

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

WILLOW LABORATORIES, INC.,
Patent Owner.

Case IPR2024-00296
U.S. Patent 10,984,911

DECLARATION OF VIJAY K. MADISETTI, PH.D.

I declare under penalty of perjury that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true.

I reserve the right to supplement my opinions in the future to respond to any arguments or positions Apple may raise, taking account of new information as it becomes available to me.

Dated: 10/16/24

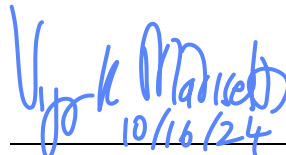

10/16/24
Vijay K. Madiseti, Ph.D.

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I, Vijay K. Madiseti, Ph.D., declare as follows:

1. I have been retained by Knobbe, Martens, Olson & Bear, LLP, counsel for Patent Owner Masimo Corporation (“Masimo”). I am making this declaration at the request of Masimo in the matter of *Inter Partes* Review No. IPR2024-00296, which concerns Claims 1-4, 6, 8, 10-13, 15, 17, 19-21, 23-26, and 28 of U.S. Patent No. 10,984,911 (“the ’911 Patent”). I understand that Apple’s Apple Watch Series 6, 7, 8, 9, Ultra, and Ultra 2 are accused by Masimo of infringing Claims 2-4, 8, 20, 21, 24, and 25 of the ’911 Patent in the parties’ parallel litigation in the United States District Court for the District of Delaware (Case No. 22-1378, the “Delaware Litigation” or the “District Court”). I understand that this Declaration is being submitted in this proceeding (IPR2024-00296) as Exhibit 2079.

2. I am being compensated for my work in this matter at my standard hourly rate for expert consulting services. My compensation in no way depends on the outcome of this proceeding. I have no financial interest in any of the parties to these matters.

I. INFORMATION AND MATERIALS CONSIDERED

3. Below is a listing of documents and materials that I considered and reviewed in connection with providing this declaration. In forming my opinions, I have reviewed and considered at least the following materials in preparing this Declaration:

- The '911 Patent, including its claims, specification, and file history;
- Apple's Petition and the declaration of Dr. Kenny (Ex. 1003) in support of Apple's Petition;
- The references Apple relies on in its Petition, including but not limited to Abdul-Hafiz (Ex. 1004), Raley (Ex. 1005), Secker (Ex. 1006), Jarman, (Ex. 1007), Barthelemy (Ex. 1008), Parker (Ex. 1009), Aoyagi (Ex. 1010), Webster (Ex. 1011), Kuenster Ex. 1012);
- Apple's complaints from the Delaware Litigation (Ex. 1062, Ex. 1063) and Masimo's counterclaims in the Delaware Litigation (Ex. 1064);
- Apple's stipulation (Ex. 1066);
- An excerpt of the November 22, 2023 Expert Report of Steven Warren (Apple's District Court invalidity expert) from the Delaware Litigation (Ex. 1068);
- The order granting certain of Masimo's patent infringement counterclaims from the Delaware Litigation (Ex. 1069);
- Any materials referenced directly or indirectly in my Declaration; and
- The information and materials identified in the following table:

Exhibit	Description
2001	<i>Curriculum Vitae</i> of Vijay K. Madiseti
2003	Commission Opinion (Public), <i>Certain Light-Based Physiological Measurement Devices and Components Thereof</i> , Inv. No. 337-TA-1276, EDIS No. 808521 (ITC Oct. 26, 2023)
2004	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01271, Paper 15 (PTAB Jan. 24, 2023)
2005	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01272, Paper 16 (PTAB Jan. 24, 2023)
2006	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01273, Paper 15 (PTAB Jan. 24, 2023)
2007	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01274, Paper 15 (PTAB Jan. 24, 2023)
2008	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01275, Paper 15 (PTAB Jan. 30, 2023)
2009	Decision Denying Institution of <i>Inter Partes</i> Review, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01276, Paper 15 (PTAB Jan. 30, 2023)
2013	Original Scheduling Order, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del. May 25, 2023), D.I. 92
2014	Amended Scheduling Order, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del. Sept. 21, 2023), D.I. 359
2018	Transcript of September 14, 2023 Markman Hearing, <i>Apple Inc. v. Masimo Corp.</i> , Nos. 22-cv-1377-MN-JLH, 22-cv-1378-MN-JLH

Exhibit	Description
2019	Aaron Tilley, <i>The Entrepreneur Who Bet His Company on a Fight With Apple</i> , Wall Street J., Dec. 30, 2023, https://www.wsj.com/tech/joe-kiani-entrepreneur-apple-warning-52eb09a9
2028	Correspondence from counsel for Apple to counsel for Masimo regarding Apple's prior art grounds in the Delaware Litigation, dated November 16, 2023
2029	Revised and Corrected Transcript of June 6, 2022 Hearing Open Sessions, <i>Certain Light-Based Physiological Measurement Devices and Components Thereof</i> , Inv. No. 337-TA-1276 (ITC).
2030	Excerpts of November 8, 2023 Deposition of Mohamed Diab, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2031	Joint Claim Construction Brief Regarding Masimo Asserted Patents, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-01378-MN-JLH (D. Del. Aug. 31, 2023), D.I. 295
2032	Excerpts of December 15, 2023 Rebuttal Expert Report of Steven Warren (Public), <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2033	Exhibit E-5 to Apple's June 8, 2023 Initial Invalidity Contentions based on Abdul-Hafiz (U.S. Patent Appl. Pub. No. 2004/0039272, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2034	Exhibit E-10 to Apple's June 8, 2023 Initial Invalidity Contentions, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2035	Exhibit E-8 to Apple's June 8, 2023 Initial Invalidity Contentions based on Masimo SET System, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2036	Excerpts of Masimo's September 7, 2023 Responses to Apple Inc.'s Final Invalidity Contentions, <i>Apple Inc. v. Masimo</i>

Exhibit	Description
	<i>Corp.</i> , No. 22-1378-MN-JLH (D. Del.)
2037	Photographs produced by Apple as APL_DEL04011694-695, APL_DEL04011703-704, APL_DEL04011718-719, APL_DEL04011721, APL_DEL04011734, APL_DEL04011827, APL_DEL04011833, APL_DEL04011842
2038	Masimo LNOP & NR SpO ₂ adhesive & reusable sensors brochure, dated 2003, produced by Apple as APL_DEL00037755-756
2039	Photograph produced by Apple as APL_DEL04011705
2040	Photograph produced by Apple as APL_DEL04011717
2041	Excerpt of Datex-Ohmeda 3800 Pulse Oximeter TruTrak [®] + User's Manual, Datex-Ohmeda (Oct. 2002)
2042	U.S. Patent No. 7,096,054 (previously published as Abdul-Hafiz – U.S. Patent Publ. No. 2004/0039272)
2043	Masimo Patent Information, https://professional.masimo.com/company/masimo/patents/ (last visited Mar. 22, 2024)
2044	Photograph produced by Apple as APL_DEL04011734
2045	Photograph produced by Apple as APL_DEL04011735
2046	<i>Masimo Corporation Announces Masimo Rainbow SET, the World's First Pulse CO-Oximeter</i> , Masimo (Mar. 1, 2005), https://professional.masimo.com/company/news/news-media/2005#news-90640ab1-c7ae-4b6f-903a-d1faabe003c6
2047	Steven J. Barker et al., <i>Measurement of Carboxyhemoglobin and Methemoglobin by Pulse Oximetry: A Human Volunteer Study</i> , 105 <i>Anesthesiology</i> 892 (2006)
2048	Mike McEvoy, <i>Non-invasive Screening for CO and MET</i> , EMS1 (Jan. 29, 2009), https://www.ems1.com/ems-

