 24 and 25). In one embodiment, when **the motion sensor(s) indicate user activity or motion (for example, motion that is not suitable or optimum to trigger, acquire and/or**

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	obtain desired heart rate measurement or data (for example, data used to determine a user's resting heart rate), the biometric monitoring device and/or the sensor(s) employed to acquire and/or obtain desired heart rate measurement or data may be placed or remain in a low power state. Notably, measurements taken during motion may be less reliable and may be corrupted by motion artifact (for example, relative motion between the sensors and the user). Park at 6:56-7:6 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Park discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers.

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	 FIG. 7 Park at Fig.7 Indeed, in one embodiment, **the color or wavelength of the light emitted by the LED (or set of LEDs) may be modified, adjusted and/or controlled in accordance with a predetermined type of physiological data being acquired or conditions of operation**. Here, the wavelength of the light emitted by the LED is adjusted and/or controlled to optimize and/or enhance the “quality” of the physiological data obtained and/or sampled by the detector. For example, the color of the light emitted by the LED may be switched from infrared to green when the user's skin temperature or the ambient temperature is cool in order to enhance the signal corresponding to cardiac activity. (See, for example, FIG. 20). Park at 11:4-16 **The biometric monitoring device, in one embodiment, includes a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and**

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	the user. Here, the window may permit light (for example, a substantial portion of a selected wavelength) to be emitted by, for example, one or more LEDs, onto the skin of the user and a response or reflection to pass into the housing to be sampled, measured and/or detected by, for example, one or more photodiodes. In one embodiment, the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for example, painted with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum. In this way, the light transmission is invisible to the human eye. Park at 11:17-31 **The source(s) may emit light having one or more wavelengths which are specific or directed to a type of physiological data to be collected. The optical detectors may sample, measure and/or detect one or more wavelengths that are also specific or directed to a type of physiological data to be collected and physiological parameter (of the user) to be assessed or determined. For instance, in one embodiment, a light source emitting light having a wavelength in the green spectrum (for example, an LED that emits light having wavelengths corresponding to the green spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect heart rate. In contrast, a light source emitting light having a wavelength in the red spectrum (for example, an LED that emits light having wavelengths corresponding to the red spectrum) and a light source emitting light having a wavelength in the infrared spectrum (for example, an LED that emits light having wavelengths corresponding to the IR spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect SpO2.** Park at 10:50-11:3 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	Park discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. FIG. 17 depicts an exemplary schematic block diagram of an optical sensor where light is emitted from a light source toward the user's skin and the reflection is sensed by a light detector, wherein the output of the detector is subsequently digitized by an analog to digital converter (ADC). The intensity of the light source may be modified (e.g., through a light source intensity control module) to maintain a desirable scattered/reflected intensity signal. For example, the intensity of the output of the light source may be reduced to avoid saturation of the output signal from the light detector. As another example, the light source intensity may be increased to maintain the output signal from the light detector within a desired range of output values. Park at 16:8-20 Where optical sensors are disposed or arranged on the skin side of the biometric monitoring device, in operation, a light source emits light upon the skin of the user and, in response, a light detector samples, acquires and/or detects a response or scattered/reflected light from the skin (and/or from inside the body). **The one or more sources and detectors may be arranged in an array or pattern that enhances or optimizes the SNR and/or reduces or minimizes power consumption by light sources and detectors. These optical detectors sample, acquire and/or detect physiological data which may then be processed or analyzed (for example, by resident processing circuitry) to obtain data which is representative of, for example, a user's heart rate, respiration, heart rate variability, oxygen saturation (SpO2), blood volume, blood glucose, skin moisture and/or skin pigmentation level.** Park at 10:34-49 In one embodiment, the biometric monitoring device includes a concave or convex shape, on the skin side of the device, to focus light towards a specific volume at a specific depth in the skin and increase the efficiency of light collected from that point into the photodetector. (See, for example, FIGS. 8-10). **Where such a biometric monitoring device also employs light pipes to selectively and controllably route light, it may be advantageous to shape the end of the light pipe with a degree of cylindricity (for example, rather than radially symmetric). Such a configuration may improve the SNR by**

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	increasing the efficiency of light transferred from the emitter onto or into the skin of the user while decreasing “stray” light from being detected or collected by the photodetector. In this way, the signal sampled, measured and/or detected by the photodetector consists less of stray light and more of the user's response to such emitted light (signal or data that is representative of the response to the emitted light). Park at 12:31-48 **As intimated above, the portable biometric monitoring device may include a material disposed on the skin or interior side which includes high reflectivity characteristic—for example, polished stainless steel, reflective paint, and polished plastic. In this way, light scattered/reflected off the skin side of the device may be scattered/reflected back into the skin in order to, for example, improve the SNR. Indeed, this effectively increases the input light signal as compared with a device body back that is non-reflective.** Notably, in one embodiment, the color of the skin or interior side of the biometric monitoring device is selected to provide certain optical characteristics (for example, reflect certain or predetermined wavelengths of light), in order to improve the signal of certain physiological data types. For example, where the skin or interior side of the biometric monitoring is green, the measurements of the heart rate may be enhanced due to the preferential emission of a wavelength of the light corresponding to the green spectrum. Where the skin or interior side of the biometric monitoring is red, the measurements of the SpO2 may be enhanced due to the emission preferential of a wavelength of the light corresponding to the red spectrum. In one embodiment, the color of the skin or interior side of the biometric monitoring device may be modified, adjusted and/or controlled in accordance with a predetermined type of physiological data being acquired. Park at 15:49-16:7 **The biometric monitoring device, in one embodiment, includes a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user. Here, the window may permit light (for example, a substantial portion of a selected wavelength) to be emitted by, for example, one or more LEDs, onto the skin of the user and a response or reflection to pass into the housing to be sampled, measured and/or detected by, for example, one or more photodiodes.** In one embodiment, the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for

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	example, painted with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum. In this way, the light transmission is invisible to the human eye. Park at 11:17-31 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Park discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample The biometric monitoring device, in one embodiment, includes a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user. Here**, the window may permit light (for example, a substantial portion of a selected wavelength) to be emitted by, for example, one or more LEDs, onto the skin of the user and a response or reflection to pass into the housing to be sampled, measured and/or detected by, for example, one or more photodiodes. In one embodiment, the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for example, painted with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum. In this way, the light transmission is invisible to the human eye**. Park at 11:17-31 The biometric monitoring device, in one embodiment, may employ light pipes or other light transmissive structures. (See, for example, FIGS. 8-10). In this regard, in one embodiment, light is directed from the light source to the skin of the user through light pipes or other light transmissive structures. **Scattered or reflected light from the user's body may be directed back to and detected by the optical circuitry through the same or similar structures. Indeed, the transmissive structures may employ a material and/or optical design to facilitate low light loss (for example,**

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	a lens) thereby improving SNR of the photo detector and/or reducing power consumption of the light emitter(s) and/or light detector(s). In one embodiment, the light pipes or other light transmissive structures may include a material that selectively transmits light having one or more specific or predetermined wavelengths with higher efficiency than others, thereby acting as a bandpass filter. This bandpass filter may be tuned to improve the signal of a specific physiological data type. For example, in one embodiment, an In-Mold-Labeling or “IML” light transmissive structure may be implemented wherein the structure uses a material with predetermined or desired optical characteristics to create a specific bandpass characteristic, for example, to pass infrared light with greater efficiency than light of other wavelengths (for example, light having a wavelength in human visible spectrum). Park at 11:32-57 **Where optical sensors are disposed or arranged on the skin side of the biometric monitoring device, in operation, a light source emits light upon the skin of the user and, in response, a light detector samples, acquires and/or detects a response or scattered/reflected light from the skin (and/or from inside the body). The one or more sources and detectors may be arranged in an array or pattern that enhances or optimizes the SNR and/or reduces or minimizes power consumption by light sources and detectors. These optical detectors sample, acquire and/or detect physiological data which may then be processed or analyzed (for example, by resident processing circuitry) to obtain data which is representative of, for example, a user's heart rate, respiration, heart rate variability, oxygen saturation (SpO2), blood volume, blood glucose, skin moisture and/or skin pigmentation level** Park at 10:34-49 **The source(s) may emit light having one or more wavelengths which are specific or directed to a type of physiological data to be collected. The optical detectors may sample, measure and/or detect one or more wavelengths that are also specific or directed to a type of physiological data to be collected and physiological parameter (of the user) to be assessed or determined. For instance, in one embodiment, a light source emitting light having a wavelength in the green spectrum (for example, an LED that emits light having wavelengths corresponding to the green spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect heart rate. In contrast, a light source emitting light having a wavelength in the red spectrum (for example, an LED that emits light having**

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	wavelengths corresponding to the red spectrum) and a light source emitting light having a wavelength in the infrared spectrum (for example, an LED that emits light having wavelengths corresponding to the IR spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect SpO2. Park at 10:50-11:3 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Park discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source The biometric monitoring device, in one embodiment, may employ light pipes or other light transmissive structures. (See, for example, FIGS. 8-10). In this regard, in one embodiment, light is directed from the light source to the skin of the user through light pipes or other light transmissive structures. **Scattered or reflected light from the user's body may be directed back to and detected by the optical circuitry through the same or similar structures. Indeed, the transmissive structures may employ a material and/or optical design to facilitate low light loss (for example, a lens) thereby improving SNR of the photo detector and/or reducing power consumption of the light emitter(s) and/or light detector(s).** In one embodiment, the light pipes or other light transmissive structures may include a material that selectively transmits light having one or more specific or predetermined wavelengths with higher efficiency than others, thereby acting as a bandpass filter. This bandpass filter may be tuned to improve the signal of a specific physiological data type. For example, in one embodiment, an In-Mold-Labeling or “IML” light transmissive structure may be implemented wherein the structure uses a material with predetermined or desired optical characteristics to create a specific bandpass characteristic, for example, to pass infrared light with greater efficiency than light of other wavelengths (for example, light having a wavelength in human visible spectrum).

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	Park at 11:32-57 FIG. 21 illustrates an exemplary PPG sensor which uses synchronous detection; notably, in this embodiment, a demodulator is employed to detect/recover the signal; Park at 4:41-43 Notably, where the biometric monitoring device employs optical techniques to acquire heart rate measurements or data (e.g., photoplethysmography), a motion signal may be employed to determine or establish a particular approach or technique to data acquisition or measurement (e.g., synchronous detection rather than a non-amplitude modulated approach or technique) and/or analysis thereof. (See, for example, FIG. 21). In this way, the data which is indicative of the amount of user motion or activity establishes or adjusts the type or technique of data acquisition or measurement by the optical heart rate data acquisition sensors. Park at 7:31-41 In one embodiment, the light detector module may incorporate a transimpedance amplifier stage with variable gain. Such a configuration may avoid or minimize saturation from bright ambient light and/or bright emitted light from the light source. For example, the gain of the transimpedance amplifier may be automatically adjusted and/or reduced with a variable resistor and/or multiplexed set of resistors in the negative feedback path of the transimpedance amplifier. In embodiment of the present inventions, the device may incorporate little to no optical shielding from ambient light by amplitude modulating the intensity of the light source and demodulating the output of the light detector (e.g., synchronous detection). (See, for example, FIG. 21). In other aspects, if the ambient light is of sufficient brightness to obtain a heart rate signal, the light source may be reduced in brightness and/or turned off completely. Park at 17:26-41 **Where optical sensors are disposed or arranged on the skin side of the biometric monitoring device, in operation, a light source emits light upon the skin of the user and, in response, a light detector samples, acquires and/or detects a response or scattered/reflected light from the skin (and/or from inside the body). The one or more sources and detectors may be arranged in an array or pattern that enhances or optimizes the SNR and/or reduces or minimizes power**

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	consumption by light sources and detectors. These optical detectors sample, acquire and/or detect physiological data which may then be processed or analyzed (for example, by resident processing circuitry) to obtain data which is representative of, for example, a user's heart rate, respiration, heart rate variability, oxygen saturation (SpO2), blood volume, blood glucose, skin moisture and/or skin pigmentation level Park at 10:34-49 **The source(s) may emit light having one or more wavelengths which are specific or directed to a type of physiological data to be collected. The optical detectors may sample, measure and/or detect one or more wavelengths that are also specific or directed to a type of physiological data to be collected and physiological parameter (of the user) to be assessed or determined. For instance, in one embodiment, a light source emitting light having a wavelength in the green spectrum (for example, an LED that emits light having wavelengths corresponding to the green spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect heart rate. In contrast, a light source emitting light having a wavelength in the red spectrum (for example, an LED that emits light having wavelengths corresponding to the red spectrum) and a light source emitting light having a wavelength in the infrared spectrum (for example, an LED that emits light having wavelengths corresponding to the IR spectrum) and photodiode positioned to sample, measure and/or detect a response or reflection may provide data used to determine or detect SpO2.** Park at 10:50-11:3 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless	Park discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen

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transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	**In one embodiment, the biometric monitoring device is one component of a system for monitoring sleep, where the system comprises a secondary device capable of communicating with the biometric monitoring device and adapted to be placed near the sleeper (e.g., an alarm clock). The secondary device may have a shape and mechanical and/or magnetic interface to accept the biometric monitoring device for safe keeping, communication, and/or charging. Notably, the communication between the biometric monitoring device and the secondary device may be provided through wireless communication techniques/methods and protocols such as Bluetooth, Bluetooth 4.0, RFID, NFC, or WLAN.** The secondary device may comprise sensors to assist in sleep or environmental monitoring such as, for example, sensors that measure ambient light, noise and/or sound (e.g., to detect snoring), temperature, humidity, and air quality (pollen, dust, CO2, etc.). **In one embodiment, the secondary device may communicate with an external service such as www.fitbit.com or server (e.g., personal computer). Communication may be achieved through wired (e.g., Ethernet, USB) or wireless (e.g., WLAN, Bluetooth, RFID, NFC, cellular) circuitry and protocols to transfer data to and/or from the secondary device. The secondary device may also act as a relay to transfer data to and/or from the biometric monitoring device to an external service such as www.fitbit.com or other service (e.g., news, social network updates, email, calendar notifications), or server (e.g., personal computer, mobile phone, tablet). Calculation of the user's sleep data may be executed on one or both devices or an external service (e.g., a cloud server) using data from one or both devices.** Park at 8:53-9:16 **The secondary device may be equipped with a display to output data obtained by the secondary device or data transferred to it by the biometric monitoring device, the external service, or a combination of data from the biometric monitoring device, the secondary device, and/or the external service. For example, the secondary device may display data indicative of the user's heart rate, total steps for the day, activity and/or sleep goal achievement, the day's weather (measured by the secondary device or reported for a location by an external service),** etc. In another example, the secondary device may display data related to the ranking of the user relative to other users, such as, in the context of user activity (for example, total weekly step count). **In yet another embodiment, the biometric monitoring device may be equipped with a display to display data obtained by the biometric monitoring device, the secondary device, the external service, or a combination of the three sources. In embodiments where the first device is equipped with a**

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	wakeup alarm (e.g., vibromotor/vibramotor, speaker), the secondary device may act as a backup alarm (e.g., using an audio speaker). The secondary device may also have an interface (e.g., display and buttons or touch screen) to create, delete, modify, or enable alarms on the first and/or the secondary device. Park at 9:17-40 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Park discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **In one embodiment, the biometric monitoring device is one component of a system for monitoring sleep, where the system comprises a secondary device capable of communicating with the biometric monitoring device and adapted to be placed near the sleeper (e.g., an alarm clock). The secondary device may have a shape and mechanical and/or magnetic interface to accept the biometric monitoring device for safe keeping, communication, and/or charging. Notably, the communication between the biometric monitoring device and the secondary device may be provided through wireless communication techniques/methods and protocols such as Bluetooth, Bluetooth 4.0, RFID, NFC, or WLAN.** The secondary device may comprise sensors to assist in sleep or environmental monitoring such as, for example, sensors that measure ambient light, noise and/or sound (e.g., to detect snoring), temperature, humidity, and air quality (pollen, dust, CO2, etc.). **In one embodiment, the secondary device may communicate with an external service such as www.fitbit.com or server (e.g., personal computer). Communication may be achieved through wired (e.g., Ethernet, USB) or wireless (e.g., WLAN, Bluetooth, RFID, NFC, cellular) circuitry and protocols to transfer data to and/or from the secondary device. The secondary device may also act as a relay to transfer data to and/or from the biometric monitoring device to an external**