Exhibit	Description
	products/co-screening/articles/non-invasive-screening-for-co-and-met-rW7fnwZeumUrE2P4/
2049	Selim Suner and John McMurdy, <i>Masimo Rad-57 Pulse CO-Oximeter™ for noninvasive carboxyhemoglobin measurement</i> , 6 Expert Rev. Med. Devices 125 (2009)
2050	Recordation of Merger Conveying Patents (including Ex. 1007) from Ohmeda, Inc. to Datex-Ohmeda, Inc.
2051	U.S. Patent No. 7,277,741
2052	U.S. Patent No. 9,341,565
2053	Datex-Ohmeda CardiCap™/5 Technical Reference Manual, Datex-Ohmeda (2d ed. May 9, 2007)
2054	Excerpts of Apple Watch photographs produced by Masimo as MASITC_01398584-621
2055	Excerpts of Apple Watch photographs produced by Masimo as MASITC_01402291-294
2056	Rimantas P. Buinevicius, <i>A Three-Wavelength Pulse Oximeter for Carboxyhemoglobin Determination</i> , University of Wisconsin-Madison Master of Science Thesis (1987)
2057	Jim Welch, 39 <i>The Fundamentals of Pulse Oximeters</i> , Biomedical Instrumentation & Tech. 125 (2005)
2058	Disposable Pulse Oximeter Sensors, Curbell Medical (2022)
2059	Rad-57 Operator's Manual, Masimo (2006)
2060	John Feiner et al., <i>Accuracy of Carboxyhemoglobin Detection by Pulse CO-Oximeter During Hypoxemia</i> , 117 <i>Anesthesia & Analgesia</i> 847 (2013)
2061	Masimo Signal Extraction Technology brochure, dated 2001, produced by Apple as APL_DEL00037764-771

Exhibit	Description
2062	Masimo Signal Extraction Technology Technical Bulletin, dated 2001, produced by Apple as APL_DEL00037757-763
2063	Excerpt of Datex-Ohmeda S/5™ M-Modules Technical Reference Manual, Datex-Ohmeda (June 2005)
2064	Excerpt of Defendant Masimo Corp.'s Letter Brief (Public) Regarding Cross-Use, <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del. Mar. 13, 2024), D.I. 621
2065	Excerpt of Transcript of March 20, 2024 Hearing, <i>Apple Inc. v. Masimo Corp.</i> , Nos. 22-cv-1377-MN-JLH, 22-cv-1378-MN-JLH
2066	Excerpt of correspondence between counsel for Apple in Delaware Litigation and counsel for Masimo regarding cross-use of Apple information in IPRs, dated March 27, 2024
2067	U.S. Patent No. 7,272,425
2068	<i>Unimed Medical Disposable SpO2 Sensor, Your Priority Choice!</i> , Unimed (Sept. 18, 2021), https://www.unimed.cn/blogs/news/unimed-medical-disposable-spo2-sensor-your-priority-choice
2069	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01271, Paper 10 (PTAB Oct. 26, 2022)
2070	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01272, Paper 11 (PTAB Oct. 26, 2022)
2071	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01273, Paper 10 (PTAB Nov. 4, 2022)
2072	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01274, Paper 10 (PTAB Nov. 4, 2022)
2073	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01275, Paper 10 (PTAB Nov. 4, 2022)

Exhibit	Description
2074	Patent Owner Preliminary Response, <i>Apple Inc. v. Masimo Corp.</i> , IPR2022-01276, Paper 10 (PTAB Nov. 4, 2022)
2075	<i>Apple Watch Series 6</i> , Apple (last visited Dec. 28, 2020), produced by Masimo at MASITC_00918307-327
2076	<i>Apple Watch Series 6 delivers breakthrough wellness and fitness capabilities</i> , Apple (Sept. 15, 2020), https://www.apple.com/newsroom/2020/09/apple-watch-series-6-delivers-breakthrough-wellness-and-fitness-capabilities/ , produced by Apple at APL_MAS_ITC_00310976-989
2077	Apple Watch Series 6 Video
2078	Apple Watch Series 6 “It Already Does That” Commercial
2080	Deposition Transcript of Thomas Kenny, Ph.D.
2081	Additional Excerpt of December 15, 2023 Rebuttal Expert Report of Steven Warren (Public), <i>Apple Inc. v. Masimo Corp.</i> , No. 22-1378-MN-JLH (D. Del.)

4. In preparing this Declaration, I have considered my own knowledge and experience, including my work in the fields of electrical and computer engineering; my experience teaching within those subjects; my experience working with others involved in those fields; and the materials identified herein. I understand my analyses and opinions, including my review of any materials cited herein, should be made from the perspective of one of ordinary skill in the art related to the '911 Patent at the relevant time (i.e., a “POSITA”). I understand the relevant time is March 1, 2005, as I have explained more below in Section V. Accordingly, my

analyses and opinions are made from that relevant perspective. My testimony herein refers to the knowledge of a person of ordinary skill in the art as of March 1, 2005, unless indicated otherwise.

5. Any figures appearing in this Declaration were prepared with the assistance of counsel and reflect my understanding of the '911 Patent and the materials discussed herein. All annotations, coloring, and emphases have been added unless indicated otherwise.

II. EXPERIENCE AND QUALIFICATIONS

6. My qualifications are set forth in my curriculum vitae, a copy of which is included as Exhibit 2001. A summary of my qualifications follows.

7. I am a tenured full professor in the Colleges of Computing and Engineering at the Georgia Institute of Technology ("Georgia Tech"). I have worked in the area of digital signal processing, wireless communications, computer engineering, integrated circuit design, and software engineering for over 25 years, and have authored, co-authored, or edited several books and numerous peer-reviewed technical papers in these areas.

8. I obtained my Ph.D. in Electrical Engineering and Computer Science at the University of California, Berkeley, in 1989. While there, I received the Demetri Angelakos Outstanding Graduate Student Award and the IEEE/ACM Ira M. Kay Memorial Paper Prize.

9. I joined Georgia Tech in the Fall of 1989 and am now a tenured full professor in the Colleges of Computing and Engineering at Georgia Tech. Among other things, I have been active in the areas of digital signal processing, wireless communications, integrated circuit design (analog & digital), system-level design methodologies and tools, and software engineering. I have been the principal investigator (“PI”) or co-PI in several active research programs in these areas, including DARPA’s Rapid Prototyping of Application Specific Signal Processors, the State of Georgia’s Yamacraw Initiative, the United States Army’s Federated Sensors Laboratory Program, and the United States Air Force Electronics Parts Obsolescence Initiative. I have received an IBM Faculty Award and NSF’s Research Initiation Award. I have been awarded the 2006 Frederick Emmons Terman Medal by the American Society of Engineering Education for contributions to Electrical Engineering, including authoring a widely used textbook in the design of VLSI digital signal processors.

10. During the past 20 years at Georgia Tech, I have created and taught undergraduate and graduate courses in hardware and software design for signal processing, computer engineering (software and hardware systems), computer engineering and wireless communication circuits.

11. I have been involved in research and technology in the area of digital signal processing since the late 1980s. I am also the Editor-in-Chief of the CRC Press's 3-volume Digital Signal Processing Handbook (1998, 2010).

12. I have founded three companies in the areas of signal processing, embedded software, military chipsets involving imaging technology, and software for computing and communications systems. I have supervised the Ph.D. dissertations of over twenty engineers in the areas of computer engineering, signal processing, communications, rapid prototyping, and system-level design methodology.

13. I have designed several specialized computer and communication systems over the past two decades at Georgia Tech for tasks such as wireless audio and video processing and protocol processing for portable platforms, such as cell phones and PDAs. I have designed systems that are efficient in view of performance, size, weight, area, and thermal considerations. I have developed courses and classes for industry on these topics, and many of my lectures in advanced computer system design, developed under the sponsorship of the United States Department of Defense in the late 1990s, are available for educational use at <http://www.eda.org/rassp> and have been used by several U.S. and international universities as part of their course work. Some of my recent publications in the area of design of computer engineering

and wireless communications systems and associated protocols are listed in Exhibit 2001.

14. In the mid 2006-2007 timeframe, I collaborated with Professor John Scharf and his colleagues at Emory Healthcare system in developing FFT-based pulse oximetry system prototypes on FPGAs, which extended technologies developed by Prof. Scharf and his colleagues from the 1996 timeframe. *See* T. Rusch, R. Sankar, J. Scharf, “Signal Processing Methods for Pulse Oximetry”, *Comput. Bio. Med.*, Vol. 26, No. 2, 1996. Some of my more recent publications in the area of biological signal processing and bioinformatics are listed in my CV and include, A. Bahga, V. Madiseti, “Healthcare Data Integration and Informatics in the Cloud”, *IEEE Computer*, Vol. 48, Issue 2, 2015, and “Cloud-Based Information Integration Informatics Framework for Healthcare Applications”, *IEEE Computer*, Issue 99, 2013. In addition to my signal processing experience specific to pulse oximetry, I also have experience in developing systems for other physiological signals. Beginning in the early 1990s, I worked, in particular, with ECG/EKG signals, and, in general, with biomedical signals and systems.

15. In addition to my signal processing experience specific to pulse oximetry, I also have experience in developing algorithms and systems for other physiological signals. I worked with ECG/EKG signals in particular, and biomedical signals and systems in general, beginning in the early 1990s. In particular, I worked

with graduate student Dr. Shahram Famorzadeh, in 1990 and 1991, to analyze and apply pattern recognition (a category of signal processing algorithms that is based on correlation with a set of templates) to ECG/EKG waveforms to identify physiological conditions.

16. I have experience with biomedical signals and devices in the field of speech and image processing since the late 1980s. I worked on deconvolution algorithms to recover the state of the system based on observed measurements of the physiological signals in the 1993-1998 timeframe. These signal processing techniques can be applied to pulse oximetry signals. I have been working with these techniques since the mid-1980s.

17. I have studied, researched, and published in the area of adaptive filter signal processing for noise reduction and signal prediction, using correlation-based approaches since the mid-1980s, both in the time-domain and frequency domain, and also to ray-tracing applications, such as Seismic Migration for oil and shale gas exploration. *See, e.g.,* V. Madisetti & D. Messerschmitt, Dynamically Reduced Complexity Implementation of Echo Cancellers, IEEE International Conference on Speech, Acoustics and Signal Processing, ICASSP 1986, Tokyo, Japan, and M. Romdhane and V. Madisetti, “All-Digital Oversampled Front-End Sensors” IEEE Signal Processing Letters, Vol. 3, Issue 2, 1996, and “LMSGEN: A Prototyping

Environment for Programmable Adaptive Digital Filters in VLSI”, VLSI Signal processing, pp. 33-42, 1994.

18. Deconvolution of symmetric (seismic) and asymmetric (pulse oximetry) signals has gained much importance in the past two decades. Some of my early work on “Homomorphic Deconvolution of Bandpass Signals” in IEEE Transactions on Signal Processing, October 1997, established several new methods for deconvolution of such signals that had several advantages of robustness, increased accuracy, and simplicity.

19. In the past decade I have authored several peer-reviewed papers in the area of computer systems, instruments, and software design, and these include:

- V. Madiseti, et al., “The Georgia Tech Digital Signal Multiprocessor”, IEEE Transactions on Signal Processing, Vol. 41, No. 7, July 1993.
- V. Madiseti et al., “Rapid Prototyping on the Georgia Tech Digital Signal Multiprocessor”, IEEE Transactions on Signal Processing, Vol. 42, March 1994.
- V. Madiseti, “Reengineering legacy embedded systems”, IEEE Design & Test of Computers, Vol. 16, Issue 2, 1999.
- V. Madiseti et al., “Virtual Prototyping of Embedded Microcontroller-based DSP Systems”, IEEE Micro, Vol. 15, Issue 5, 1995.

- V. Madiseti, et al., “Incorporating Cost Modeling in Embedded-System Design”, IEEE Design & Test of Computers, Vol. 14, Issue 3, 1997.
- V. Madiseti, et al., “Conceptual Prototyping of Scalable Embedded DSP Systems”, IEEE Design & Test of Computers, Vol. 13, Issue 3, 1996.
- V. Madiseti, Electronic System, Platform & Package Codesign,” IEEE Design & Test of Computers, Vol. 23, Issue 3, June 2006.
- V. Madiseti, et al., “A Dynamic Resource Management and Scheduling Environment for Embedded Multimedia and Communications Platforms”, IEEE Embedded Systems Letters, Vol. 3, Issue 1, 2011.

20. I have been active in the areas of signal processing systems and mobile device communication systems for several years. Some of my publications in this area include “Frequency Dependent Space-Interleaving of MIMO OFDM Systems” Proc. of IEEE Radio and Wireless Conference (RAWCON '03), 2003, “Embedded Alamouti Space Time Codes for High Rate and Low Decoding Complexity”, Proc. IEEE Asilomar Conf. on Signals, Systems, and Computers, 2008; and “Asymmetric Golden Codes for Fast Decoding in Time Varying Channels”, Wireless Personal Communications (2011).

21. Above, I have provided a short summary of my education and experience that I believe is most relevant to the analyses and opinions I have

expressed in this Declaration. A copy of my curriculum vitae, which describes in further detail my qualifications, responsibilities, employment history, honors, awards, professional associations, presentations, publications, and patents is included as Exhibit 2001.

III. APPLICABLE LEGAL STANDARDS

22. I am an electrical and computer engineer by training and profession. The opinions I express in this Declaration involve the application of my knowledge and experience to the evaluation of the '911 Patent and certain prior art to the '911 Patent.

23. Although I have been involved as a technical expert in patent matters before, I am not an expert in patent law and offer no legal conclusions. I have been advised of certain principles of patent law applicable in this matter, which I have used in arriving at my determinations and opinions. The paragraphs below express my understanding of the legal requirements I have used in forming my opinions.

A. Level Of Ordinary Skill In The Relevant Art

24. I understand that certain issues in an IPR, such as claim construction and whether a claim is invalid as obvious, are assessed from the view of a hypothetical person of ordinary skill in the relevant art at the time of the invention. I understand there are multiple factors relevant to determining the level of ordinary skill in the art, including (1) the level of education and experience of persons working

in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems. I understand that this hypothetical person of ordinary skill is presumed to have had knowledge from the teachings of the prior art.

25. I discuss the asserted level of skill further below, in Section V of this declaration.

B. Claim Construction

26. I understand that claim construction in an IPR is a legal question for the Board to decide. I also understand, however, that in construing claim terms, the Board asks what the terms would mean to a person of ordinary skill in the relevant art in view of the disclosures in the patent and the prosecution history of the patent. I understand that the Board may also consider external evidence, such as dictionaries. In general, however, I understand that claim terms are given the plain and ordinary meaning one of ordinary skill in the relevant art would apply to them in the context of the patent at the time the patent was filed.

C. Obviousness

27. I understand that a claim is unpatentable as “obvious” under 35 U.S.C. § 103 if the claimed subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time of the invention. I also understand that an obviousness analysis takes into account the following factors, which are

sometimes referred to as the Graham factors: (1) the scope and content of the prior art, (2) the differences between the claimed subject matter and the prior art, (3) the level of ordinary skill in the art at the time of the invention, and (4) “objective indicia of nonobviousness,” also referred to as secondary considerations of nonobviousness.

I understand that these objective indicia include considerations such as whether there was: (i) any unexpected result(s); (ii) skepticism of the invention; (iii) a teaching away from the invention; (iv) failure of others to find the solution(s) provided by the claimed invention; (v) copying by other companies; (vi) commercial success due to the merits of the claimed invention; (vii) praise by others for the invention; and (viii) a long-felt need in the industry for the claimed invention. I understand that objective indicia of nonobviousness, if available, must be considered as part of the obviousness analysis.

28. In determining the scope and content of the prior art, it is my understanding that a reference is considered appropriate prior art if it falls within the field of the inventor’s endeavor. In addition, a reference is appropriate prior art if it is reasonably pertinent to the particular problem with which the inventor was involved. A reference is reasonably pertinent if it logically would have commended itself to an inventor’s attention in considering his or her problem. If a reference relates to the same problem as the claimed invention, that supports use of the reference as prior art in an obviousness analysis.

29. To assess the differences between prior art and the claimed subject matter, it is my understanding that 35 U.S.C. § 103 requires the claimed invention to be considered as a whole. This “as a whole” assessment requires showing that a person of ordinary skill in the art at the time of invention, confronted by the same problems as the inventor and with no knowledge of the claimed invention, would have selected the elements from the prior art and combined them in the claimed manner.