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	service such as www.fitbit.com or other service (e.g., news, social network updates, email, calendar notifications), or server (e.g., personal computer, mobile phone, tablet). Calculation of the user's sleep data may be executed on one or both devices or an external service (e.g., a cloud server) using data from one or both devices. Park at 8:53-9:16 **The secondary device may be equipped with a display to output data obtained by the secondary device or data transferred to it by the biometric monitoring device, the external service, or a combination of data from the biometric monitoring device, the secondary device, and/or the external service. For example, the secondary device may display data indicative of the user's heart rate, total steps for the day, activity and/or sleep goal achievement, the day's weather (measured by the secondary device or reported for a location by an external service),** etc. In another example, the secondary device may display data related to the ranking of the user relative to other users, such as, in the context of user activity (for example, total weekly step count). **In yet another embodiment, the biometric monitoring device may be equipped with a display to display data obtained by the biometric monitoring device, the secondary device, the external service, or a combination of the three sources. In embodiments where the first device is equipped with a wakeup alarm (e.g., vibromotor/vibramotor, speaker), the secondary device may act as a backup alarm (e.g., using an audio speaker). The secondary device may also have an interface (e.g., display and buttons or touch screen) to create, delete, modify, or enable alarms on the first and/or the secondary device.** Park at 9:17-40 Indeed, the biometric monitoring device may also correlate GPS related data to a database of predetermined geographic locations that have activities associated with them for a set of predetermined conditions. For example, activity determination and corresponding physiological classification (for example, heart rate classification) may include correlating a user's GPS coordinates that correspond to location(s) of exercise equipment, health club and/or gym and physiological data. Under these circumstances, a user's heart rate during, for example a gym workout, may be automatically measured and displayed. Notably, many physiological classifications may be based on GPS related data including location, acceleration, altitude, distance and/or velocity. **Such a database including geographic data and physiological data may be compiled, developed and/or stored on the biometric monitoring**

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	device and/or external computing device. Indeed, in one embodiment, the user may create their own location database or add to or modify the location database to better classify their activities. Park at 23:9-27 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	Park discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **In one embodiment, the biometric monitoring device is one component of a system for monitoring sleep, where the system comprises a secondary device capable of communicating with the biometric monitoring device and adapted to be placed near the sleeper (e.g., an alarm clock). The secondary device may have a shape and mechanical and/or magnetic interface to accept the biometric monitoring device for safe keeping, communication, and/or charging. Notably, the communication between the biometric monitoring device and the secondary device may be provided through wireless communication techniques/methods and protocols such as Bluetooth, Bluetooth 4.0, RFID, NFC, or WLAN.** The secondary device may comprise sensors to assist in sleep or environmental monitoring such as, for example, sensors that measure ambient light, noise and/or sound (e.g., to detect snoring), temperature, humidity, and air quality (pollen, dust, CO2, etc.). **In one embodiment, the secondary device may communicate with an external service such as www.fitbit.com or server (e.g., personal computer). Communication may be achieved through wired (e.g., Ethernet, USB) or wireless (e.g., WLAN, Bluetooth, RFID, NFC, cellular) circuitry and protocols to transfer data to and/or from the secondary device. The secondary device may also act as a relay to transfer data to and/or from the biometric monitoring device to an external service such as www.fitbit.com or other service (e.g., news, social network updates, email, calendar notifications), or server (e.g., personal computer, mobile phone, tablet). Calculation of**

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	the user's sleep data may be executed on one or both devices or an external service (e.g., a cloud server) using data from one or both devices. Park at 8:53-9:16 **The secondary device may be equipped with a display to output data obtained by the secondary device or data transferred to it by the biometric monitoring device, the external service, or a combination of data from the biometric monitoring device, the secondary device, and/or the external service. For example, the secondary device may display data indicative of the user's heart rate, total steps for the day, activity and/or sleep goal achievement, the day's weather (measured by the secondary device or reported for a location by an external service),** etc. In another example, the secondary device may display data related to the ranking of the user relative to other users, such as, in the context of user activity (for example, total weekly step count). **In yet another embodiment, the biometric monitoring device may be equipped with a display to display data obtained by the biometric monitoring device, the secondary device, the external service, or a combination of the three sources. In embodiments where the first device is equipped with a wakeup alarm (e.g., vibromotor/vibramotor, speaker), the secondary device may act as a backup alarm (e.g., using an audio speaker). The secondary device may also have an interface (e.g., display and buttons or touch screen) to create, delete, modify, or enable alarms on the first and/or the secondary device.** Park at 9:17-40 Indeed, the biometric monitoring device may also correlate GPS related data to a database of predetermined geographic locations that have activities associated with them for a set of predetermined conditions. For example, activity determination and corresponding physiological classification (for example, heart rate classification) may include correlating a user's GPS coordinates that correspond to location(s) of exercise equipment, health club and/or gym and physiological data. Under these circumstances, a user's heart rate during, for example a gym workout, may be automatically measured and displayed. Notably, many physiological classifications may be based on GPS related data including location, acceleration, altitude, distance and/or velocity. **Such a database including geographic data and physiological data may be compiled, developed and/or stored on the biometric monitoring device and/or external computing device. Indeed, in one embodiment, the user may create their own location database or add to or modify the location database to better classify their activities.**

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	Park at 23:9-27 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	See claim 5 above Park discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. In another embodiment, the sensor device may incorporate a differential amplifier to amplify the relative changes in the output of the light detector output. (See, for example, FIG. 22). **In one embodiment, a digital average or digital lowpass filtered signal is subtracted from the output of the light detector output and amplified before it is digitized by the ADC. In another embodiment, an analog average or analog lowpass filtered signal is subtracted from the output of the light detector through, for example, the use of a sample and hold circuit and analog signal conditioning circuitry.** The power provided to the light source, light detector, and differential amplifier may be controlled separately from the power provided to the analog signal conditioning circuit to improve power savings. Park at 17:11-25 The biometric monitoring device, in one embodiment, may employ light pipes or other light transmissive structures. (See, for example, FIGS. 8-10). In this regard, in one embodiment, light is directed from the light source to the skin of the user through light pipes or other light transmissive structures. Scattered or reflected light from the user's body may be directed back to and detected by the optical circuitry through the same or similar structures. Indeed, **the transmissive structures may employ a material and/or optical design to facilitate low light loss (for example, a lens) thereby**

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	improving SNR of the photo detector and/or reducing power consumption of the light emitter(s) and/or light detector(s). In one embodiment, the light pipes or other light transmissive structures may include a material that selectively transmits light having one or more specific or predetermined wavelengths with higher efficiency than others, thereby acting as a bandpass filter. This bandpass filter may be tuned to improve the signal of a specific physiological data type. For example, in one embodiment, an In-Mold-Labeling or “IML” light transmissive structure may be implemented wherein the structure uses a material with predetermined or desired optical characteristics to create a specific bandpass characteristic, for example, to pass infrared light with greater efficiency than light of other wavelengths (for example, light having a wavelength in human visible spectrum). Park at 11:33-57 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	See claim 5 above Park discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. **The biometric monitoring device, in one embodiment, includes a window (for example, a visually opaque window) in the housing to facilitate optical transmission between the optical sensors and the user. Here, the window may permit light (for example, a substantial portion of a selected wavelength) to be emitted by, for example, one or more LEDs, onto the skin of the user and a response or reflection to pass into the housing to be sampled, measured and/or detected by, for example, one or more photodiodes.** In one embodiment, the circuitry related to emitting and receiving light may be disposed in the interior of the device housing and underneath a plastic or glass layer (for

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	example, painted with infrared ink) or an infrared lens which permits infrared light to pass but not light in the human visual spectrum. In this way, the light transmission is invisible to the human eye. Park at 11:17-31 In another embodiment, the biometric monitoring device may monitor heart rate optically through an array of photodetectors such as a grid of photodiodes or a CCD camera. Motion of the optical device with respect to the skin may be tracked through feature tracking of the skin and/or adaptive motion correction using an accelerometer and gyroscope. The detector array may be in contact with the skin or offset at a small distance away from the skin. The detector array and its associated optics may be actively controlled (e.g., with a motor) to maintain a stabilized image of the target and acquire a heart rate signal. **This optomechanical stabilization may be achieved using information from motion sensors (e.g., gyroscope) or image features. In one embodiment, the biometric monitoring device may implement relative motion cancellation using a coherent or incoherent light source to illuminate the skin and a photodetector array with each photodetector associated with comparators for comparing the intensity between neighboring detectors—obtaining a so-called speckle pattern which may be tracked using a variety of image tracking techniques such as, for example, optical flow, template matching, edge tracking, etc**. In this embodiment, the light source used for motion tracking may be different from the light source used in the optical heart rate monitor. Park at 19:22-45 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Park, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Park, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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EXHIBIT B7

U.S. Pat. No. 9,651,533 in view of
U.S. Patent No. 8,923,918 to Kevin Kreger ("Kreger")

As described in detail below, Kreger (individually or collectively) anticipates and/or renders obvious claims 5, 11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Kreger. The cited portions of Kreger are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Kreger. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Kreger "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Kreger does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Kreger (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Kreger anticipates and/or renders obvious the Asserted Claims of the '533 Patent

This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

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Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Kreger discloses or renders obvious a measurement system. In one aspect of another embodiment**, the biosensor interface apparatus further includes one or more biosensors. The biosensors may be electrodes including ECG electrodes, a photo plethysmograph (PPG), a pulse oximeter, a sphygmomanometer (inflatable blood pressure cuff), a thermometer/temperature sensor, a pedometer, a capnograph, a respiratory movement sensor, a respiratory flow sensor, a transdermal blood alcohol sensor, and a blood sugar sensor (glucometer). Thus it is an object to provide for a wide range of common medical and sport/fitness biosensors in a single compact interface apparatus**. Kreger at 3:24-34 In one aspect of another embodiment, **the biosensor interface apparatus further includes one or more biosensor connectors capable of receiving a biosensor signal. Thus it is an object to provide an interface apparatus that supports biosensors' industry standard and manufacturer specified probe connectors, thereby improving the invention's usability and promoting reuse of existing biosensor probes**. Kreger at 3:35-41 In one aspect of another embodiment, **the biosensor interface apparatus further includes at least one connector capable of receiving a biosensor signal, wherein the biosensor signal is an electrical signal, a chemical signal, a gas signal, or a force signal. Thus, it is one object to provide for transmission of gas, chemical compounds, or force such as through a tube in order to measure, for example, end-tidal CO2 (ETCO2), respiratory rate (RR), or respiratory flow with a capnograph. It is another object to provide for the transmission of an electrical signal such as from an ECG or pulse oximeter. In addition vibrations and other audible and inaudible force may be detected by a force sensor that could be in communication with a stethoscope or accelerometer.**

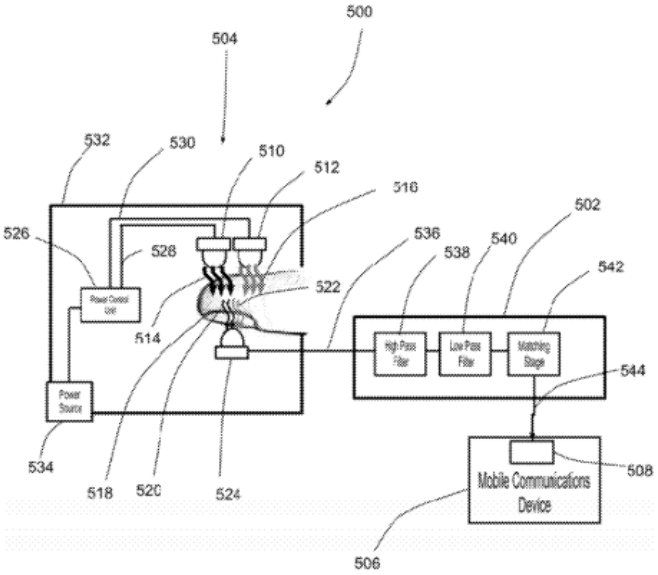
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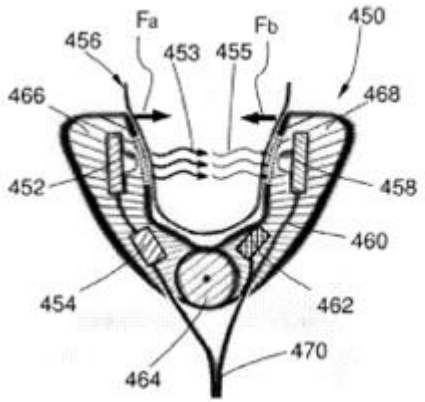
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	Kreger at 3:42-54 **With reference to FIG. 1, there is shown a first embodiment of the biosensor interface apparatus for use with a mobile communication device 10. The biosensor 14 produces one or more biosensor signals transmitted via cable 22 and received by interface device 20. The interface device transforms the biosensor signals so that they can be conducted via electrical connector 28 and compatibly received by the mobile communications device shown as smart phone 12.** Kreger at 5:40-47 **Continuing with FIG. 1, the biosensor is shown as a pulse oximeter 14 in communication with finger 16. The pulse oximeter may provide a pulse signal to calculate BPM, a SPO2 reading, or a diagnostic cardiac waveform. The pulse oximeter 14 may be retained against the base of finger 16 using a mounting device that may be worn on the finger or hand, shown as gauntlet 18. Alternatively, the pulse oximeter may be worn on the fingertip, ear, forehead, or nasal septum using various mounting devices such as rings, clips, elastic straps, and adhesive pads.** Kreger at 5:54-63 **Referring to FIGS. 1 and 2, the biosensor 14 may be in communication with the interface device 20 via cable 22. The cable may contain one or more conductors 24, 26. The cable 22 may transmit power to the pulse oximeter 14 via conductor 26, or may transmit biosensor signals, such as the two absorption light signals from the pulse oximeter 14, via conductor 24.** Kreger at 5:64-6:3 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Kreger discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. **The sensor assembly 134 has a cardiac sensor shown as photo plethysmograph (“PPG”) 136, a movement sensor accelerometer 138, and an external power source 140 supplying power to both sensors via power connection 27. The PPG 136 works as follows: first, an infrared (“IR”) light emitting diode (“LED”) 142 has power applied by power control unit 143 thereby stimulating it to emit IR light 144, some of which is scattered, reflected or absorbed by a human tissue such as finger 146. Next, some light 148 emerges from finger 146 striking an infrared sensor such as photodiode 150. The photodiode electrical output (i.e. the PPG signal having pulsatile blood flow) is communicated to interface device 132 via connection 26 a, while one or more accelerometer signals are communicated to the interface device 132 via connection 26 b. Note that 26 a, 26 b may be hardwired as shown or releaseably connected to interface device with mating connectors (not shown).** Kreger at 8:9-25 **The pulse oximeter output signal 558 may be multiplexed with accelerometer signal 560 by multiplexer 562. Recall that the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526. Similarly, power control unit 564 may supply a signal to the multiplexor 562 to time multiplex the accelerometer and pulse oximeter signals 566 into a combined signal 567.** Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals combined in pulse ox output 558 and the accelerometer output 569 into their three individual components (and perhaps more for additional accelerometer outputs). The power control unit 564 may provide a synchronizing signal such as 568 to the mobile device 556 to demultiplex the pulse oximeter data and accelerometer data. The synchronizing signal 568 may be further combined with the sensor data by another multiplexer 576. Kreger at 14:33-48

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	 FIG. 17 Kreger at Fig.17 Continuing with FIG. 17, **the pulse oximeter 504 has, for example, two LED light-emitting elements 510, 512 emitting two different frequencies of light, for example red light 514 with a wavelengths of substantially 660 nanometers, and infrared light 516 with wavelengths of substantially 940 nanometers. The light 514, 516 is partially transmitted through fingertip 518 and emerges as modulated light 520, 522 respectively, now having a cardiac signal and information about the saturated percentage of oxygen in the blood, referred to as SPO2. The user's heart rate and other information may be derived from the pulse oximeter signal as well. The information containing light 520,522 strikes light receiving device such as photo transistor 524 which transforms the photonic energy to a corresponding electrical signal transmitted via one or more conductors 536 to interface device 502.** Kreger at 13:36-50

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	Referring to FIGS. 17 and 18, **to determine SPO2 the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526 and LED control lines 528, 530 as shown by voltage plots 529, 531 respectively. The information containing light 520, 522 has separate contributions shown in plots 523, 525. The alternating lights 520, 522 are received and combined (multiplexed) by a single receiver 524 as shown in plot 526.** Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals into their individual components 523, 525. The signals 529, 531, and 533, or information derived therefrom may be supplied to the mobile device 506 to demultiplex the pulse oximeter data as well as other sensor data (see detailed description of FIG. 19 below). Kreger at 13:51-64  FIG.13a Kreger at Fig.13a **Turning now to FIG. 13 a, a cross section of photo plethysmograph 450 taken along axes 13 a is shown. The PPG 450 contains a light emitting element such as IR LED 452. The LED 452 emits a light 453 when activated by power from a power control unit 454. The light 453 has a substantially distinct wavelength such as 880 nanometers or 920 nanometers. The light 453 enters the human tissue having a blood flow such as in earlobe 456. The light is partially absorbed, or otherwise filtered by the blood flowing in the earlobe 456 and emerges as light signal 455, carrying a blood flow signal.** The light signal 455 is received by the light signal receiving device 458,