30. It is my further understanding that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; a predictable use of prior art elements according to their established functions; applying a known technique to a known device (method or product) ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

31. I understand that the obviousness analysis must be performed from the perspective of a person of ordinary skill in the art at the time of the alleged invention. I understand this requirement is to help avoid using impermissible hindsight in the analysis. I further understand that the claims of the patent-at-issue must not be used to provide a road map for obviousness; instead, the claims would have been obvious only if a person of ordinary skill in the art, without knowledge of the patent-at-issue, would have been motivated to combine the teachings of the prior art to arrive at the claimed invention and had a reasonable expectation of success in doing so.

32. I understand that an assessment of what a reference discloses or teaches—for purposes of an anticipation analysis or an obviousness analysis—must be conducted from the perspective of a person of ordinary skill in the art at the time of the invention. In other words, a reference discloses or teaches a claim limitation if a person of ordinary skill in the art would, at the relevant time, interpret the reference as expressly, implicitly, or inherently disclosing the claim limitation. I further understand that a reference does not need to use the exact language of the claim to disclose a claim limitation. I also understand that something is only “inherent in,” and therefore taught by, the prior art if it necessarily flows from the explicit disclosure of the prior art. I understand the fact that a certain result or characteristic may be present in the prior art is not sufficient to establish inherency.

33. I also understand that the prior art used in an anticipation or obviousness analysis must enable a skilled artisan to make and use the claimed invention without undue experimentation.

34. Applying these legal standards to the challenged claims of the '911 Patent, I believe the challenged claims would not have been obvious to a person of ordinary skill in the art based on the ground asserted by Apple in its Petition, as discussed below.

IV. SUMMARY OF OPINIONS

35. I have conducted analyses leading to the opinions expressed in this Declaration. It is my conclusion, from a technical point of view, that the challenged claims of the '911 Patent (Claims 1-4, 6, 8, 10-13, 15, 17, 19-21, 23-26, and 28) would not have been obvious to a person of ordinary skill in the art based on the grounds asserted by Apple in its Petition. To summarize my opinions, it is my opinion that:

- (Ground 1A) Claims 1, 6, 8, 10, 15, 17, 19-21, 26, and 28 of the '911 Patent would not have been obvious to a person of ordinary skill in the art based on Abdul-Hafiz and Raley; and
- (Ground 1B) Claims 2-4, 11-13, and 23-25 of the '911 Patent would not have been obvious to a person of ordinary skill in the art based on Abdul-Hafiz, Raley, and Secker.

36. Below, I provide the complete analyses supporting my opinions.

V. LEVEL OF ORDINARY SKILL IN THE ART

37. It is my opinion that a person of ordinary skill in the art at the time of the '911 Patent would be a person with a working knowledge of physiological monitoring technologies and/or optical sensors used in physiological monitoring technologies. The person would have had a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, software, or optical technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information, or designing and using optical sensors or systems, including but not limited to physiological monitoring technologies. Alternatively, the person could have had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline.

38. Apple asserts that:

A person of ordinary skill in the art at the time of the '911 patent ("POSITA") would have had at least a Bachelor of Science in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field, with at least one to two years of relevant work experience with capture and processing of data or information including but not limited to physiological information, or equivalents thereof.

Petition, 7. Alternatively, Apple asserts "[s]uperior education could compensate for a deficiency in work experience, and vice-versa." *Id.*

39. Dr. Kenny states that he applies the same level of skill in his analysis:

a person of ordinary skill in the art relating to the subject matter of the '911 Patent as of March 1, 2005 ("POSITA" or "one of ordinary skill") would have had a Bachelor of Science degree in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field, with at least one to two years of relevant work experience with capture and processing of data or information including but not limited to physiological information, or equivalents thereof. A greater amount of education, *i.e.*, a doctorate in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field would also qualify for the hypothetical person of ordinary skill in the art in lieu of fewer years of work experience. Additional education or industry experience may compensate for a deficit in one of the other aspects of the requirements stated above.

Ex. 1003 ¶22.

40. I note that Apple's asserted level of skill (1) requires no coursework, training or experience with optics or optical physiological monitors; (2) requires no coursework, training or experience in physiology; and (3) focuses on data capture and processing and not optical sensor design. Petition, 7. Therefore, I believe my proposed definition of the level of skill in the art is more accurate.

41. Further, in his analysis, Apple's expert, Dr. Kenny, assumes that a person of skill in the art would have had a particular understanding or capabilities because he or she had "already developed a system such as described by Abdul-Hafiz." Ex. 1003 ¶42. However, Abdul-Hafiz is a pulse oximetry system, which is something that Dr. Kenny admitted he has not published on or developed. Ex. 2080, 151:19-152:6. Therefore, Dr. Kenny does not have the level of understanding or

capability that his declaration presumes a person of ordinary skill in the art “already” would have had before attempting to modify Abdul-Hafiz.

42. Additionally, I understand that Masimo and Apple do not argue that the level of ordinary skill in the art affects the patentability of the claims challenged in this proceeding. My opinions herein remain the same, regardless of which definition of the level of skill in the art is applied.

43. I understand that the level of ordinary skill in the art for the ’911 Patent is measured as of its March 1, 2005 priority date. My analysis herein is therefore made from the perspective of one of ordinary skill in the art as of that relevant time. Dr. Kenny acknowledges, and never disputes, the March 1, 2005 priority date of the ’911 Patent and used that date in his analysis. Ex. 1003 ¶17; Ex. 2080, 15:17-21. I do not offer any opinions regarding priority in this declaration.

VI. THE ’911 PATENT

A. Overview of the ’911 Patent

44. The ’911 Patent is entitled “Multiple Wavelength Sensor Emitters.” The claimed devices and methods noninvasively determine measurements of physiological parameters of the user, such as oxygen saturation and pulse rate. *See, e.g.,* ’911 Patent at 3:23-58, 5:34-51. The ’911 Patent explains:

FIG. 1 illustrates a physiological measurement system 10 having a monitor 100 and a multiple wavelength sensor assembly 200 with enhanced measurement capabilities as compared with conventional pulse oximetry. The physiological measurement system 10 allows the

monitoring of a person, including a patient. In particular, the multiple wavelength sensor assembly 200 allows the measurement of blood constituent and related parameters in addition to oxygen saturation and pulse rate. Alternatively, the multiple wavelength sensor assembly 200 allows the measurement of oxygen saturation and pulse rate with increased accuracy or robustness as compared with conventional pulse oximetry.

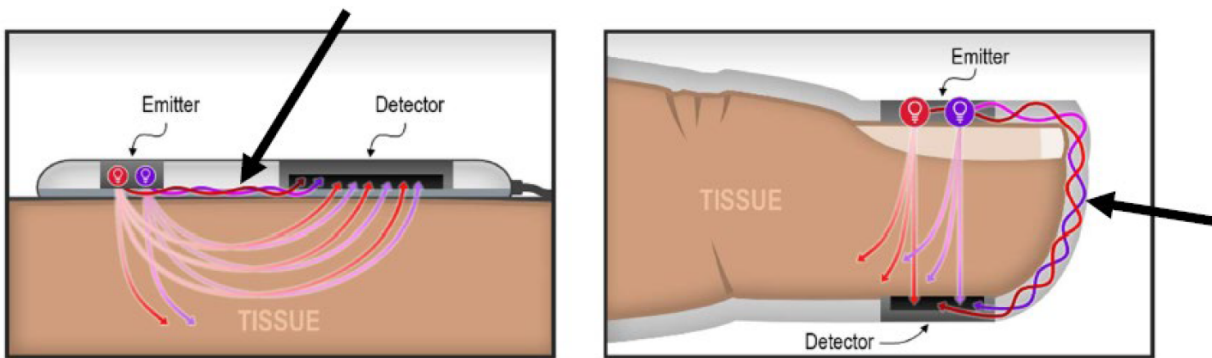
In one embodiment, the sensor assembly 200 is configured to plug into a monitor sensor port 110. Monitor keys 160 provide control over operating modes and alarms, to name a few. A display 170 provides readouts of measured parameters, such as oxygen saturation, pulse rate, HbCO and HbMet to name a few.

Id. at 5:34-51.

45. The claimed devices and systems are the result of research conducted by Ammar Al-Ali, Mohamed Diab, and their co-inventors into more accurately measuring multiple physiological parameters. *See, e.g.*, Ex. 2030, 122:1-129:3, 138:9-141:14. The sensor designs claimed in the '911 Patent include various features to measure physiological parameters more accurately in difficult conditions, such as for determining additional parameters and at various measurement locations, including “a finger,” “a foot,” “an ear,” or “a forehead or other tissue surface.” *See, e.g.*, '911 Patent at 5:66-6:3 (“various tissue sites other than a finger, such as a foot or an ear”), 6:42-55, 15:14-23, FIGS. 1, 32, 46, Claims 2-4, 8, 20, 21, 24, 25.

46. The claimed devices and methods determine multiple physiological parameters by utilizing at least three LEDs configured to emit light of at least three different wavelengths, and at least one detector configured to detect emitted light

after attenuation by the user's tissue. *See, e.g., id.* at Claims 1, 10, 19. The claimed devices and methods also include a light block that reduces light piping, which was a significant problem encountered by the inventors. *Id.*; Ex. 2030, 122:1-123:17, 126:7-128:21, 130:23-131:19, 227:18-230:1. As co-inventor Mohamed Diab explained, "[t]he ability to minimize light piping turned out to be extremely important." Ex. 2030 at 130:23-131:9; *see also id.* at 229:1-7 ("The light piping [mitigation] and the light block that we have used was quite critical because even the designs that we have right there did not work before for the ADT and the LNOP sensor. We had to go beyond that. That was another piece ... [that] directly impacted the accuracy."). Light piping occurs when light goes directly from a light source to a detector without first being attenuated by the user's tissue. *See, e.g., '911 Patent* at 6:45-47. The below figures depict (with black arrows) examples of light piping.



47. Light piping is a problem because light that reaches the detector without first being attenuated by the user's tissue provides no information about the parameters of the tissue being measured and thus leads to inaccuracy in noninvasive

physiological measurements. The devices and methods recited in the claims of the '911 Patent reduce light piping and improve measurement accuracy by including a light block formed at least partly of black material and having a top with only one opening or window through which light can reach the detector, with the area of the opening or window being smaller than the area of the detector. *See, e.g., '911 Patent* at Claims 1, 10, 20. The combinations of claimed features improve accuracy of physiological parameter measurements and provide the ability to measure difficult physiological parameters at numerous different measurement sites.

B. Independent Claims of the '911 Patent

48. The '911 Patent has three independent claims. They are Claims 1, 10, and 19. Some of the limitations at issue are included in Claim 1 of the '911 Patent, which recites:

1. A physiological monitoring device comprising:
 - at least three LEDs recessed into a cavity, the at least three LEDs configured to emit light of at least three different wavelengths;
 - at least one detector configured to detect at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has been attenuated by tissue, the at least one detector configured to output at least one signal responsive to the detected light;
 - a light block surrounding the at least one detector, the light block comprising a shoebox structure configured to recess the at least one detector into the shoebox structure, wherein the shoebox structure is at least partially formed of a black material, wherein a top of the shoebox structure includes only one opening through which light is configured to pass, the opening comprising an area smaller than a detection surface area of the at least one detector; and

a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signals.

Ex. 1001, Claim 1.

49. Independent Claims 1 and 10 (and their dependents—Claims 2-9 and 11-18) require an opening (or window) through which light is configured to pass to the detector that has an area *smaller* than the detection surface area of the detector. In my opinion, the Board’s institution decision correctly found that Apple fails to show that the asserted prior art discloses at least that requirement of Claims 1-18. Dr. Kenny applies the same combination of references against Claim 1 (Ex. 1003 ¶¶72-116), Claim 10 (*id.* ¶¶120-139), and Claim 19 (*id.* ¶¶140-148), as well as their relevant dependent claims. For Claims 10 and 19, Dr. Kenny primarily relies on and incorporates his analysis for Claim 1. *Id.* ¶¶120-123, 129-131, 135-136, 141-148. Accordingly, in analyzing the Petition and Dr. Kenny’s opinions, my analysis applies to each of Claims 1, 10, and 19 unless indicated otherwise.

VII. APPLE’S CITED REFERENCES

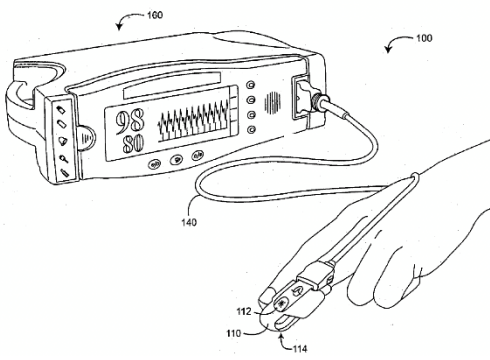
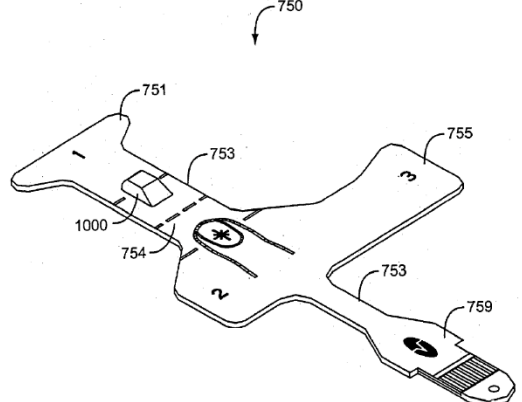
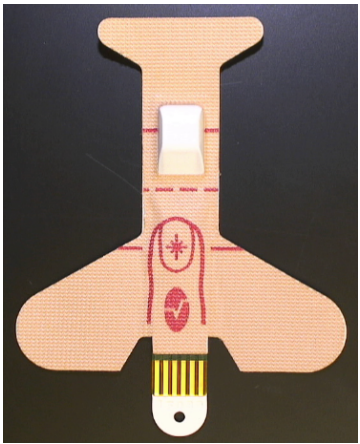
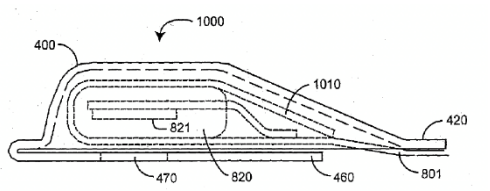
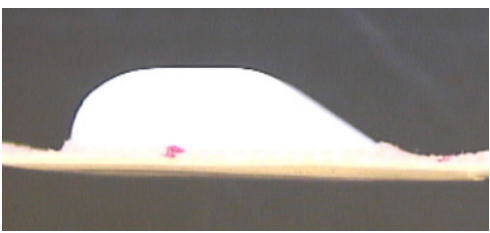
50. Apple’s Petition presents two grounds, Grounds 1A and 1B. In Ground 1A, Apple proposes modifying Abdul-Hafiz’s pulse oximeter (Ex. 1004) based on Raley (Ex. 1005). Petition, 1. Ground 1A challenges Claims 1, 6, 8, 10, 15, 17, 19-21, 26, and 28. *Id.* In Ground 1B, Apple proposes modifying the Abdul-

Hafiz + Raley sensor of Ground 1A based on Secker (Ex. 1006). *Id.* at 1. Ground 1B challenges Claims 2-4, 11-13, and 23-25. *Id.*

A. Abdul-Hafiz (U.S. Pat. Publ. No. 2004/0039272 – Ex. 1004)

51. Abdul-Hafiz is a Masimo patent publication titled “Low Noise Optical Housing.” Ex. 1004. Abdul-Hafiz relates to a shielded detector assembly (1000) for a transmission pulse oximetry system. *See, e.g., id.* ¶¶3-4. Abdul-Hafiz’s sensor has only two LEDs and only emits light of two wavelengths (“red and infrared”). Ex. 1004 ¶2.