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	which transforms the energy from the photons of the light signal 455 into a corresponding electrical signal. In one embodiment the light receiving device 458 is a photo diode, in another embodiment the receiving device 458 is a photo transistor, in yet another embodiment the light receiving device 458 has an internal amplifier for amplifying the output signal, for example, transmitted over conductor 460 Kreger at 12:29-47 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	Kreger discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. **The sensor assembly 134 has a cardiac sensor shown as photo plethysmograph (“PPG”) 136, a movement sensor accelerometer 138, and an external power source 140 supplying power to both sensors via power connection 27. The PPG 136 works as follows: first, an infrared (“IR”) light emitting diode (“LED”) 142 has power applied by power control unit 143 thereby stimulating it to emit IR light 144, some of which is scattered, reflected or absorbed by a human tissue such as finger 146. Next, some light 148 emerges from finger 146 striking an infrared sensor such as photodiode 150.** The photodiode electrical output (i.e. the PPG signal having pulsatile blood flow) is communicated to interface device 132 via connection 26 a, while one or more accelerometer signals are communicated to the interface device 132 via connection 26 b. Note that 26 a, 26 b may be hardwired as shown or releaseably connected to interface device with mating connectors (not shown). Kreger at 8:9-25 Turning now to FIG. 13 a, **a cross section of photo plethysmograph 450 taken along axes 13 a is shown. The PPG 450 contains a light emitting element such as IR LED 452. The LED 452 emits**

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	a light 453 when activated by power from a power control unit 454. The light 453 has a substantially distinct wavelength such as 880 nanometers or 920 nanometers. The light 453 enters the human tissue having a blood flow such as in earlobe 456. The light is partially absorbed, or otherwise filtered by the blood flowing in the earlobe 456 and emerges as light signal 455, carrying a blood flow signal. The light signal 455 is received by the light signal receiving device 458, which transforms the energy from the photons of the light signal 455 into a corresponding electrical signal. In one embodiment the light receiving device 458 is a photo diode, in another embodiment the receiving device 458 is a photo transistor, in yet another embodiment the light receiving device 458 has an internal amplifier for amplifying the output signal, for example, transmitted over conductor 460. Kreger at 12:29-47 Turning now to FIG. 15, **a cross section of photo plethysmograph 490 taken along axes 15 is shown. Referring also to the PPG 490 shown in isometric view in FIGS. 14 and 16, the PPG 490 contains a light emitting element such IR LED 492. A light 493 is emitted from the LED 492 with a substantially distinct wavelength such as 880 nanometers or 920 nanometers. The light 493 enters the human tissue 496 having a blood flow such as forehead 485. The light is partially absorbed, or otherwise filtered by the blood flowing in the tissue 496, is reflected off bone 498, and emerges as light signal 495 carrying blood flow signal. The light signal 495 is received by the light signal receiving device 499, which transforms the energy from the photons of the light signal 455 into a corresponding electrical signal.** Biosensors may also include a temperature sensor 497 to measure the user's body temperature in thermal communication with the user's skin 491. The PPG 450 and temperature sensor 497 may be contained in sensors housing 481 which can be brought into communication with the user's forehead 456 by using a mounting or retaining device such as hat 483 worn by user 489. **Additionally, PPG 490 and thermal sensor 498 are connected via conductors 470 to interface device 482 which is mated to one or more electrical connectors on smart phone 484. Other embodiments may retain the sensors using a headband, a visor, a cap, other types of hats, adhesive bands, and so forth**. Kreger at 13:4-29

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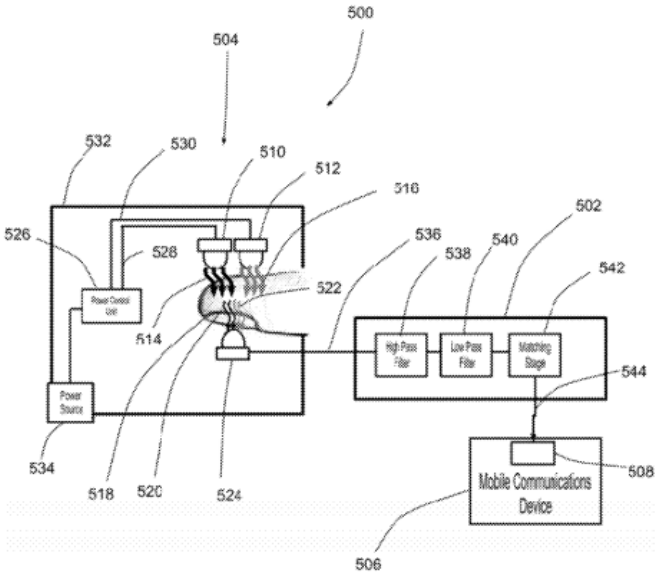
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	Thus, it is another object to provide compatible signals to the **mobile's electrical connectors which may involve transforming the biosensor signals to match requisite impedance and signal levels, eliminate noise, cancel DC noise and drif**t, demultiplex or multiplex multiple measurements, provide electrical isolation, serialization, synchronization, and so forth. Kreger at 3:17-23 The interface device 20 may also provide a sensors interface circuit 42 which receives biosensor signals on input conductor 24 and transforms the signals to output electrical signals 43 that are output on electrical connector 28. **The interface circuit provides output electrical signals 43 signals that are electrically compatible, for example, with respect to impedance, voltage amplitude, noise levels**, and so forth such that the signals can be received by the mobile's processor via connector 24. Kreger at 6:22-30 Still referring to FIGS. 17 and 18, **the interface device 502 may receive pulse oximeter and other sensors signals on conductors 536 and perform various transformations on the signals. For example, high frequency noise may be reduced with high pass filter538, DC offsets and baseline wander can may be reduced with a low pass filter 440, These filters may be instrumental in creating a signal which is usable for examples as a diagnostic display, an SPO2 calculation, a BPM calculation, and so forth**. Internal mobile device filters, for example such as an anti-aliasing filter for recording inputs or a CODEC filter may be used. Alternatively, internal filters can be reconfigured or disabled to allow, for example, the reception of lower frequency signals by the mobile 12 CODEC 76 or AtoD converter 78. Kreger at 14:4-17 Still referring to FIG. 19, the interface device 552 may receive pulse oximeter, other sensors signals, and synchronizing signals on conductors 567, 568 and perform various transformations on the signals**. For example, high frequency noise, DC offsets and baseline wander may be reduced with a band pass filter570. In addition, proper matching of the electrical characteristics of mobile's electrical connector may provided by matching stage 572, for example, as provided by matching stage 542 above.**

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	Kreger at 14:49-57 **The photo plethysmograph output signal and temperature sensor signal may be communicated from sensors assembly 587 by separate (i.e. parallel) conductors 588, 590 to interface device 582. High frequency noise, DC offsets and baseline wander may be reduced with anti-alias filters592, 593.** The filtered signals are received by the serial AtoD converter 594, which converts them to digital values that are serialized for transmission to serial electrical connector 588 on mobile 586. Kreger at 14:65-15:5 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Kreger discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample Turning now to FIG. 13, an embodiment of the interface apparatus 440 comprises an interface device 442 that may connect multiple medical or other biosensors to a mobile device such as smart phone 444 via electrical connector, for example 472. **The biosensors may include a sphygmomanometer such as inflatable blood pressure cuff 446 to measure or monitor the user's blood pressure. The blood pressure cuff 446 may be in communication with the user's arm 447 and may also house or otherwise carry mobile 444. The embodiment of interface apparatus 440 may also have an integral headset 448 worn by user 452, and a PPG 450, for example, attached to the user's earlobe.** Mobile device smart phone 444 may derive measurements and display plots of the biosensor data on its display 445. Smart phone 444 may also transmit the patient's biosensor data and measurements using one or more internal RF transmitters, for example, over the mobile's data network, or as as modulated data, using frequency shift key (FSK), phase shift key (PSK) encoding or like modulation schemes over the mobile's voice network. In addition, the mobile 444 may transmit the

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	data over a serial cable or an RF bluetooth channel, to a PC or other computing device, or via various other such wireless and wired interfaces, such as 3G, 4G, wired and wireless Ethernet and the like. Kreger at 12:5-28 Referring to FIGS. 1 and 2, the biosensor 14 may be in communication with the interface device 20 via cable 22. The cable may contain one or more conductors 24, 26**. The cable 22 may transmit power to the pulse oximeter 14 via conductor 26, or may transmit biosensor signals, such as the two absorption light signals from the pulse oximeter 14, via conductor 24.** Kreger at 5:64-6:3 **The sensor assembly 134 has a cardiac sensor shown as photo plethysmograph (“PPG”) 136, a movement sensor accelerometer 138, and an external power source 140 supplying power to both sensors via power connection 27. The PPG 136 works as follows: first, an infrared (“IR”) light emitting diode (“LED”) 142 has power applied by power control unit 143 thereby stimulating it to emit IR light 144, some of which is scattered, reflected or absorbed by a human tissue such as finger 146. Next, some light 148 emerges from finger 146 striking an infrared sensor such as photodiode 150. The photodiode electrical output (i.e. the PPG signal having pulsatile blood flow) is communicated to interface device 132 via connection 26 a, while one or more accelerometer signals are communicated to the interface device 132 via connection 26 b. Note that 26 a, 26 b may be hardwired as shown or releaseably connected to interface device with mating connectors (not shown).** Kreger at 8:9-25 **The pulse oximeter output signal 558 may be multiplexed with accelerometer signal 560 by multiplexer 562. Recall that the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526. Similarly, power control unit 564 may supply a signal to the multiplexor 562 to time multiplex the accelerometer and pulse oximeter signals 566 into a combined signal 567.** Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals combined in pulse ox output 558 and the accelerometer output 569 into their three individual components (and perhaps more for additional accelerometer outputs). The power control

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	unit 564 may provide a synchronizing signal such as 568 to the mobile device 556 to demultiplex the pulse oximeter data and accelerometer data. The synchronizing signal 568 may be further combined with the sensor data by another multiplexer 576. Kreger at 14:33-48  FIG. 17 Kreger at Fig.17 Continuing with FIG. 17, **the pulse oximeter 504 has, for example, two LED light-emitting elements 510, 512 emitting two different frequencies of light, for example red light 514 with a wavelengths of substantially 660 nanometers, and infrared light 516 with wavelengths of substantially 940 nanometers. The light 514, 516 is partially transmitted through fingertip 518 and emerges as modulated light 520, 522 respectively, now having a cardiac signal and information about the saturated percentage of oxygen in the blood, referred to as SPO2. The user's heart rate and other information may be derived from the pulse oximeter signal as well.**

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	The information containing light 520,522 strikes light receiving device such as photo transistor 524 which transforms the photonic energy to a corresponding electrical signal transmitted via one or more conductors 536 to interface device 502. Kreger at 13:36-50 Referring to FIGS. 17 and 18, **to determine SPO2 the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526 and LED control lines 528, 530 as shown by voltage plots 529, 531 respectively. The information containing light 520, 522 has separate contributions shown in plots 523, 525. The alternating lights 520, 522 are received and combined (multiplexed) by a single receiver 524 as shown in plot 526.** Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals into their individual components 523, 525. The signals 529, 531, and 533, or information derived therefrom may be supplied to the mobile device 506 to demultiplex the pulse oximeter data as well as other sensor data (see detailed description of FIG. 19 below). Kreger at 13:51-64 **Continuing with FIG. 12, the biosensor signals are received by a smart phone 386 through dock connector 382, which is in communication with an electrical connector on smart phone 386 (obscured). The interface device dock 382 converts the human breath and human biopotential signals from sampling tube 388 and ECG leads 396 respectively into electrical signals suitable for communication to the smart phone 386 via one or more of the smart phone's electrical connectors such as a USB connector, a docking connector, or a headset connector. The electrical biosensor signals may be further processed by the smart phone 386 to produce displayed measurements such as BPM 414, respiratory rate 372, body temperature 418, and the like. As well, the biosensor signals may be plotted or otherwise displayed. For example, biosensor signals may be displayed by smart phone 386 such as ECG 420, ETCO 2 422, and the like**. **Biosensor signals may also be received by one or more RF receivers in the dock 346 (not shown) and communicated to the smart phone 386 via wired electrical connectors. Interface device dock 382 may also include a connecting and supporting component 424 for communicating with electrical connectors and retaining the smart phone 386**. The connecting and supporting component 424 may have an attached neck or supporting component 426, which may be connected to base 428. The neck

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	426 may be articulated or otherwise provide a position for smart phone 386 such that the patient 390 is viewable for video monitoring or audible for audio monitoring 434. Base 428 may provide a secure mechanism for attaching the interface apparatus 380 to, for example, an incubator side 430. In addition, interface apparatus 380 may have an external source of AC or DC electrical power 432, which may provide electrical power to smart phone 386 through the electrical connectors in communication with connecting and supporting component 424. Further, **all signals received by the smart phone 386, such as ECG, ETCO2, body temperature, respiratory movement, video, and audio may be transmitted wirelessly by smart phone 386 or via a cable connected to the mobile for remote monitoring and storage.** Kreger at 11:35-12:4 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Kreger discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source **Continuing with FIG. 12, the biosensor signals are received by a smart phone 386 through dock connector 382, which is in communication with an electrical connector on smart phone 386 (obscured). The interface device dock 382 converts the human breath and human biopotential signals from sampling tube 388 and ECG leads 396 respectively into electrical signals suitable for communication to the smart phone 386 via one or more of the smart phone's electrical connectors such as a USB connector, a docking connector, or a headset connector. The electrical biosensor signals may be further processed by the smart phone 386 to produce displayed measurements such as BPM 414, respiratory rate 372, body temperature 418, and the like. As well, the biosensor signals may be plotted or otherwise displayed. For example, biosensor signals may be displayed by smart phone 386 such as ECG 420, ETCO 2 422, and the like**. **Biosensor**

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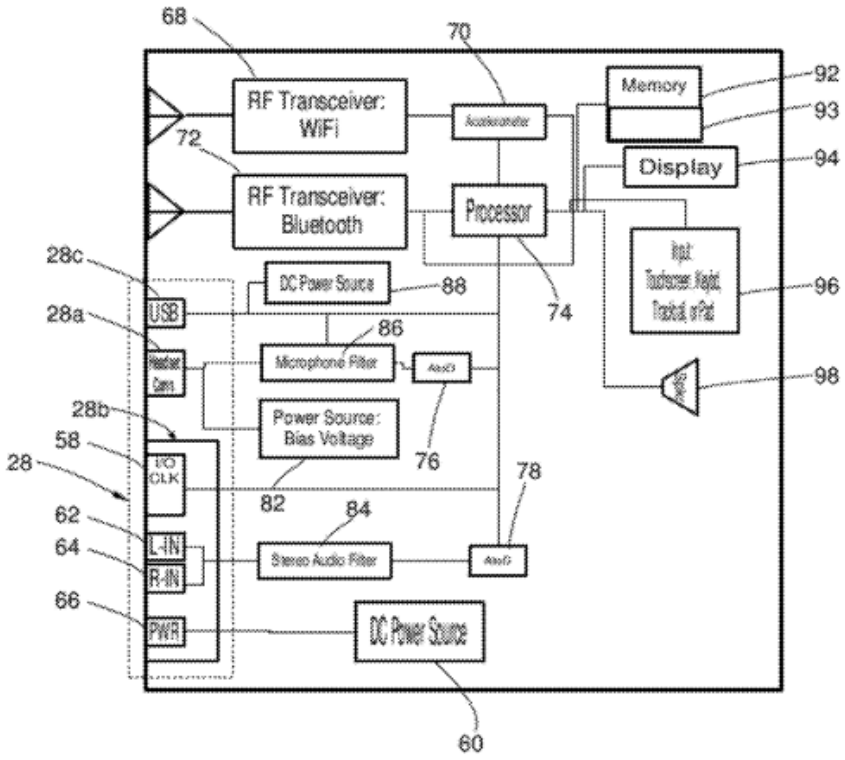
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	signals may also be received by one or more RF receivers in the dock 346 (not shown) and communicated to the smart phone 386 via wired electrical connectors. Interface device dock 382 may also include a connecting and supporting component 424 for communicating with electrical connectors and retaining the smart phone 386. The connecting and supporting component 424 may have an attached neck or supporting component 426, which may be connected to base 428. The neck 426 may be articulated or otherwise provide a position for smart phone 386 such that the patient 390 is viewable for video monitoring or audible for audio monitoring 434. Base 428 may provide a secure mechanism for attaching the interface apparatus 380 to, for example, an incubator side 430. In addition, interface apparatus 380 may have an external source of AC or DC electrical power 432, which may provide electrical power to smart phone 386 through the electrical connectors in communication with connecting and supporting component 424. Further, **all signals received by the smart phone 386, such as ECG, ETCO2, body temperature, respiratory movement, video, and audio may be transmitted wirelessly by smart phone 386 or via a cable connected to the mobile for remote monitoring and storage.** Kreger at 11:35-12:4 Turning now to FIG. 13a, a cross section of photo plethysmograph450 taken along axes13a is shown. The PPG450 contains a light emitting element such as IR LED452. The LED452 emits a light 453 when activated by power from a power control unit454. The light 453 has a substantially distinct wavelength such as 880 nanometers or 920 nanometers. The light 453 enters the human tissue having a blood flow such as in earlobe456. The light is partially absorbed, or otherwise filtered by the blood flowing in the earlobe456 and emerges as light signal455, carrying a blood flow signal. **The light signal455 is received by the light signal receiving device458, which transforms the energy from the photons of the light signal455 into a corresponding electrical signal. In one embodiment the light receiving device458 is a photo diode, in another embodiment the receiving device458 is a photo transistor, in yet another embodiment the light receiving device458 has an internal amplifier for amplifying the output signal, for example, transmitted over conductor460.** Kreger at 12:30-47 Referring now to FIGS. 21-23, an embodiment of the interface apparatus 600 may comprise an interface device 602 that has a frequency multiplexer 601. The interface device may connect multiple