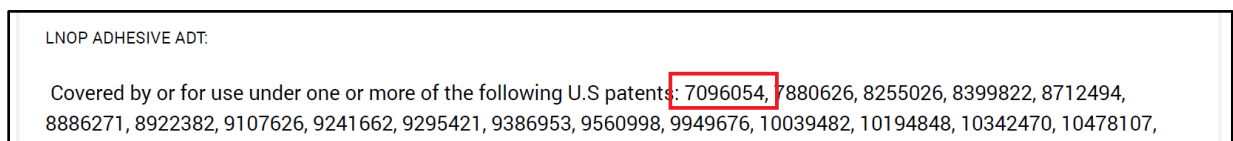
52. Abdul-Hafiz’s shielded detector assembly (1000) includes an optical housing (400), which has an aperture (470). *See, e.g., id.*, FIGS. 6-7, 10-11, ¶¶37-39, 41, 46. The optical housing (400) surrounds an EMI shield (1005, 1010), which in turn surrounds the detector (820). *Id.* The aperture (470) of the optical housing (400) allows light to reach the EMI shield, and the four square openings in the EMI shield (1005) allow light to reach the underlying detector. *Id.* Additionally, Apple’s primary reference, Abdul-Hafiz, describes Masimo’s LNOP (low noise optical probe) sensors, as shown below.

Abdul-Hafiz	Masimo LNOP
 Ex. 1004, FIG. 1	 Ex. 2038
 Ex. 1004, FIG. 7C	 Ex. 2039
	

Abdul-Hafiz	Masimo LNOP
Ex. 1004, FIG. 6A	Ex. 2040

I understand that Apple and its technical expert in the Delaware Litigation rely on the Masimo LNOP sensor (shown above) as a primary reference, and argue that the Masimo LNOP sensor is basically identical to the sensor of Abdul-Hafiz. Ex. 2035; Ex. 2037.

53. Additionally, I understand that Abdul-Hafiz was invented during Masimo’s development of its LNOP sensors, which embody Abdul-Hafiz’s claimed inventions. I also understand that Abdul-Hafiz (which itself is a patent publication) issued as U.S. Patent No. 7,096,054 (Ex. 2042) on August 22, 2006. And as shown below, Masimo’s patent marking website (Ex. 2043) confirms that the patent issuing from Abdul-Hafiz (U.S. Patent No. 7,096,054) covers the Masimo LNOP Adhesive ADT sensor, which is the sensor depicted in the above table.



Ex. 2043.

B. Raley (U.S. Pat. No. 6,014,576 – Ex. 1005)

54. Raley is a Datex-Ohmeda patent titled “Segmented Photoplethysmographic Sensor With Universal Probe-End.” Ex. 1005. Raley relates to a partially re-usable two-piece transmittance sensor. *See, e.g.*, Ex. 1005, 2:23-44.

Raley describes a reusable interconnect cable segment (20), connector (17), and disposable probe (10) and explains that “the reusable manufacturer specific interconnect cable can remain attached to the monitor with which it is being used until the reusable cable requires replacement.” *Id.*; *see id.*, 3:55-57.

55. Raley’s interconnect cable segment (20) removably attaches to a separate connector (17) that is secured to the substrate (12) of the disposable probe end (10), which is worn by the user. *Id.*, 5:27-38. The interconnect cable segment (20) contains emitters (21-24) that “may be [LEDs].” Ex. 1005, 3:63-4:3, 2:33-37.

56. Raley mentions physiological parameters beyond oxygen saturation, but does not enable measuring parameters such as carboxyhemoglobin or methemoglobin using only four wavelengths of light. *See, e.g., id.*, 3:33-36; *infra* Section IX.C.1. Raley speculates that:

[I]f the monitor 100 is capable of measuring a plurality of blood analyte concentrations such as O₂Hb, RHb, COHb and MetHB then plug 42 and interconnect 104 will contain sufficient electrical connectors 46 to interconnect probe interface 102 with a plurality of emitters 21, 22, 23 and 24 located in the connector-end 25 of interconnect cable segment 20.

Id., 3:59-65. Raley also contemplates what “new” developments “will” happen in the future, when it is possible to noninvasively measure other parameters like carboxyhemoglobin or methemoglobin:

Also, the types of photoplethysmographic [“PPG”] monitors continues to increase. One of the primary uses of photoplethysmography has been the monitoring of the oxygen saturation of a patient’s blood. However,

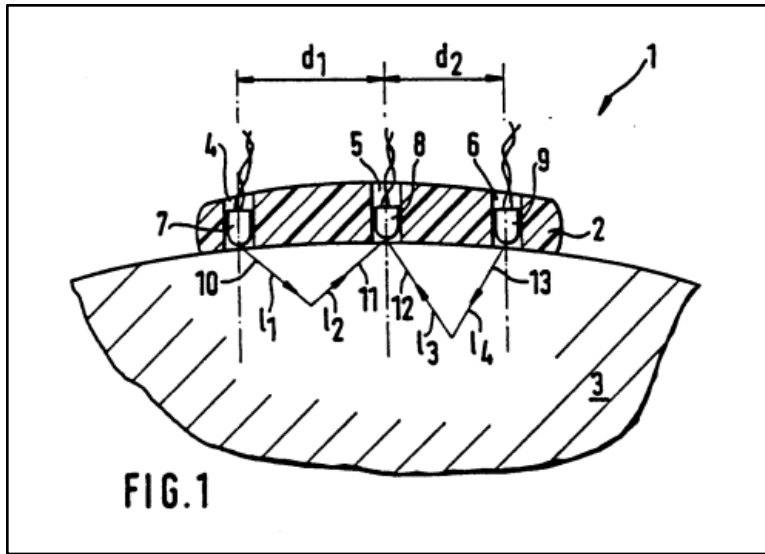
there is a desire to expand the use of photoplethysmography into the monitoring of additional blood analytes such as carboxyhemoglobin, methemoglobin and other dyshemoglobins. This proliferation of monitor types will add additional confusion in the health care environment due to the number of additional probe types which will be offered with these new monitors.

Id., 1:38-48. Overall, Raley assumes a scenario where a monitor “is capable of measuring a plurality of blood analyte concentrations” and speculates as to the impact such monitors “will” or “would” have in the future. *Id.*, 1:38-48, 3:59-65. This aspirational language of Raley is consistent with the inability of those of skill in the art at that time to measure any four of the physiological parameters mentioned in Raley using only four wavelengths of light. *Infra* Section IX.C.1.

C. Secker (U.S. Pat. No. 5,188,108 – Ex. 1006)

57. Secker is a patent titled “Sensor, Apparatus and Method for Non-Invasive Measurement of Oxygen Saturation.” Ex. 1006.

58. Secker concerns reflectance pulse oximeters. In a reflectance sensor, the light source and light detector are on the same side of the tissue, as shown in the example below:



Id., FIG. 1 (depicting reflectance pulse oximeter with two LEDs (7, 9) and one detector (8)), Abstract. Secker describes reflectance pulse oximetry sensors with two total wavelengths, namely, one or more LEDs of a “first wavelength” (e.g., infrared) and one or more LEDs of a “second wavelength” (e.g., red). *See, e.g., id.*, FIGS. 1-5, 8, Abstract, 3:7-27, 4:6-25, 11:58-66, 12:56-65, 13:4-22, 13:38-49, 14:29-40, 15:29-54, claims 1, 19, 36.

VIII. CLAIM CONSTRUCTION

59. I understand that in the parties’ parallel Delaware Litigation where Masimo has asserted the ’911 Patent, Apple asserted express claim constructions for several claim terms of the ’911 Patent: (1) a “cavity” is a “hollowed-out space” within a one-piece “solid body”; (2) “a light block...” is a “coined term” and thus limited to an exemplary embodiment in the specification; (3) “a top of the [shoebox structure/light block]” mandates a particular device orientation; and (4) an “opening”

requires “empty space.” Ex. 2031, 57-84. In its Petition, however, Apple states that “no express constructions are required” for the terms of the ’911 Patent. Petition, 7-8. Dr. Kenny does not discuss Apple’s claim constructions in the Delaware Litigation, and does not state his opinion on the correct construction of the claim terms of the ’911 Patent. *See generally* Ex. 1003.

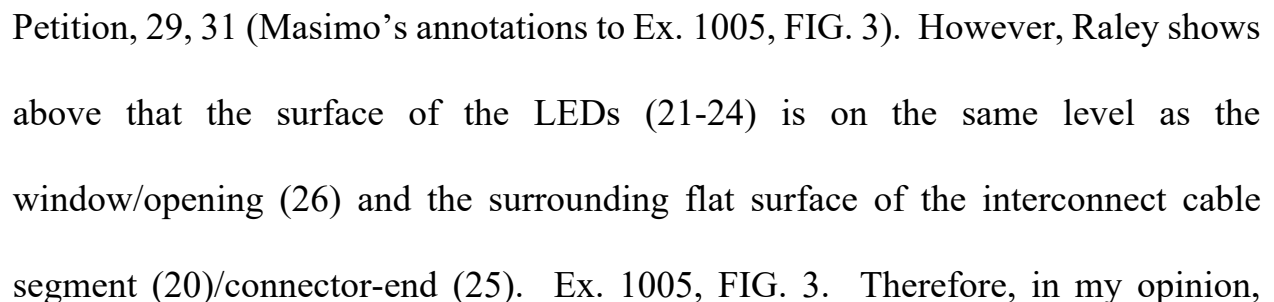
60. I have given the claim terms of the ’911 Patent their plain and ordinary meaning in my analysis herein.

61. I understand that here and in the Delaware Litigation, Masimo submits that the claims of the ’911 Patent have their plain meaning and, therefore, require no construction. Ex. 2031, 57-84. As noted above, I agree.

62. I also understand that Apple presents inconsistent claim constructions here and in the Delaware Litigation. In the Delaware Litigation, Apple asserted the express constructions I noted above for the disputed terms, which include: (1) a “cavity” is a “hollowed-out space” within a one-piece “solid body”; (2) “a light block...” is a “coined term” and thus limited to an exemplary embodiment in the specification; (3) “a top of the [shoebox structure/light block]” mandates a particular device orientation; and (4) an “opening” requires “empty space” despite being an opening for light. Ex. 2031, 57-84. Apple relies on these narrow constructions for noninfringement arguments. Ex. 2032 ¶¶473-474, 487-490, 498, 528-539, 512-523. Apple’s Petition, however, does not mention its constructions from the Delaware

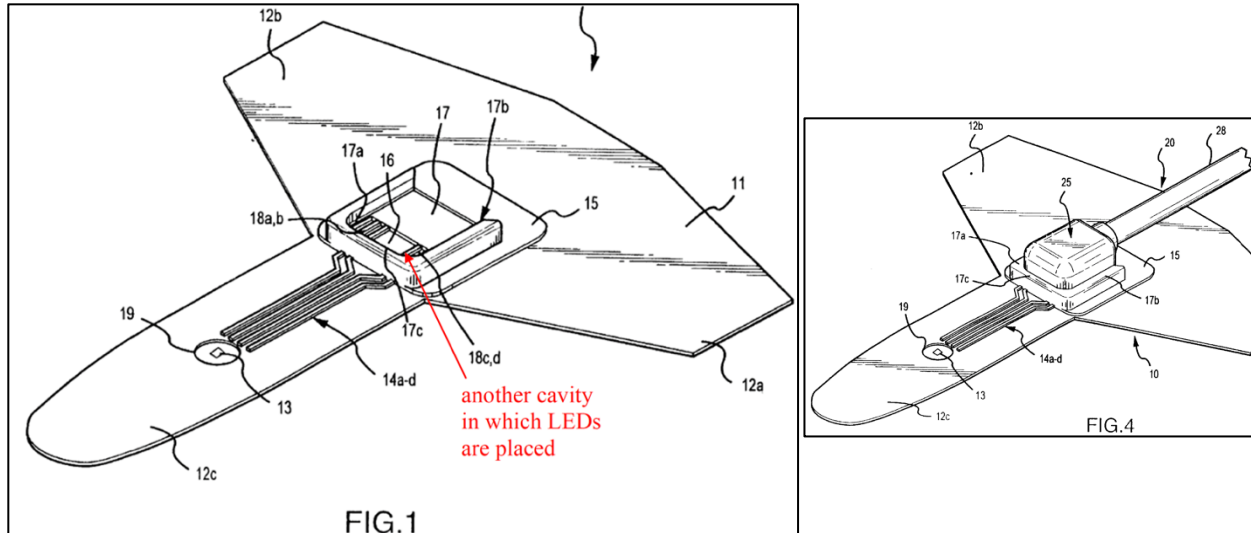
63. As I discuss below, the references Apple asserts in its Petition do not meet its constructions in the Delaware Litigation.

64. Apple asserts in the Delaware Litigation that “cavity” (Claims 1, 10) means “a *hollowed-out* space *within a solid body*.” Ex. 2031, 57. Here, Apple relies only on Raley for the “cavity.” Apple first argues that the interconnect cable segment (20) of Raley discloses “at least three LEDs recessed into a cavity”:



Raley's LEDs are not "recessed." *Id.* Apple also agrees that Raley's LEDs (21-24) are "flush with" the window/opening (26). Paper 6, 5. Therefore, because Raley's LEDs are "flush with" the window/opening (26), it is my opinion that those LEDs are not "in a hollowed-out-space" as Apple's Delaware construction requires. Ex. 1005, FIG. 3.

65. Additionally, Apple argues that Raley's LEDs of cable segment (20) (shown above) are recessed into "another cavity" in Raley's connector (17):



Petition, 29, 31 (excerpted); Ex. 1005, FIG. 4. However, Raley's LEDs would be recessed into this alleged cavity only when Raley's connector (17) was connected to the cable segment (20). Ex. 1005, FIGS. 1, 3, 5:15-62, 6:6-12. In my opinion, when Raley's connector (17) and cable segment (20) were connected, Raley's LEDs would not be recessed into a cavity "within *a solid body*" because the alleged cavity is formed of two components: (1) the connector and (2) the cable segment. Ex. 1005,

FIGS. 1, 3, 5:15-47, 5:57-62, 6:6-12. In my opinion, each of those components (the connector (17) and cable segment (20) (or connector-end (25)) forming the alleged “cavity” is a separate solid body, not the singular solid body (“*a solid body*”) required by Apple’s construction of “cavity” in the Delaware Litigation. *Id.*

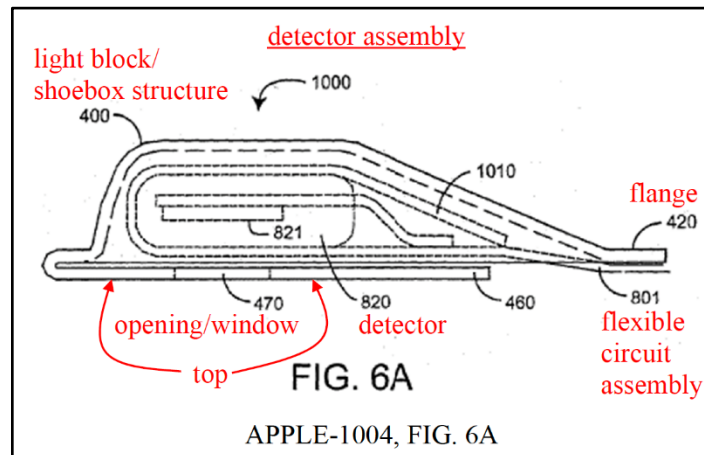
66. I understand that Apple argues in the Delaware Litigation that a “cavity” has two additional requirements, namely that: (a) “the plain and ordinary meaning of ‘recessed into’ requires setting the LEDs back into a pre-existing cavity,” and that (b) “LEDs [that] are mounted on a flat substrate” do not satisfy the claim language. Ex. 2081 ¶476. However, Apple does not argue or show in this IPR that Raley meets either requirement of its construction in the Delaware Litigation. And, in my opinion, Raley does not disclose either of Apple’s additional requirements for a “cavity” because Raley does not discuss whether (a) the LEDs are placed into a “pre-existing” cavity or (b) mounted on a flat substrate. Ex. 1005. Rather, as Dr. Kenny admitted at his deposition, “the exact structure at that location is not explicitly described” and “Raley doesn’t provide a detailed engineering diagram or explicit specifications of the individual components.” Ex. 2080, 100:21-101:18.

67. Accordingly, in my opinion, Raley (the only reference that Apple relies on for this element) does not disclose a “cavity” under Apple’s construction of that term in the Delaware Litigation.