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	signals such as pulse oximeter signal 604, body temperature signal 606, microphone signal 608, which are combined by multiplexer 601 into a signal that may be transmitted to one or more mobile electrical audio inputs 612. The interface device 602 may also provide outputs for a headsets loudspeakers 614 allowing the headset to connect to the audio connector loudspeaker outputs 616, that may otherwise be utilized by interface device 602. Similarly, **the interface device 602 microphone input 608, that may otherwise be utilized by interface device 602. The frequency multiplexer 601 may combine the signals 604, 606, 608 in a number of ways. For example, the microphone input 608 may be transformed by notch filter 618 to remove a portion of the signal between frequencies fn1 and fn2 as shown by frequency profile of notch filter output signal 620. The sensor inputs 604, 606 may be transformed by low pass filters 622, 624 and frequency shifted by modulators 626, 628 such that they are non-overlapping and within the notch 620 of notch filter 618 as shown by frequency plots of signals 630, 632.** The filtered microphone signal 620 and the filtered and shifted sensors 630, 632 are combined by summer 634 to form the combination signal 636 which is received by a mobile device's audio input having bandwidth from f1 to f h 638. Alternatively, the data may be modulated and/or multiplexed by any number of modulation schemes such as frequency shift key (FSK), phase shift key (PSK) encoding or the like. Kreger at 15:6-34 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a	Kreger discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen. **In alternative embodiments the mobile communication device may be a mobile phone, a personal digital assistant, a smartphone, a portable media playback device, a handheld tablet, and the**

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microprocessor and a touch screen	**like. Thus, it is one object of the device to provide for an flexible interface apparatus that will be compatible with a variety of mobile communications devices.** Kreger at 2:21-26 **With reference to FIG. 1, there is shown a first embodiment of the biosensor interface apparatus for use with a mobile communication device 10. The biosensor 14 produces one or more biosensor signals transmitted via cable 22 and received by interface device 20. The interface device transforms the biosensor signals so that they can be conducted via electrical connector 28 and compatibly received by the mobile communications device shown as smart phone 12.** Kreger at 5:40-47 **In other embodiments, the mobile communications device can be any of a number of mobile phones such as an iPhone® or an Android® phone, a personal digital assistant (PDA) such as a Blackberry®, a portable audio playback device such as an MP3 player, a portable media playback device such as an iPod®, or a handheld tablet such as an iPad®.** Kreger at 5:48-53 **The sensor data and measurements may be transmitted to remote medical personnel, internet servers, and others using WiFi transceiver 68, Bluetooth transceiver 72 or other RF transmitter such as for a cellular phone network. As well, the signals and measurements on the mobile 12 may be transferred via a cable connected to USB connector 28 c or docking connector 28 b to another computer storage device, over a computer network, to a personal computer, and so forth.** Kreger at 7:39-46

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	 FIG. 3 Kreger at Fig.3 **Turning now to FIG. 3, a mobile communications device 12 of the present invention is shown as a block diagram. The biosensor signals may be received by one or more electrical connectors 28 on the mobile 12 and communicated to the processor 16 whereupon the microprocessor produces a biosensor measurement or a biosensor signal for analysis. The electrical connectors 28 are shown as a headset audio connector 28 a (providing a microphone input and at least one audio output); a hybrid power, data and audio connector 28 b (aka docking connector); and USB connector 28 c. Although the USB connector 28 c may provide data communications, it may also double as a headset connector**. The docking connector 28 b may be comprised of connections that

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	allow recording high quality with audio inputs 62, 64; provide a source of DC power 60 via power connection 66; and provide other data input/output (“I/O”) via I/O and clock connections 58. **Referring now to FIGS. 4 a and 4 b and also to FIG. 3, the microprocessor 74 may drive a display 94 to display the biosensor signals and measurements derived there from. For example a movement sensor may be used to determine the speed 100 (strides per minute or SPM) or distance traveled 102 by an athlete during a workout. A cardiac sensor my provide an ECG signal 104 which can be used to calculate the heart rate 106.** The speed 100 can be used separately, but preferably in tandem, to perform a cardiac stress exam and determine a patient's stress level. Speed 100 and/or heart rate 106 may also be used to monitor and control an effort level 110, 112 in a workout. As well, effort level 114 may be a target that is set for the workout. Goals may be set and measurements may be displayed on, for example, a workout timer 112, which may show elapsed or remaining time and may have controls to set workout time. Moreover, other measurements such as Calories 116 may be displayed as “Calories elapsed” or “Calories remaining until goal”. Similarly for elapsed or remaining distance 102, a distance goal can be set, for example, in strides, miles, or kilometers. As well, for effort where an actual effort level 122 and a target effort level 120 can be shown graphically and the user may choose a certain effort profile or course such as Hill 124. Kreger at 7:47-8:2 Turning now to FIGS. 6 and 7, **an embodiment of the biosensor interface apparatus 160 may be integrated into a mobile headset 162 having speakers 178 for the ear and a microphone 180, but also having a sensors assembly 164. The sensors assembly 164 may have a cardiac sensor and a movement sensor, for example, a PPG and an accelerometer. In this embodiment the sensors assembly 164 receives power from and communicates signals to the interface device 166 as follows: PPG signal on conductor 26 a, one or more accelerometer signals on conductors 26 b, and power on conductor 27.** Furthermore, power source 168 on interface device 166, which supplies power on conductor 27, may also supply power to the other circuits on the interface device 166, and may receive power via power charging circuit 170. Power charging circuit 170 may receive power from mobile communications device 12, for example, from a microphone bias voltage via headset connector 28 a, or from a power source on docking connector 28 b. In alternative embodiments the power source 168 may be external or it may be within mobile 12, sensors assembly 164, and/or interface device 166.

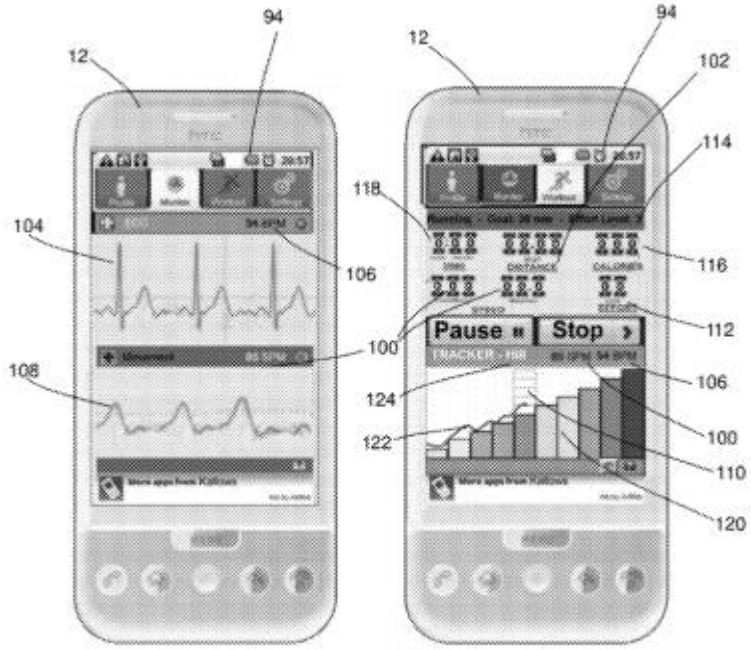
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	Kreger at 8:26-45 Referring now to FIG. 8, an embodiment of the biosensor interface apparatus 190 may be integrated into an emergency or pre-hospital critical care monitor having multiple biosensors. **The biosensors are arranged so that the patient 192 may be wearing an ECG electrode retaining device such as garment 193 that holds cloth or textile ECG electrodes 192, 194, 196, 198 in communication with the patient's skin**. There also may be an thermal sensor 202 for measuring the patient's body temperature (shown under the patient's arm), and a movement sensor accelerometer 204, which is in communication with the patient's thorax 206 measuring thoracic movement as a respiratory monitor. The interface device 208 receives the biosensor signals via electrical cable 210, processes the signals, and outputs them to the mobile communication device 212 via one or more electrical connectors. **Various sensor signals and measurements may be displayed on the mobile's screen 214 such as electrocardiogram (ECG) 216, heart rate (BPM) 218, respiratory movement 220, respiratory rate (RR) 224, and body temperature (degrees Fahrenheit or Centigrade) 222. In another embodiment the connection of cable 210 to interface device 208 may have releasable connectors either for a single electrical cable such as 210, or as individual sensor connectors. In another embodiment one or more sensors communicate with the interface device 208 wirelessly such as with bluetooth-capable sensors.** In another alternative embodiment, the patient is using adhesive ECG electrodes, and there is no retaining garment 193. In yet another embodiment the accelerometer 204 can be used to determine periods of activity, rest, and cessation of patient movement, as well as patient position. The movement sensor 204 can also track user 192 position, velocity and acceleration, either of a patient or a fitness user. Kreger at 9:9-40 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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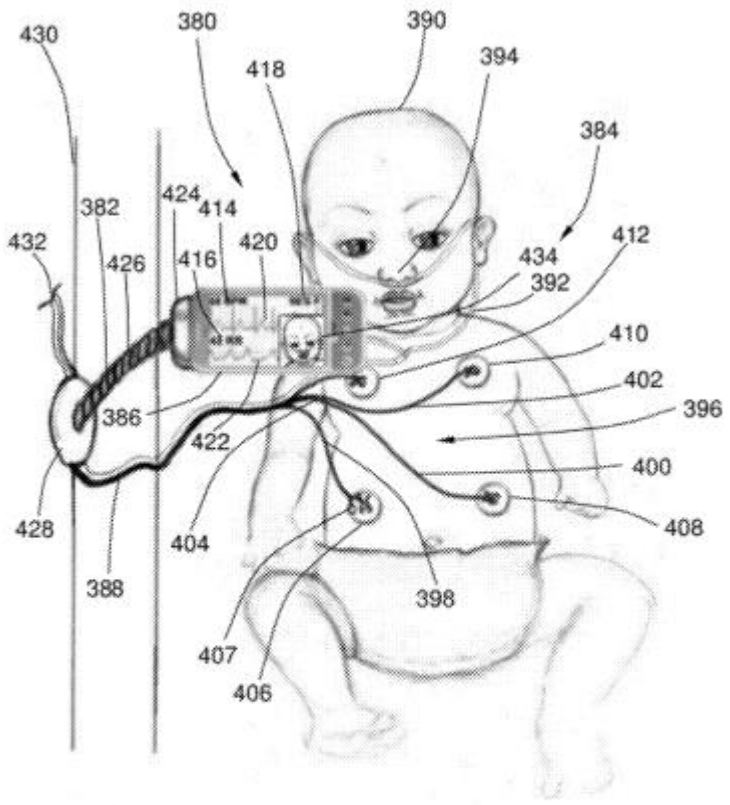
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5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Kreger discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link **19. The bio sensor interface apparatus of claim 1 further comprising a cell phone display with the processor configured to communicate the measurement to the display.** Kreger at claim 19 **The sensor data and measurements may be transmitted to remote medical personnel, internet servers, and others using WiFi transceiver 68, Bluetooth transceiver 72 or other RF transmitter such as for a cellular phone network. As well, the signals and measurements on the mobile 12 may be transferred via a cable connected to USB connector 28 c or docking connector 28 b to another computer storage device, over a computer network, to a personal computer, and so forth.** Kreger at 7:39-46 **The electrical PPG signal 174 a is communicated to headset interface circuit 176, which may further condition the signal, for example to match an electrical circuit impedance. As well, the headset interface circuit connects or switches the resulting signal to output conductor 29 a. The headset interface circuit may also connect the headset speakers 178 and microphone 180 to output conductor 29 a**. The headset interface circuit may also combine or multiplex the microphone signal 182 and the PPG signal 174 a to output conductor 29 a. Kreger at 8:52-60

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	 FIG. 4a FIG. 4b Kreger at Fig.4A and 4B **Referring now to FIGS. 4 a and 4 b and also to FIG. 3, the microprocessor 74 may drive a display 94 to display the biosensor signals and measurements derived there from. For example a movement sensor may be used to determine the speed 100 (strides per minute or SPM) or distance traveled 102 by an athlete during a workout. A cardiac sensor my provide an ECG signal 104 which can be used to calculate the heart rate 106.** The speed 100 can be used separately, but preferably in tandem, to perform a cardiac stress exam and determine a patient's stress level. Speed 100 and/or heart rate 106 may also be used to monitor and control an effort level 110, 112 in a workout. As well, effort level 114 may be a target that is set for the workout. Goals may be set and measurements may be displayed on, for example, a workout timer 112, which may show elapsed or remaining time

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	and may have controls to set workout time. Moreover, other measurements such as Calories 116 may be displayed as “Calories elapsed” or “Calories remaining until goal”. Similarly for elapsed or remaining distance 102, a distance goal can be set, for example, in strides, miles, or kilometers. As well, for effort where an actual effort level 122 and a target effort level 120 can be shown graphically and the user may choose a certain effort profile or course such as Hill 124. Kreger at 7:47-8:2

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	 FIG. 12 Kreger at Fig.12 **Continuing with FIG. 12, the biosensor signals are received by a smart phone 386 through dock connector 382, which is in communication with an electrical connector on smart phone 386**

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	(obscured). The interface device dock 382 converts the human breath and human biopotential signals from sampling tube 388 and ECG leads 396 respectively into electrical signals suitable for communication to the smart phone 386 via one or more of the smart phone's electrical connectors such as a USB connector, a docking connector, or a headset connector. The electrical biosensor signals may be further processed by the smart phone 386 to produce displayed measurements such as BPM 414, respiratory rate 372, body temperature 418, and the like. As well, the biosensor signals may be plotted or otherwise displayed. For example, biosensor signals may be displayed by smart phone 386 such as ECG 420, ETCO 2 422, and the like. **Biosensor signals may also be received by one or more RF receivers in the dock 346 (not shown) and communicated to the smart phone 386 via wired electrical connectors. Interface device dock 382 may also include a connecting and supporting component 424 for communicating with electrical connectors and retaining the smart phone 386**. The connecting and supporting component 424 may have an attached neck or supporting component 426, which may be connected to base 428. The neck 426 may be articulated or otherwise provide a position for smart phone 386 such that the patient 390 is viewable for video monitoring or audible for audio monitoring 434. Base 428 may provide a secure mechanism for attaching the interface apparatus 380 to, for example, an incubator side 430. In addition, interface apparatus 380 may have an external source of AC or DC electrical power 432, which may provide electrical power to smart phone 386 through the electrical connectors in communication with connecting and supporting component 424. Further, **all signals received by the smart phone 386, such as ECG, ETCO2, body temperature, respiratory movement, video, and audio may be transmitted wirelessly by smart phone 386 or via a cable connected to the mobile for remote monitoring and storage.** Kreger at 11:35-12:4 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	Kreger discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data **Continuing to refer to FIG. 3, the microprocessor 74 receives one or more biosensor signals and may transform the data into a biosensor measurement such as BPM, or an otherwise useful signal such as a ECG signal suitable for medical diagnosis. The signals and measurements may be stored in memory 12 and may be used for plotting on display 94.** The signals and measurements may also be used to provide information such as a BPM via speaker 98 or via a headset or earpiece (not shown). In addition, biosensor data may be produced by the mobile's internal accelerometer 70 if it is in communication with a human body, thereby serving as a biosensor that may be used to determine the patient's position, respiratory movement, and so forth. Kreger at 7:26-38 **The sensor data and measurements may be transmitted to remote medical personnel, internet servers, and others using WiFi transceiver 68, Bluetooth transceiver 72 or other RF transmitter such as for a cellular phone network. As well, the signals and measurements on the mobile 12 may be transferred via a cable connected to USB connector 28 c or docking connector 28 b to another computer storage device, over a computer network, to a personal computer, and so forth**. Kreger at 7:39-46 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 11	
11. The system of claim 5, wherein the receiver further	Kreger discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.

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comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	*See* claim 5. Referring now to FIGS. 21-23, an embodiment of the interface apparatus 600 may comprise an interface device 602 that has a frequency multiplexer 601. The interface device may connect multiple signals such as pulse oximeter signal 604, body temperature signal 606, microphone signal 608, which are combined by multiplexer 601 into a signal that may be transmitted to one or more mobile electrical audio inputs 612. The interface device 602 may also provide outputs for a headsets loudspeakers 614 allowing the headset to connect to the audio connector loudspeaker outputs 616, that may otherwise be utilized by interface device 602. Similarly, the interface device 602 microphone input 608, that may otherwise be utilized by interface device 602. **The frequency multiplexer 601 may combine the signals 604, 606, 608 in a number of ways. For example, the microphone input 608 may be transformed by notch filter 618 to remove a portion of the signal between frequencies fn1 and fn2 as shown by frequency profile of notch filter output signal 620. The sensor inputs 604, 606 may be transformed by low pass filters 622, 624 and frequency shifted by modulators 626, 628 such that they are non-overlapping and within the notch 620 of notch filter 618 as shown by frequency plots of signals 630, 632. The filtered microphone signal 620 and the filtered and shifted sensors 630, 632 are combined by summer 634 to form the combination signal 636 which is received by a mobile device's audio input having bandwidth from f1 to f h 638. Alternatively, the data may be modulated and/or multiplexed by any number of modulation schemes such as frequency shift key (FSK), phase shift key (PSK) encoding or the like** Kreger at 15:6-34 **Continuing with FIG. 3, analog input signals received by mobile 12 are digitized and communicated to the processor 74. The headset inputs from the headset connector 28 a, the USB connector 28 c, and the docking connector 28 b (not shown) may be filtered by microphone filter, undergo analog to digital conversion using analog to digital (“AtoD”) 76, and be communicated to the microprocessor 74. In addition, the audio inputs, generally for high- quality stereo 62, 64 may be filtered by stereo audio filter 84 (such as an anti-aliasing filter) and then digitized by AtoD 78 and communicated to the microprocessor 74. Alternatively, the audio filter 84 and the AtoD 78 could be integrated, and the microphone filter 86 and the AtoD 76 may be combined such as in a CODEC (not shown).** In addition, data input signals received by mobile 12 may be

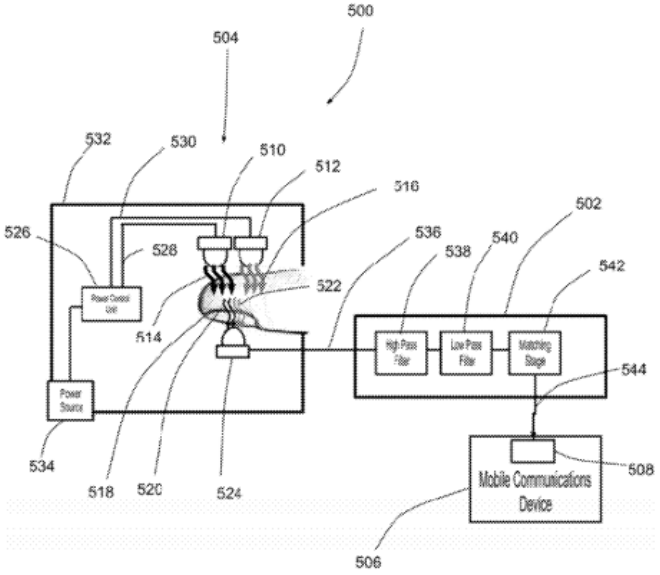
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’533 Patent	Kreger
	communicated to microprocessor 74 from USB connector 28 c, and the data I/O connections 58 of docking connector 28 b. The data connections can be serial or parallel, asynchronous or synchronous, and may comprise clock signals. Alternatively, the audio inputs 62, 65 may be separate female audio connectors rather than in a docking connector 28 b. Kreger at 7:4-25 The biosensor signals 344 are received by a mobile device such as a tablet 312 through dock connector 346 which is in communication with an electrical connector on tablet 312 (not visible). The signals may be processed by the interface device dock 342 before being communicated to tablet 312. The biosensor signals may be further processed by the tablet 312 to produce displayed measurements such as BPM 364, diastolic and systolic blood pressure 370, respiratory rate 372, and the like. As well, the biosensor signals may be plotted or otherwise displayed, either with further processing by tablet 312, or plotted in the form received from dock 342. For example, **biosensor signals may be displayed by tablet 312 such as those used for medical diagnosis and monitoring: ECG 366, PPG cardiac signal 374, respiratory motion 376, end-tidal CO2 (ETCO2) 378, and the like. Biosensor signals may also be received by one or more RF receivers in the dock 346 (not shown) and communicated to the tablet 312 via wired electrical connector 346, for example, to allow the wireless sensor to utilize the features of the wired audio input's anti-alias filters and analog to digital converter. Interface device dock 342 may also include a support 368 for retaining the mobile 312 in communication with connector 346**. Kreger at 19:59-11:14 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
Claim 12	

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12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	Kreger discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. *See* claim 5. **Continuing with FIG. 17, the pulse oximeter 504 has, for example, two LED light-emitting elements 510, 512 emitting two different frequencies of light, for example red light 514 with a wavelengths of substantially 660 nanometers, and infrared light 516 with wavelengths of substantially 940 nanometers. The light 514, 516 is partially transmitted through fingertip 518 and emerges as modulated light 520, 522 respectively, now having a cardiac signal and information about the saturated percentage of oxygen in the blood, referred to as SPO2. The user's heart rate and other information may be derived from the pulse oximeter signal as well. The information containing light 520,522 strikes light receiving device such as photo transistor 524 which transforms the photonic energy to a corresponding electrical signal transmitted via one or more conductors 536 to interface device 502.** Kreger at 13:35-50 **The sensor assembly 134 has a cardiac sensor shown as photo plethysmograph (“PPG”) 136, a movement sensor accelerometer 138, and an external power source 140 supplying power to both sensors via power connection 27. The PPG 136 works as follows: first, an infrared (“IR”) light emitting diode (“LED”) 142 has power applied by power control unit 143 thereby stimulating it to emit IR light 144, some of which is scattered, reflected or absorbed by a human tissue such as finger 146. Next, some light 148 emerges from finger 146 striking an infrared sensor such as photodiode 150. The photodiode electrical output (i.e. the PPG signal having pulsatile blood flow) is communicated to interface device 132 via connection 26 a, while one or more accelerometer signals are communicated to the interface device 132 via connection 26 b. Note that 26 a, 26 b may be hardwired as shown or releaseably connected to interface device with mating connectors (not shown).** Kreger at 8:9-25

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	The pulse oximeter output signal 558 may be multiplexed with accelerometer signal 560 by multiplexer 562. Recall that the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526. Similarly, power control unit 564 may supply a signal to the multiplexor 562 to time multiplex the accelerometer and pulse oximeter signals 566 into a combined signal 567. Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals combined in pulse ox output 558 and the accelerometer output 569 into their three individual components (and perhaps more for additional accelerometer outputs). The power control unit 564 may provide a synchronizing signal such as 568 to the mobile device 556 to demultiplex the pulse oximeter data and accelerometer data. The synchronizing signal 568 may be further combined with the sensor data by another multiplexer 576. Kreger at 14:33-48  FIG. 17 Kreger at Fig.17

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	Continuing with FIG. 17, **the pulse oximeter 504 has, for example, two LED light-emitting elements 510, 512 emitting two different frequencies of light, for example red light 514 with a wavelengths of substantially 660 nanometers, and infrared light 516 with wavelengths of substantially 940 nanometers. The light 514, 516 is partially transmitted through fingertip 518 and emerges as modulated light 520, 522 respectively, now having a cardiac signal and information about the saturated percentage of oxygen in the blood, referred to as SPO2. The user's heart rate and other information may be derived from the pulse oximeter signal as well. The information containing light 520,522 strikes light receiving device such as photo transistor 524 which transforms the photonic energy to a corresponding electrical signal transmitted via one or more conductors 536 to interface device 502.** Kreger at 13:36-50 Referring to FIGS. 17 and 18, **to determine SPO2 the LEDs 510, 512 may be turned on alternately and without overlapping with power control unit 526 and LED control lines 528, 530 as shown by voltage plots 529, 531 respectively. The information containing light 520, 522 has separate contributions shown in plots 523, 525. The alternating lights 520, 522 are received and combined (multiplexed) by a single receiver 524 as shown in plot 526.** Further processing of the signal to yield SPO2 must separate (demultiplex) the two signals into their individual components 523, 525. The signals 529, 531, and 533, or information derived therefrom may be supplied to the mobile device 506 to demultiplex the pulse oximeter data as well as other sensor data (see detailed description of FIG. 19 below). Kreger at 13:51-64 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Kreger, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Kreger, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

EXHIBIT B8

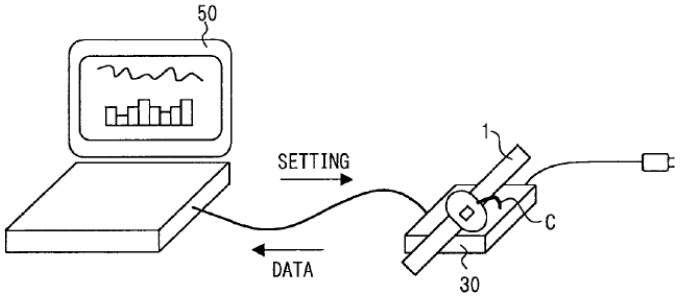
U.S. Pat. No. 9,651,533 in view of
U.S. Patent No. 7,507,207 to Kazuhiro Sakai ("Sakai")

As described in detail below, Sakai (individually or collectively) anticipates and/or renders obvious claims 5, 11-12 ("Asserted Claims") of U.S. Patent No. 9,651,533 (the "'533 Patent") under 35 U.S.C. §102 and/or §103, either alone in combination with the knowledge of a person of ordinary skill, and/or additional prior art references discussed in discussed in Exhibits B1-B8, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '533 Patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result. This invalidity claim chart is based on Defendants' present understanding of the Asserted Claims and Plaintiff's apparent construction of the Asserted Claims in its Preliminary Infringement Contentions ("Infringement Contentions").

The following invalidity chart includes references to the structure, function, operation, and/or features of the technology described in Sakai. The cited portions of Sakai are merely illustrative, and Defendants reserve the right to rely on alternative or additional evidence, including uncited portions of Sakai. Where a particular figure is cited, the citation should be understood to encompass the caption and description of the figure as well as any text relating to or describing the figure. Conversely, where particular text referring to a figure is cited, the citation should be understood to include the figure as well. Although the documentation collectively evidences prior knowledge, use, or sale, Defendants reserve the right to rely upon individual documents as printed publications. Where the chart below states that Sakai "describes" or "provides for" a limitation, such disclosure may be express, inherent, or implicit. To the extent it is found Sakai does not expressly disclose certain limitations in the asserted claim, such limitations are inherent. Defendants reserve the right to present direct evidence of the structure, function, operation, and/or features of the technology described in Sakai (including product samples, source code, and/or witness testimony) and/or its prior art status, and to present alternative or additional documents concerning the same as evidence that the technology described in Sakai anticipates and/or renders obvious the Asserted Claims of the '533 Patent

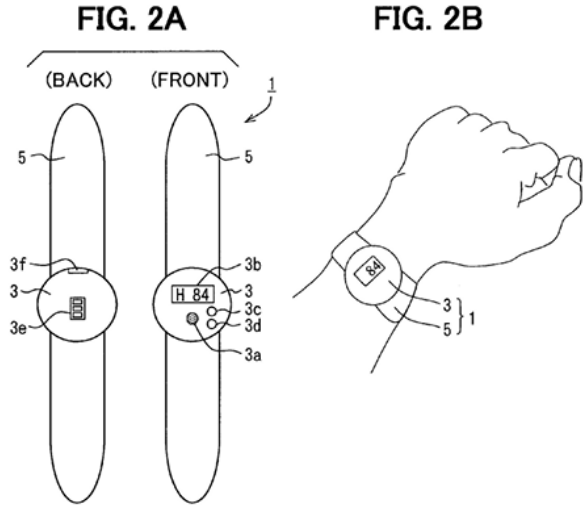
This chart is subject to all reservations, objections, and disclaimers in Defendants' Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. Nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of the Asserted Claims, Plainitff's apparent claim constructions, or the accuracy of any particular claim construction. Defendants reserve all rights to challenge any of the claim terms herein under 35 U.S.C. § 112, including by arguing that they are indefinite, are not supported by the written description, and/or are not enabled. Defendants further reserve all rights to amend this invalidity claim chart without leave of court pursuant to the Court's Docket Control Order, or upon a showing of good cause.

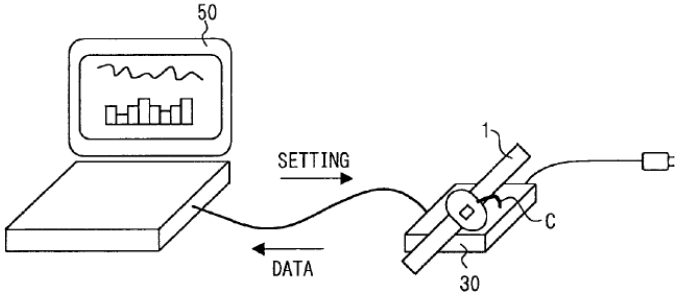
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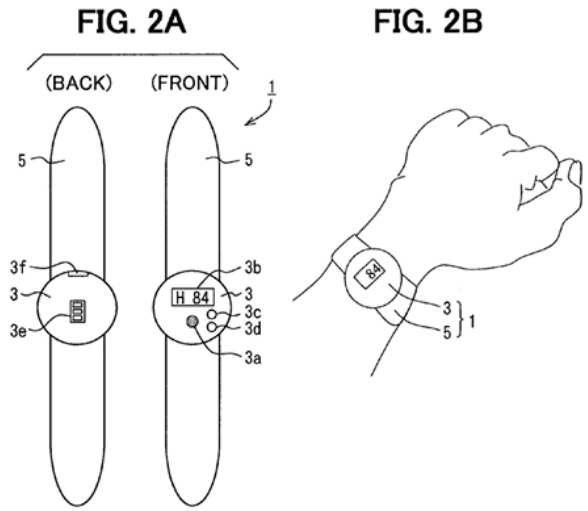
’533 Patent	Sakai
Claim 5	
5[pre]. A measurement system comprising:	By providing this disclosure, Defendants do not take a position on whether the preamble is limiting. Sakai discloses or renders obvious a measurement system. **In a portable biological information monitor apparatus, a pulse wave detection signal obtained by light emission from a green LED and a body motion detection signal obtained by light emission from an infrared LED are detected as biological information. This biological information is analyzed to compute various barometers. In a wake normal mode of a set generation mode, body motion and pulse are calculated as wake evaluation barometers for evaluation of a test subject's status in wake. In a wake steady state motion mode, body motion, pulse, and pitch are calculated as motion evaluation barometers for evaluation of the test subject's status in steady state motion. In a sleep mode, body motion, pulse, and autonomic nervous function are calculated as sleep evaluation barometers for evaluation of the test subject's status in sleep**. Necessary barometers are thereby generated regardless of the test subject's action using the portable monitor apparatus alone. Sakai at [Abstract] FIG. 1  Sakai at Fig.1 **As shown in FIG. 1, the physical condition management system of the present embodiment has a portable biological information monitor apparatus 1 (hereinbelow, simply referred to as a**

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	“monitor”) which is attached to a test subject as the subject of management when **the apparatus is used; a charger 30 which charges the monitor 1 and interfaces communication with the monitor 1 via a cable C attachable to and removable from the monitor 1; and an information management unit 50 which performs communication with the monitor 1 via the charger 30 to thereby change internal settings of the monitor 1, and performs various processings based on data obtained from the monitor 1**. Note that **the information management unit 50 includes a well-known personal computer having a keyboard, a display, a CPU, a ROM, a RAM, a hard disk, a communication interface**, and the like. The communication interface is connected to a cable from the charger 30. **A management database is formed on the hard disk. The management database is generated by accumulating data obtained from the monitor 1 via the communication interface and the charger 30, with separately-inputted various data (data on the test subject which cannot be inputted with the monitor 1, data on other test subjects, and the like). The CPU analyzes and evaluates the data accumulated in the management database, and performs processings for displaying the results of analysis and evaluation and the data accumulated in the management database on the display in various formats**. Further, a management database server may be constructed through the Internet or the like so that a third person can also manage many data. In this case, **the management of data may be performed via the information management apparatus or may be directly performed with the monitor. Further, data transmission and data reception are possible**. Sakai at 4:16-48

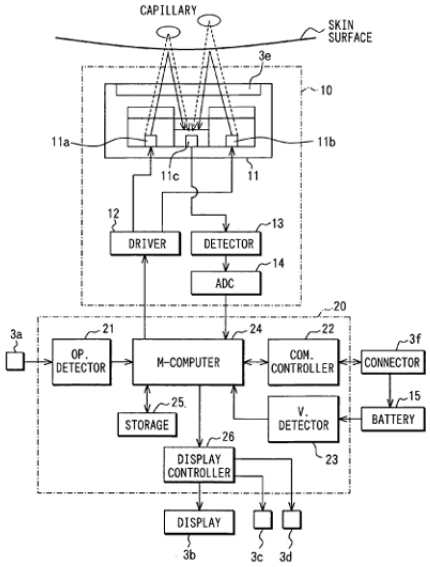
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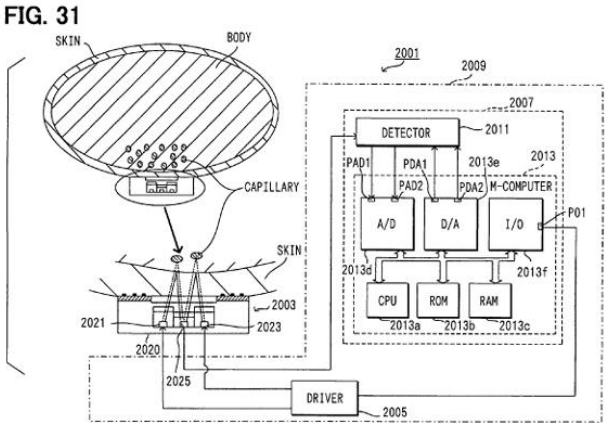
’533 Patent	Sakai
	 Sakai at Figs 2A and 2B FIGS. 2A and 2B are explanatory views showing the arrangement of the monitor and the monitor apparatus in use. **As shown in FIG. 2A, the monitor 1 has a main body 3 formed to approximately have a size of wrist watch, and a belt-type attachment portion 5 integrally formed with the main body 3**. **An operation button 3 a, a display panel 3 b, a light emission diode (LED) 3 c for operation check, and an LED 3 d for charging check are provided on the front surface of the main body 3. A detection window 3 e for transmitting light used in biological information detection and a connector 3 f for connection with the cable C extended from the charger 30 are provided on the back surface of the main body 3**. Further, the main body 3 is water-proof coated such that the test subject can have a bath while wearing the monitor 1. As shown in FIG. 2B, **the monitor 1 is fixed around the test subject's wrist or ankle with the attachment portion 5 when the monitor apparatus is used such that the detection window 3 e on the back surface of the main body 3 is in contact with the test subject's skin**. **The attachment position is not limited to the wrist or ankle but may be set in any position from a finger tip to a root of all limbs**. Further, the attachment portion 5 may be a supporter member in place of the belt.

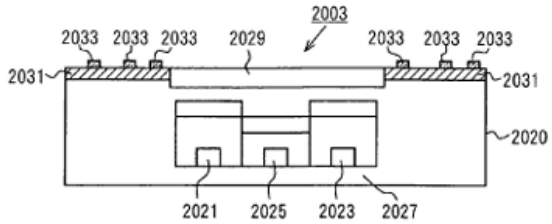
'533 Patent	Sakai
	Sakai at 4:49-5:03 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants' Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[a]. a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers	Sakai discloses or renders obvious a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers. FIG. 1  Sakai at Fig.1 **As shown in FIG. 1, the physical condition management system of the present embodiment has a portable biological information monitor apparatus 1 (hereinbelow, simply referred to as a "monitor") which is attached to a test subject as the subject of management** when **the apparatus is used; a charger 30 which charges the monitor 1 and interfaces communication with the monitor 1 via a cable C attachable to and removable from the monitor 1; and an information management unit 50 which performs communication with the monitor 1 via the charger 30 to**

’533 Patent	Sakai
	thereby change internal settings of the monitor 1, and performs various processings based on data obtained from the monitor 1. Sakai at 4:16-27  Sakai at Figs 2A and 2B FIGS. 2A and 2B are explanatory views showing the arrangement of the monitor and the monitor apparatus in use. **As shown in FIG. 2A, the monitor 1 has a main body 3 formed to approximately have a size of wrist watch, and a belt-type attachment portion 5 integrally formed with the main body 3**. **An operation button 3 a, a display panel 3 b, a light emission diode (LED) 3 c for operation check, and an LED 3 d for charging check are provided on the front surface of the main body 3. A detection window 3 e for transmitting light used in biological information detection and a connector 3 f for connection with the cable C extended from the charger 30 are provided on the back surface of the main body 3**. Further, the main body 3 is water-proof coated such that the test subject can have a bath while wearing the monitor 1.

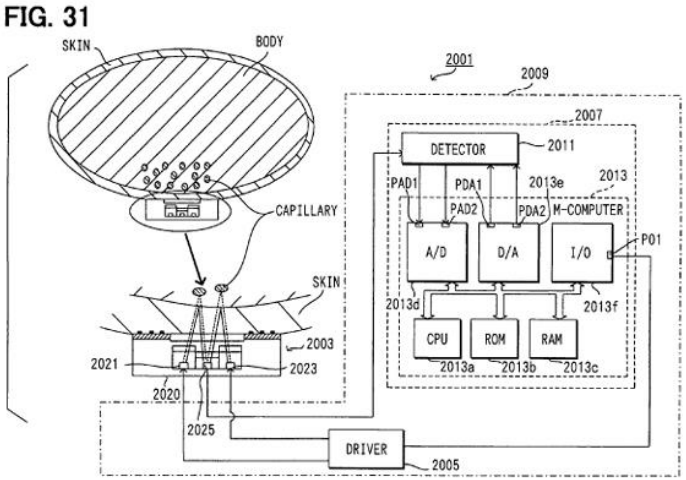
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’533 Patent	Sakai
	As shown in FIG. 2B, **the monitor 1 is fixed around the test subject's wrist or ankle with the attachment portion 5 when the monitor apparatus is used such that the detection window 3 e on the back surface of the main body 3 is in contact with the test subject's skin**. **The attachment position is not limited to the wrist or ankle but may be set in any position from a finger tip to a root of all limbs**. Further, the attachment portion 5 may be a supporter member in place of the belt. Sakai at 4:49-5:03 FIG. 3  Sakai at Fig.3 FIG. 3 is a block diagram showing the construction of the monitor 1. **As shown in FIG. 3, the monitor 1 has an information detection unit 10 which emits light via the detection window 3 e and receives reflected light to thereby detect biological information; an information processor 20 which processes the biological information detected by the information detection unit 10**; and a battery 15 chargeable via the cable connected to the connector 3 f, which supplies power to the respective elements of the apparatus.

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	The information detection unit 10 has an optical pulse wave and body motion sensor 11 having a green LED 11 a to emit green light (in the present embodiment, the wavelength is about 520 nm), an infrared LED 11 b to emit infrared light (in the present embodiment, the wavelength is about 950 nm), and a photo diode (PD) 11 c to receive reflected light from the LEDs 11 a and 11 b; a driver 12 which drives the LEDs 11 a and 11 b in accordance with instructions from the information processor 20; a detector 13 which drives the PD 11 c and generates a detection signal in correspondence with the intensity of reflected light; and an A/D converter 14 which converts the detection signal from the detector 13 into digital data. Sakai at 5:04-24 16. The **portable biological information monitor apparatus according to claim 15, wherein the light emission unit includes**: **a first light emission device to emit light** when the pulse wave sensor outputs the pulse wave detection signal; and **a second light emission device to emit light** when the pulse wave sensor outputs the body motion detection signal. Sakai at Claim 16 FIG. 31  Sakai at Fig.31

'533 Patent	Sakai
	A pulse wave detection apparatus 2001 according to the present embodiment detects a human body's pulse rate. As shown in FIG. 31, the pulse wave detection apparatus 2001 has a pulse wave sensor 2003 including an infrared LED 2021 and a green LED 2023 as light emission devices; a photo diode (PD) 2025 as a photoreception device; a driver 2005 which drives the pulse wave sensor 2003 by outputting driving signals to the infrared LED 2021 and the green LED 2023 to emit light at different timings; and a data processing unit 2007 which processes a signal from the pulse wave sensor 2003 and controls the driver 2005. Note that the driver 2005 and the data processing unit 2007 are accommodated in a casing of a pulse wave detection apparatus main body 2009. FIG. 32A  Sakai at Fig.32A First, the **construction of the pulse wave sensor 2003 will be described with reference to FIGS. 32A and 32B. FIG. 32A is a cross-sectional view showing the structure of the pulse wave sensor 2003. FIG. 32B is a plan view showing the pulse wave sensor 2003 from the side in contact with human skin**. **The pulse wave sensor 2003 is fixed to human body's arm or the like when it is used. As shown in FIG. 32A, the pulse wave sensor is an optical reflective type sensor having the infrared LED 2021 to emit infrared light having a wavelength of about 940 nm, the green LED 2023 to emit green light having a wavelength of about 520 nm, and the PD 2025 to receive light and output a signal corresponding to the amount of received light (photoreception signal).** **The infrared LED 2021, the green LED 2023, and the PD 2025 are arrayed in a bottom 2027 of a casing 2020 of the pulse wave sensor 2003 such that the PD 2025 is positioned between the**

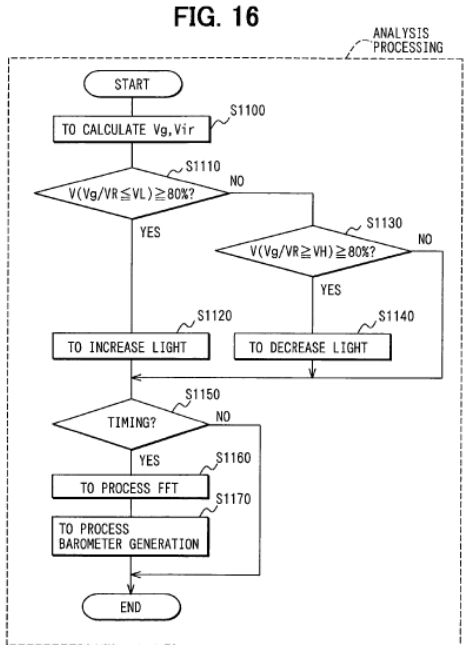
’533 Patent	Sakai
	infrared LED 2021 and the green LED 2023. Infrared light or green light is emitted to the human body via a light transmitting plate 2029. Sakai at 28:01-32 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[b]. the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;	Sakai discloses or renders obvious the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources. **The present embodiment has been made in view of this problem, and provides a pulse wave detection apparatus to eliminate the influence of sunlight and detect a pulse wave with high accuracy**. Sakai at 27:64-67

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	 Sakai at Fig.31 **A pulse wave detection apparatus 2001 according to the present embodiment detects a human body's pulse rate. As shown in FIG. 31, the pulse wave detection apparatus 2001 has a pulse wave sensor 2003 including an infrared LED 2021 and a green LED 2023 as light emission devices; a photo diode (PD) 2025 as a photoreception device; a driver 2005 which drives the pulse wave sensor 2003 by outputting driving signals to the infrared LED 2021 and the green LED 2023 to emit light at different timings; and a data processing unit 2007 which processes a signal from the pulse wave sensor 2003 and controls the driver 2005**. Note that the driver 2005 and the data processing unit 2007 are accommodated in a casing of a pulse wave detection apparatus main body 2009. Sakai at 28:01-13 **The direct current component is based on the changes in light amount accompanied by blood stream changes due to as follows: expansion and contraction of blood vessel (hereinbelow, referred to as “noise A”); the change of amount of light scattered on the skin surface accompanied by shift of the pulse wave sensor 2003 (hereinbelow, referred to as “noise B”); and the change of amount of light incident from the outside of the pulse wave sensor 2003 (e.g.,**

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	sunlight) etc. The direct current component is cut with the detector 2011 using a method to be described later. Sakai at 29:49-58 As shown in FIG. 31, **the microcomputer 2013 has a CPU 2013 a which performs processing based on predetermined processing programs, a ROM 2013 b in which various control programs are stored, a RAM 2013 c in which various memories for storing various data are provided, an A/D converter 2013 d which converts a voltage value of analog signal into 10-bit digital value, a D/A converter 2013 e which converts the 10-bit digital data generated by the CPU 2013 a into an analog signal, and an input/output port 2013 f having multiple input ports to input various digital signals and multiple output ports to output various digital signals.** Note that as shown in FIG. 31, **the A/D converter 2013 d has the A/D ports PAD1 and PAD2 to input analog signals, and the D/A converter 2013 e has the D/A ports PDA1 and PDA2 to output analog signals**. Further, as shown in FIG. 31, **the input/output port 2013 f has an output port PO1. A driver 2007 is connected to the output port PO1**. **In the microcomputer 2013 having the above construction, the CPU 2013 a performs processing for outputting a signal having a component corresponding to the above noise A and noise B from the above-described direct current component signal, and processing for outputting a signal having a component corresponding to external light**. First, **the processing for outputting a signal having a component corresponding to the noise A and the noise B will be described. The frequency of voltage fluctuation of photoreception signal due to the noise A and the noise B is sufficiently low in comparison with a pulse component, and the voltage fluctuation due to these noises is small in a short period. Accordingly, the CPU 2013 a analyzes the voltage fluctuation of photoreception signal within each predetermined period (e.g., 10 seconds), thereby controls output values in the D/A ports PDA1 and PDA2 in correspondence with the voltage fluctuation due to the noise A and the noise B. Thus direct current component signal corresponding to the noise A and the noise B is outputted from the corrector 2043. That is, the voltage value of the direct current component can be controlled by each time**.

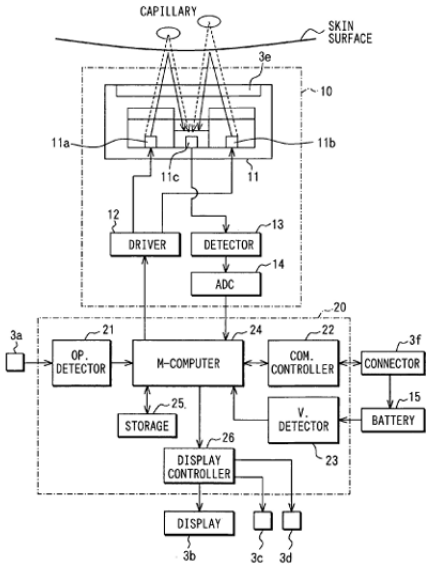
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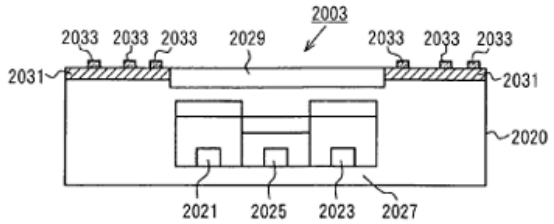
’533 Patent	Sakai
	Next, **external light control processing for outputting a signal having a component corresponding to the external light** (hereinbelow, referred to as a “external light reception signal”) will be described with reference to FIG. 34. **FIG. 34 is a flowchart showing the external light control processing. The external light control processing is repeatedly performed upon each light emission from the infrared LED 2021 and the green LED 2023 while the CPU 2013 a is activated (power ON).** **In the external light control processing, first, at Step S2010, the CPU 2013 a obtains data on the voltage value of signal inputted in the A/D port PAD2. Then at Step S2020, it is determined whether or not the voltage value data obtained at Step S2010 is the same as the voltage value data previously obtained from the A/D port PAD2. When it is determined that the currently obtained voltage value data is the same as the previously obtained data (Step S2020: YES), the process proceeds to Step S2050. On the other hand, when it is determined that the currently obtained voltage value data is not the same as that previously obtained data (Step S2020: NO), the process proceeds to Step S2030**. **At Step S2030, the voltage fluctuation in the output from the D/A ports PDA1 and PDA2 is calculated based on a difference value between the voltage value obtained at Step S2010 and the previously obtained voltage value. Further, at Step S2040, present output values in the D/A ports PDA1 and PDA2 are controlled in correspondence with the voltage fluctuation calculated at Step S2030**. Thereafter, the process proceeds to Step S2050. **At Step S2050, light emission from the green LED 2023 is performed, and data on voltage value of signal inputted into the A/D port PAD1 is obtained. Further, at Step S2060, light emission from the infrared LED 2021 is performed, and data on voltage value of signal inputted into the A/D port PAD 1 is obtained, and the external light controlling processing ends.** **That is, in the external light control processing, a photoreception signal from the PD 2025 when the infrared LED 2021 and the green LED 2023 do not emit light is regarded as an external light reception signal, and voltage values of analog signals outputted from the D/A ports PDA1 and PDA2 are controlled in correspondence with the voltage value of the external light reception signal**. In the pulse wave detection apparatus 2001 having the above construction, immediately **before light emission from the green LED 2023, light received by the PD 2025 is detected as an external light**

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	reception signal (Step S2010), and the external light reception signal is outputted (Step S2020 to Step S2040). Then, light emission is performed in the green LED 2023 then in the infrared LED 2021. Then differentiation is performed between a photoreception signal, outputted from the PD 2025 upon light emission from the green LED 2023 or the infrared LED 2021, and the external light reception signal in the amplifier 2041, and a differentiated signal is obtained (Step S2050 to Step S2060); thereby, a pulse wave is detected. As **the human body's pulse wave can be detected in consideration of light component due to external light in photoreception signal upon light emission from the infrared LED 2021 or the green LED 2023, the influence of external light can be eliminated and the pulse wave can be detected with high accuracy**. Sakai at 32:23-33:55  Sakai at Fig. 16

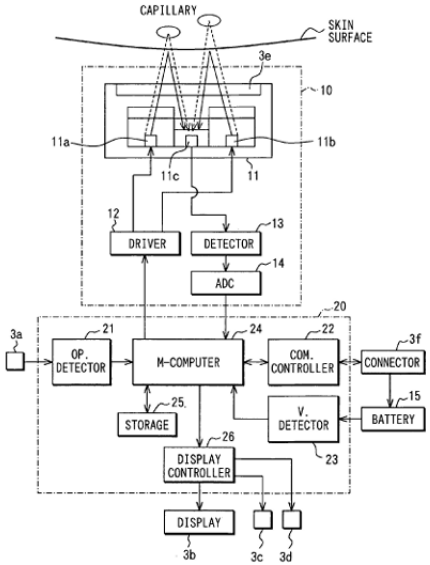
’533 Patent	Sakai
	Hereinbelow, the details of the analysis processing and the barometer generation processing according to the present embodiment will be described. **FIG. 16 is a flowchart showing the contents of the analysis processing**. Note that when **the information detection unit 1010 has been started, the analysis processing is started by a preset time interval (in the present embodiment, 1 second). Further, upon starting of the information detection unit 1010, the driver 1012 is initialized to a setting to cause light emission from the LEDs 1011 a and 1011 b at a maximum intensity**. When **the process starts, with regard to the respective pulse wave detection signal and body motion detection signal, an amplitude Vg of the pulse wave detection signal and an amplitude Vir of the body motion detection signal are calculated based on digital data (in the present embodiment, 20 data) obtained within a unit section (i.e., 1 second) from the previous startup to the current time point (Step S1100)**. More particularly, as shown in FIG. 17A, **a maximum value and a minimum value in the digital data obtained in the unit section are extracted, and the difference is obtained as the amplitudes Vg and Vir**. Next, **with a voltage range where the pulse wave detection signal is detected as VR (see FIG. 17B), it is determined whether or not the percentage of unit sections, where Vg/VR is equal to or less than a lower limit value VL (in the present embodiment, 0.1) within a past preset period (in the present embodiment, 20 seconds), is equal to or higher than a predetermined percentage (in the present embodiment, 80%) (Step S1110). When the percentage is the predetermined or higher percentage, it is determined that the amount of light in the LEDs 1011 a and 1011 b are insufficient. Then a command to increase the light emission intensity is outputted to the driver 1012 (Step S1120)**. Sakai at 19:33-65 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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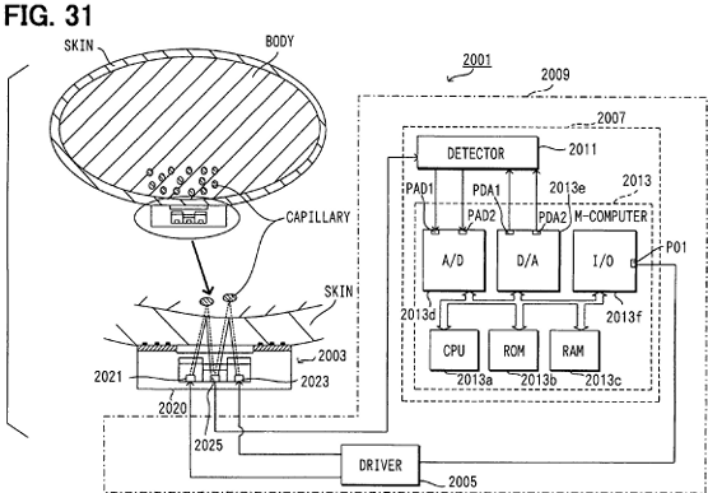
’533 Patent	Sakai
5[c]. an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample	Sakai discloses or renders obvious an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample. FIG. 3  Sakai at Fig.3 FIG. 3 is a block diagram showing the construction of the monitor 1. **As shown in FIG. 3, the monitor 1 has an information detection unit 10 which emits light via the detection window 3 e and receives reflected light to thereby detect biological information; an information processor 20 which processes the biological information detected by the information detection unit 10**; and a battery 15 chargeable via the cable connected to the connector 3 f, which supplies power to the respective elements of the apparatus. **The information detection unit 10 has an optical pulse wave and body motion sensor 11 having a green LED 11 a to emit green light (in the present embodiment, the wavelength is about 520 nm), an infrared LED 11 b to emit infrared light (in the present embodiment, the wavelength is about 950 nm),** and a photo diode (PD) 11 c to receive reflected light from the LEDs 11 a and 11 b; a

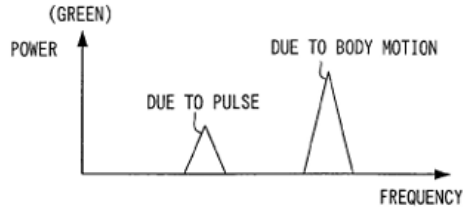
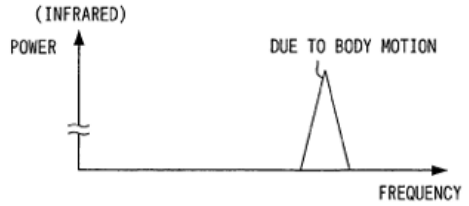
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	driver 12 which drives the LEDs 11 a and 11 b in accordance with instructions from the information processor 20; a detector 13 which drives the PD 11 c and generates a detection signal in correspondence with the intensity of reflected light; and an A/D converter 14 which converts the detection signal from the detector 13 into digital data. **Note that when light emitted from the LEDs 11 a and 11 b arrives at capillary artery running through the test subject's body,** a part of the light is absorbed in hemoglobin in blood flowing through the capillary artery, and the rest of the light is reflected with the capillary artery and scattered. Then a part of the scattered light enters the PD 11 c as reflected light. Sakai at 5:04-30 FIG. 32A  Sakai at Fig.32A First, the construction of the pulse wave sensor 2003 will be described with reference to FIGS. 32A and 32B. **FIG. 32A is a cross-sectional view showing the structure of the pulse wave sensor 2003**. FIG. 32B is a plan view showing the pulse wave sensor 2003 from the side in contact with human skin. **The pulse wave sensor 2003 is fixed to human body's arm or the like when it is used. As shown in FIG. 32A, the pulse wave sensor is an optical reflective type sensor having the infrared LED 2021 to emit infrared light having a wavelength of about 940 nm, the green LED 2023 to emit green light having a wavelength of about 520 nm**, and the PD 2025 to receive light and output a signal corresponding to the amount of received light (photoreception signal).

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	The infrared LED 2021, the green LED 2023, and the PD 2025 are arrayed in a bottom 2027 of a casing 2020 of the pulse wave sensor 2003 such that the PD 2025 is positioned between the infrared LED 2021 and the green LED 2023. Infrared light or green light is emitted to the human body via a light transmitting plate 2029. Sakai at 28:14-32 **In the pulse wave sensor 2003 having the above construction, first, as shown in FIG. 31, the light transmitting plate 2029** and the light shielding plate 2031 are **brought into contact with the human body's arm skin and the pulse sensor 2003 is fixed. Thereafter, the infrared LED 2021 and the green LED 2023 alternately emit infrared light and green light to the human body, and the PD 2025 receives reflected light. Then PD 2025 outputs the change of photoreception amount as a photoreception signal (e.g., a voltage signal) to the data processing unit 2007**. Sakai at 29:09-18 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[d]. a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;	Sakai discloses or renders obvious a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source.

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	FIG. 3  Sakai at Fig.3 FIG. 3 is a block diagram showing the construction of the monitor 1. **As shown in FIG. 3, the monitor 1 has an information detection unit 10 which emits light via the detection window 3 e and receives reflected light to thereby detect biological information; an information processor 20 which processes the biological information detected by the information detection unit 10**; and a battery 15 chargeable via the cable connected to the connector 3 f, which supplies power to the respective elements of the apparatus. **The information detection unit 10 has an optical pulse wave and body motion sensor 11 having a green LED 11 a to emit green light** (in the present embodiment, the wavelength is about 520 nm)**, an infrared LED 11 b to emit infrared light** (in the present embodiment, the wavelength is about 950 nm)**, and a photo diode (PD) 11 c to receive reflected light from the LEDs 11 a and 11 b; a driver 12 which drives the LEDs 11 a and 11 b in accordance with instructions from the information processor 20; a detector 13 which drives the PD 11 c and generates a detection signal**

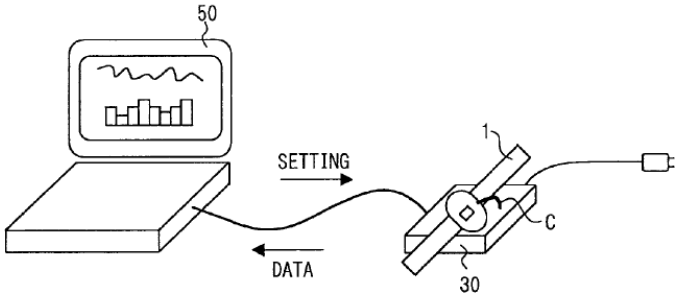
’533 Patent	Sakai
	in correspondence with the intensity of reflected light; and an A/D converter 14 which converts the detection signal from the detector 13 into digital data. Note that when **light emitted from the LEDs 11 a and 11 b arrives at capillary artery running through the test subject's body, a part of the light is absorbed in hemoglobin in blood flowing through the capillary artery, and the rest of the light is reflected with the capillary artery and scattered. Then a part of the scattered light enters the PD 11 c as reflected light**. At this time, as **the amount of hemoglobin in the capillary artery changes in an undulating manner due to blood pulsation, the light absorbed into the hemoglobin also changes in an undulating manner. Further, as the amount of received light (signal level of the detection signal) reflected with the capillary artery and detected by the PD 11 c also changes, information on pulse wave can be obtained from the detection signal.** Sakai at 5:04-38 In the pulse wave sensor 2003 having the above construction, first, **as shown in FIG. 31, the light transmitting plate 2029 and the light shielding plate 2031 are brought into contact with the human body's arm skin and the pulse sensor 2003 is fixed. Thereafter, the infrared LED 2021 and the green LED 2023 alternately emit infrared light and green light to the human body, and the PD 2025 receives reflected light. Then PD 2025 outputs the change of photoreception amount as a photoreception signal (e.g., a voltage signal) to the data processing unit 2007**. Sakai at 29:09-18

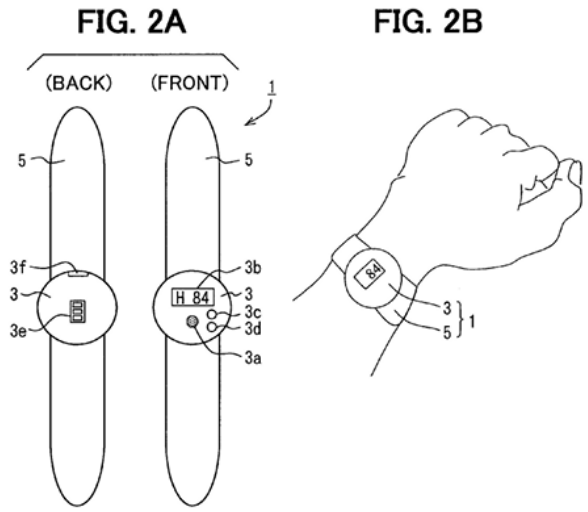
’533 Patent	Sakai
	FIG. 31  Sakai at Fig.31 **A pulse wave detection apparatus 2001 according to the present embodiment detects a human body's pulse rate. As shown in FIG. 31, the pulse wave detection apparatus 2001 has** a pulse wave sensor 2003 including an infrared LED 2021 and a green LED 2023 as light emission devices; **a photo diode (PD) 2025 as a photoreception device; a driver 2005 which drives the pulse wave sensor 2003 by outputting driving signals to the infrared LED 2021 and the green LED 2023 to emit light at different timings; and a data processing unit 2007 which processes a signal from the pulse wave sensor 2003 and controls the driver 2005. Note that the driver 2005 and the data processing unit 2007 are accommodated in a casing of a pulse wave detection apparatus main body 2009**. Sakai at 28:01-18 Accordingly, **information on a pulse wave can be obtained from the photoreception signal outputted from the PD 2025 (corresponding to the reflected light of the light emitted from the infrared LED 2021 or the green LED 2023).** Hereinbelow, the reason of use of the infrared LED 2021 and the green LED 2023 for pulse wave detection will be described. As shown in FIG. 35, **the photoreception signal outputted from the PD 2025 includes a signal indicating a pulse wave reflected from the capillary artery (pulse wave**

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	component) and a component of reflected wave from the skin surface or other portion than the capillary artery (reflected wave component). The photoreception signal is frequency-analyzed mainly to a pulse component synchronized with heartbeat, a body motion component synchronized with body motion, and approximately a direct current component (as a reflected wave component except the body motion component). Sakai at 29:31-48 FIG. 9A  FIG. 9B  Sakai at Figs 9A and 9B Note that infrared light has a low light absorption characteristic in comparison with green light. **As shown in FIGS. 9A and 9B, in the detection signal obtained by the PD 11 c upon light emission from the green LED 11 a, the pulse component and body motion component are detected at extractable signal levels (see FIG. 9A). On the other hand, in the detection signal obtained by the PD 11 c upon light emission from the infrared LED 11 b,** the pulse component is at a very low level

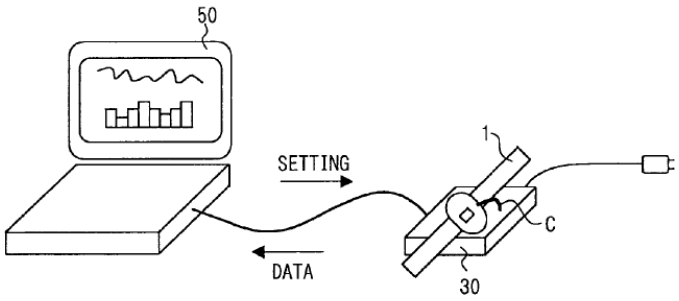
’533 Patent	Sakai
	in comparison with the body motion component and only the body motion component is detected at an extractable signal level (see FIG. 9B). Note that FIGS. 9A and 9B are graphs showing frequency spectra of the detection signal. That is, **upon light emission from the green LED 11 a, the pulse wave and body motion sensor 11 operates as a pulse wave sensor which outputs a pulse wave detection signal including pulse component and body motion component, while upon light emission from the infrared LED 11 b, operates as a body motion sensor which outputs a body motion detection signal including body motion component**. **When the driver 12 is started in accordance with a command from the information processor 20, the driver 12 drives the LEDs 11 a and 11 b alternately at different timings, by preset sampling interval (50 msec in the present embodiment). Further, the A/D converter 14 operates in synchronization with the light emission timing of the driver 12, to thereby convert the pulse wave detection signal detected upon light emission from the green LED 11 a and the body motion detection signal detected upon light emission from the infrared LED 11 b into digital data**, and provides these digital data, as biological information, to the information processor 20. Sakai at 5:47-6:09 Note that **infrared light has a low light absorption characteristic in comparison with green light. In the detection signal detected by the PD 1011 c upon light emission from the infrared LED 1011 b (body motion detection signal), the pulse component synchronized with the pulse is smaller in comparison with the detection signal detected by the PD 1011 c upon light emission from the green LED 1011 a (pulse wave detection signal). The body motion component synchronized with body motion is thereby relatively emphasized in the detection signal detected by the PD 1011 c upon light emission from the infrared LED 1011 b**. Sakai at 18:01-11 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are

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	incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[e]. a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen	Sakai discloses or renders obvious a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen FIG. 1  Sakai at Fig.1 **As shown in FIG. 1, the physical condition management system of the present embodiment has a portable biological information monitor apparatus 1 (hereinbelow, simply referred to as a “monitor”) which is attached to a test subject as the subject of management** when **the apparatus is used; a charger 30 which charges the monitor 1 and interfaces communication with the monitor 1 via a cable C attachable to and removable from the monitor 1; and an information management unit 50 which performs communication with the monitor 1 via the charger 30 to thereby change internal settings of the monitor 1, and performs various processings based on data obtained from the monitor 1**. Note that **the information management unit 50 includes a well-known personal computer having a keyboard, a display, a CPU, a ROM, a RAM, a hard disk, a communication interface**, and the like. The communication interface is connected to a cable from the charger 30. **A management database is formed on the hard disk. The management database is generated by accumulating data obtained from the monitor 1 via the communication interface and the charger 30, with**

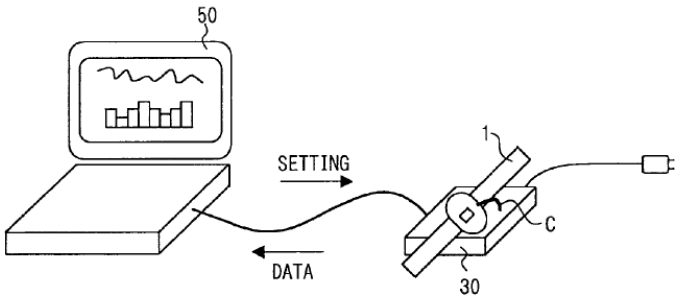
’533 Patent	Sakai
	separately-inputted various data (data on the test subject which cannot be inputted with the monitor 1, data on other test subjects, and the like). The CPU analyzes and evaluates the data accumulated in the management database, and performs processings for displaying the results of analysis and evaluation and the data accumulated in the management database on the display in various formats. Further, a management database server may be constructed through the Internet or the like so that a third person can also manage many data. In this case, **the management of data may be performed via the information management apparatus or may be directly performed with the monitor. Further, data transmission and data reception are possible**. Sakai at 4:16-48  Sakai at Figs 2A and 2B FIGS. 2A and 2B are explanatory views showing the arrangement of the monitor and the monitor apparatus in use. **As shown in FIG. 2A, the monitor 1 has a main body 3 formed to approximately have a size of wrist watch, and a belt-type attachment portion 5 integrally formed with the main body 3**.

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	An operation button 3 a, a display panel 3 b, a light emission diode (LED) 3 c for operation check, and an LED 3 d for charging check are provided on the front surface of the main body 3. A detection window 3 e for transmitting light used in biological information detection and a connector 3 f for connection with the cable C extended from the charger 30 are provided on the back surface of the main body 3. Further, the main body 3 is water-proof coated such that the test subject can have a bath while wearing the monitor 1. Sakai at 4:49-62 For example, in the above embodiment, **the monitor 1 and the information management unit 50 communicate with each other via the charger 30;** however, as shown in FIG. 11, the charger may be integrated with an information management unit 70. Further, **it may be arranged such that the charger 30 is provided with a display unit having a screen larger than that of the monitor 1, and the monitor 1 is provided in the charger 30; thereby information obtained by the monitor 1 is displayed in more easily-viewable format in comparison with display on the display panel 3 b of the monitor 1**. **Further, it may be arranged such that multiple monitors 1 directly perform communication and mutually exchange data**. Further, in **the above embodiment, the communication controller 22 performs cable communication via the cable C connected to the connector 3 f; however, wireless communication may be performed**. In this case, it may be further arranged such that the operation button 3 a is omitted and a separately prepared remote controller is used, and various mode settings are performed via the communication controller 22. Sakai at 4:32-52 9. The portable **biological information monitor apparatus according to claim 1, further comprising:** **communication means for performing communication with an external device**. Sakai at Claim 9

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	53. **The information management apparatus according to claim 52, further comprising a remote controller, for controlling operation of the portable biological information monitor apparatus via the first communication means**. Sakai at Claim 53 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants' Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5[f]. the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link	Sakai discloses or renders obvious the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link FIG. 1  Sakai at Fig.1 **As shown in FIG. 1, the physical condition management system of the present embodiment has a portable biological information monitor apparatus 1 (hereinbelow, simply referred to as a "monitor") which is attached to a test subject as the subject of management** when **the apparatus**

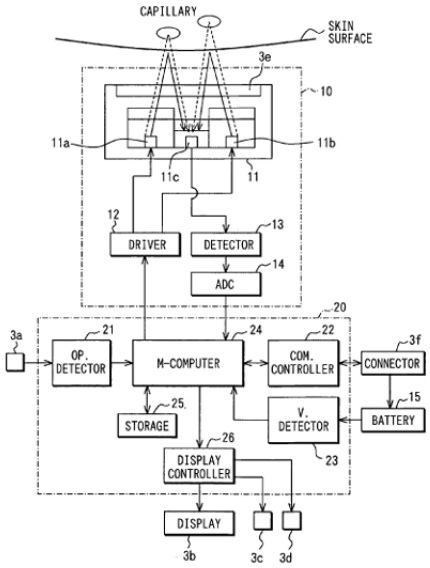
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	is used; a charger 30 which charges the monitor 1 and interfaces communication with the monitor 1 via a cable C attachable to and removable from the monitor 1; and an information management unit 50 which performs communication with the monitor 1 via the charger 30 to thereby change internal settings of the monitor 1, and performs various processings based on data obtained from the monitor 1. Note that **the information management unit 50 includes a well-known personal computer having a keyboard, a display, a CPU, a ROM, a RAM, a hard disk, a communication interface**, and the like. The communication interface is connected to a cable from the charger 30. **A management database is formed on the hard disk. The management database is generated by accumulating data obtained from the monitor 1 via the communication interface and the charger 30, with separately-inputted various data (data on the test subject which cannot be inputted with the monitor 1, data on other test subjects, and the like). The CPU analyzes and evaluates the data accumulated in the management database, and performs processings for displaying the results of analysis and evaluation and the data accumulated in the management database on the display in various formats**. **Further, a management database server may be constructed through the Internet or the like so that a third person can also manage many data**. In this case, **the management of data may be performed via the information management apparatus or may be directly performed with the monitor. Further, data transmission and data reception are possible**. Sakai at 4:16-48 For example, in the above embodiment, **the monitor 1 and the information management unit 50 communicate with each other via the charger 30;** however, as shown in FIG. 11, the charger may be integrated with an information management unit 70. Further, **it may be arranged such that the charger 30 is provided with a display unit having a screen larger than that of the monitor 1, and the monitor 1 is provided in the charger 30; thereby information obtained by the monitor 1 is displayed in more easily-viewable format in comparison with display on the display panel 3 b of the monitor 1**. **Further, it may be arranged such that multiple monitors 1 directly perform communication and mutually exchange data**.

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	Further, in **the above embodiment, the communication controller 22 performs cable communication via the cable C connected to the connector 3 f; however, wireless communication may be performed**. In this case, it may be further arranged such that the operation button 3 a is omitted and a **separately prepared remote controller is used, and various mode settings are performed via the communication controller 22**. Sakai at 14:32-52 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading..
5[g]. a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.	Sakai discloses or renders obvious a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data FIG. 1  Sakai at Fig.1 **As shown in FIG. 1, the physical condition management system of the present embodiment has a portable biological information monitor apparatus 1 (hereinbelow, simply referred to as a**

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	“monitor”) which is attached to a test subject as the subject of management when **the apparatus is used; a charger 30 which charges the monitor 1 and interfaces communication with the monitor 1 via a cable C attachable to and removable from the monitor 1; and an information management unit 50 which performs communication with the monitor 1 via the charger 30 to thereby change internal settings of the monitor 1, and performs various processings based on data obtained from the monitor 1**. Note that **the information management unit 50 includes a well-known personal computer having a keyboard, a display, a CPU, a ROM, a RAM, a hard disk, a communication interface**, and the like. The communication interface is connected to a cable from the charger 30. **A management database is formed on the hard disk. The management database is generated by accumulating data obtained from the monitor 1 via the communication interface and the charger 30, with separately-inputted various data (data on the test subject which cannot be inputted with the monitor 1, data on other test subjects, and the like). The CPU analyzes and evaluates the data accumulated in the management database, and performs processings for displaying the results of analysis and evaluation and the data accumulated in the management database on the display in various formats**. **Further, a management database server may be constructed through the Internet or the like so that a third person can also manage many data**. In this case, **the management of data may be performed via the information management apparatus or may be directly performed with the monitor. Further, data transmission and data reception are possible**. Sakai at 4:16-48 Further, in **the above embodiment, the communication controller 22 performs cable communication via the cable C connected to the connector 3 f; however, wireless communication may be performed**. In this case, it may be further arranged such that the operation button 3 a is omitted and a **separately prepared remote controller is used, and various mode settings are performed via the communication controller 22**. Sakai at 14:45-52 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references

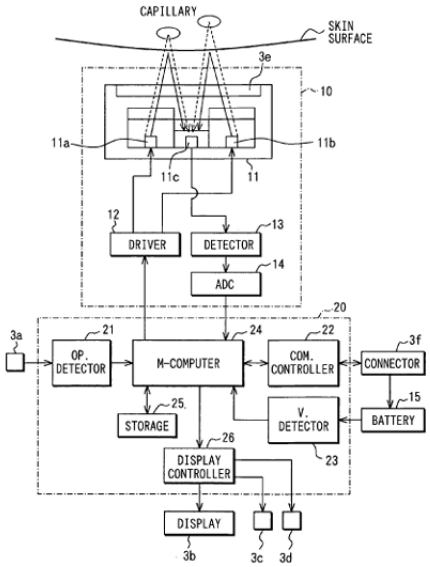
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Claim 11	
11. The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.	Sakai discloses or renders obvious wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths. *See* claim 5. FIG. 3  Sakai at Fig.3 FIG. 3 is a block diagram showing the construction of the monitor 1. **As shown in FIG. 3, the monitor 1 has an information detection unit 10 which emits light via the detection window 3 e and receives reflected light to thereby detect biological information; an information processor 20 which processes the biological information detected by the information detection unit 10**; and a battery

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	15 chargeable via the cable connected to the connector 3 f, which supplies power to the respective elements of the apparatus. **The information detection unit 10 has an optical pulse wave and body motion sensor 11 having a green LED 11 a to emit green light (in the present embodiment, the wavelength is about 520 nm), an infrared LED 11 b to emit infrared light (in the present embodiment, the wavelength is about 950 nm), and a photo diode (PD) 11 c to receive reflected light from the LEDs 11 a and 11 b; a driver 12 which drives the LEDs 11 a and 11 b in accordance with instructions from the information processor 20; a detector 13 which drives the PD 11 c and generates a detection signal in correspondence with the intensity of reflected light; and an A/D converter 14 which converts the detection signal from the detector 13 into digital data**. Sakai at 5:04-24 **The information processor 20 has an operation detector 21 which detects an operation made with an operation button 3a; a communication controller 22 which detects cable connection with and disconnection from the connector 3f and controls communication with an external device via the cable connected to the connector 3f; a voltage detector 23 which detects a voltage of the battery 15; a microcomputer 24 which performs processing for generating barometers from biological information detected by the information detection unit 10**, monitoring of battery voltage via the voltage detector 23, communication processing for communication with the external device via the communication controller 22; a storage unit 25 which holds the biological information detected by the information detection unit 10 and various information generated by the microcomputer 24 based on the biological information; and a display controller 26 which displays characters and figures on the display panel 3 b and turns on and off the LEDs 3 c and 3 d in accordance with instructions from the microcomputer 24. Sakai at 6:10-28 Next, **an algorithm used in calculation of barometers such as body motion, pulse, autonomic nervous function, motion pitch, and the like from biological information (sampling data of pulse detection signal and body motion detection signal) in the normal monitor processing at Step S320, the motion monitor processing at Step S380, and the sleep monitor processing at Step S420 will be described**.

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	First, as **the body motion, an amplitude value of body motion detection signal or an amplitude value of differential waveform of body motion signal (e.g., mean or accumulated value by 1 second) is obtained**. Then the occurrence and nonoccurrence of the body motion and the magnitude of body motion are obtained from the amplitude value and the number of zero-level crossings of the body motion detection signal is counted (so-called zero-crossing method), and the frequency of body motion is obtained from the count value. **The pulse is obtained by performing FFT (Fast Fourier Transform) processing on the pulse wave detection signal and the body motion detection signal and by thereby specifying a component having a maximum peak (pulse component) from the FFT result of the pulse wave detection signal. Note that in a case where body motion occurs, a body motion component is specified from the FFT result of the body motion detection signal, and the body motion component is eliminated from the FFT result of the pulse wave detection signal**. Note that **upon execution of FFT processing, zero addition (adding virtual data having a value of zero to actual data thereby increasing the number of data before FFT processing) as a well-known technique for improvement in frequency resolution and reduction of response time (time required for data accumulation) may be performed**. **The motion pitch is obtained by specifying the body motion component from the FFT result of the body motion detection signal**. In a case where the frequency peak (fundamental or harmonic wave) of the specified body motion component is clear, the motion pitch is obtained from the frequency of the body motion component on the assumption that the body motion is caused by steady state motion such as jogging. Sakai at 11:44-12:25 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of the reference and its incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ Invalidity Contentions. Rather than repeat those disclosures here, they are incorporated by reference into this chart. To the extent this limitation is not disclosed by Sakai, it would have been obvious to one of ordinary skill in the art to combine, with the teachings of Sakai, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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Claim 12	
12. The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	Sakai discloses or renders obvious wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. *See* claim 5. FIG. 3  Sakai at Fig.3 FIG. 3 is a block diagram showing the construction of the monitor 1. **As shown in FIG. 3, the monitor 1 has an information detection unit 10 which emits light via the detection window 3 e and receives reflected light to thereby detect biological information; an information processor 20 which processes the biological information detected by the information detection unit 10**; and a battery 15 chargeable via the cable connected to the connector 3 f, which supplies power to the respective elements of the apparatus.

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	The information detection unit 10 has an optical pulse wave and body motion sensor 11 having a green LED 11 a to emit green light (in the present embodiment, the wavelength is about 520 nm), an infrared LED 11 b to emit infrared light (in the present embodiment, the wavelength is about 950 nm), and a photo diode (PD) 11 c to receive reflected light from the LEDs 11 a and 11 b; a driver 12 which drives the LEDs 11 a and 11 b in accordance with instructions from the information processor 20; a detector 13 which drives the PD 11 c and generates a detection signal in correspondence with the intensity of reflected light; and an A/D converter 14 which converts the detection signal from the detector 13 into digital data. Sakai at 5:04-24 Further, **an apparatus using an optical pulse wave sensor to emit two types of lights having different wavelengths is known (e.g., see JP-H7-88092 A (U.S. Pat. No. 6,022,321)). The apparatus discriminates a pulse component from a body motion component and detects exercise intensity of the living body or the like, from a ratio and the change of rate between amplitudes of peak frequency components included in the respective detection signals. The detection signals are detected using the lights having different wavelengths.** Here, two facts are utilized, i.e, the first fact that the light absorption characteristic of blood component changes in correspondence with light wavelength, and the second fact that the motion of living body influences blood flow rate. Sakai at 16:03-15 **The information detection unit 1010 has an optical pulse wave sensor 1011 having a green LED 1011a to emit green light (in the present embodiment, the wavelength is about 520 nm), an infrared LED 1011b to emit infrared light (in the present embodiment, the wavelength is about 950 nm),** and a photo diode (PD) 1011c to receive reflected light from the LEDs 1011a and 1011b; a driver 1012 which drives the LEDs 1011a and 1011b in accordance with instructions from the information processor 1020; a detector 1013 which drives the PD1011c and generates a detection signal in correspondence with the intensity of reflected light; and an A/D converter 1014 which converts the detection signal from the detector 1013 into digital data. Sakai at 17:12-24

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