B. Abdul-Hafiz Does Not Disclose “A Top ...” Under Apple’s Construction In The Delaware Litigation

68. Apple asserts in the Delaware Litigation that “a top of the [shoebox structure/light block]” (Claims 1, 10, 19) means “the *uppermost* structure that covers the [shoebox structure/light block].” Ex. 2031, 68. Apple also argues there that the light block’s “base” cannot also be its “top.” *Id.*, 75 (“*the claims distinguish the ‘top’* portion of the [light block] structure *from its ‘base.’*”); Ex. 2032 ¶528 (“the claim term ‘top’ refers to an uppermost structure and an uppermost position relative to the base of the light block.”).

69. In this IPR, Apple relies only on Abdul-Hafiz for the alleged “top.” However, Apple asserts that Abdul-Hafiz’s bottommost “base 460” discloses the claimed “top,” as shown below.



Petition, 43, 67-69, 73. However, as shown above, the alleged light block’s “base” is both not the uppermost structure; and cannot also be its “top” under Apple’s Delaware construction. Therefore, the only reference Apple now relies on for this

element does not disclose a “top” under the construction that Apple asserts in the Delaware Litigation.

IX. GROUND 1A FAILS TO DEMONSTRATE OBVIOUSNESS

70. In my opinion, Apple’s Petition does not establish obviousness of any of the challenged claims of the ’911 Patent. At this stage, I discuss certain problems with the Petition’s proposed obviousness arguments, but I reserve the right to provide additional analysis and identify additional deficiencies in Apple’s grounds.

71. Apple argues that modifying Abdul-Hafiz based on Raley renders obvious Claims 1, 6, 8, 10, 15, 17, 19-21, 26, and 28. Petition, 1. However, Apple fails to show that Abdul-Hafiz discloses or suggests a light block with “only one opening,” which is a limitation of independent Claims 1 and 19 for which Apple relies only on Abdul-Hafiz. Further, Apple fails to show that Abdul-Hafiz discloses or suggests a light block where “the opening” (or “window”) has “an area smaller than a detection surface area of the at least one detector,” which is another limitation of independent Claims 1 and 10 for which Apple relies only on Abdul-Hafiz.

72. Apple also argues that a person of ordinary skill in the art would have modified Abdul-Hafiz based on Raley to measure three or four physiological parameters (or at least oxygen saturation, carboxyhemoglobin, and methemoglobin) using four different wavelengths of light. Petition, 15-20, 55-59. However, the prior art did not enable measuring such parameters with only four wavelengths of light.

Further, Apple fails to show that a person of ordinary skill in the art would have reasonably expected the proposed modification to succeed, or that a person of ordinary skill in the art would have been motivated to modify Abdul-Hafiz as Apple proposes. Therefore, for at least these reasons, it is my opinion that Apple has not met its burden of demonstrating that any claim of the '911 Patent is unpatentable.

A. Apple Fails To Establish That Any Reference Discloses the Claimed Light Block

73. The independent claims recite a “light block [at least partially] surrounding the at least one detector” with numerous additional requirements.

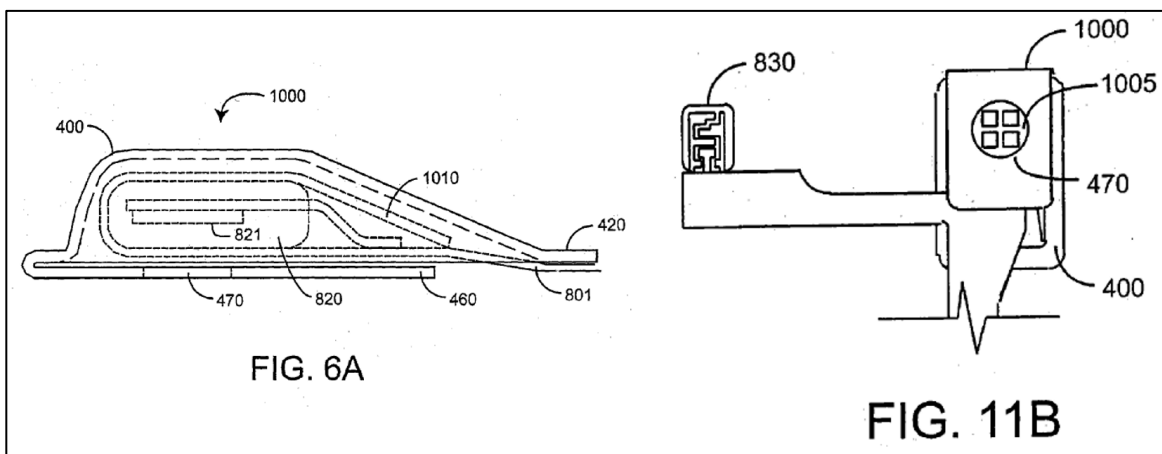
- Claims 1 and 19 require that the “light block” has “only one opening through which light is configured to pass” to the at least one detector
- Claims 1 and 10 require that the “opening” (Claim 1) or “window” (Claim 10) has “an area smaller than a detection surface area of the at least one detector”¹

However, it is my opinion that Abdul-Hafiz does not disclose either requirement of the claims and thus, in my opinion, Grounds 1A-1B fail for the following reasons.

¹ Relatedly, Claim 20 depends from Claim 19 and requires that the “opening” has “an area ... smaller than a detection surface area of the at least one detector.”

1. Apple Fails To Establish Any Reference Discloses A Light Block With “Only One Opening”
(Independent Claims 1, 19)

74. Abdul-Hafiz’s discloses a shielded detector assembly (1000). Ex. 1004, FIGS. 6-7, 9-11, ¶¶39-41, 45-48. In shielded detector assembly (1000), the detector (820) is enclosed by both an optical housing (400) and an EMI shield (1005, 1010), as shown below.



Ex. 1004, FIGS. 6A, 11B, ¶¶39, 46-47; Ex. 2080; 108:4-16. The optical housing (400) has an aperture (470), as shown above (left). Ex. 1004, FIGS. 6A, 11B, ¶¶39. The aperture (470) reveals the fixed portion (1005) of the underlying EMI shield, which has four square holes as shown above (right). *Id.*, FIGS. 6A, 11B, ¶¶39, 46-47; Ex. 2080, 108:17-109:20.

75. In its grounds in the Petition, Apple relies on the shielded detector assembly (1000) of Abdul-Hafiz. *See, e.g.*, Petition, 36-51, 61-65; Ex. 2080, 106:22-108:3. For the “light block” with “only one opening” (or window) limitations, Apple

argues that Abdul-Hafiz's optical housing (400) is the "light block" and that Abdul-Hafiz's aperture (470) is the "only one opening." Petition, 35-43, 72-73.

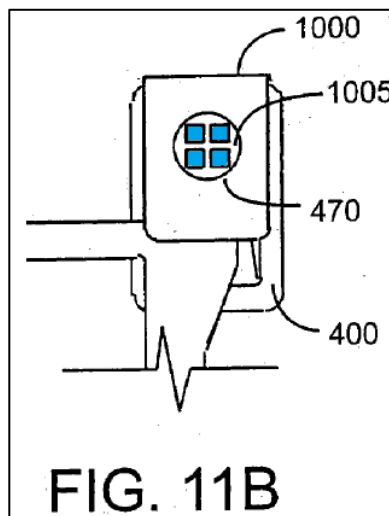
76. However, Apple's arguments ignore the presence of the EMI shield (1005, 1010) in the detector assembly (1000). *See, e.g.*, Petition, 20-59. Further, the Board previously also ignored the EMI shield simply because Apple narrowly asserts that Abdul-Hafiz's optical housing (400) on its own is the alleged "light block." Paper 8, 39. However, I understand that the prior art must be considered for all that it teaches, not selectively, as Apple proposes doing with respect to Abdul-Hafiz by ignoring the EMI shield.

77. Further, Dr. Kenny admitted at his deposition that the EMI shield (1005, 1010) in Abdul-Hafiz's detector assembly (1000) would block at least some light from reaching the underlying detector (820/821). Ex. 2080, 109:13-20, 110:22-111:5, 111:18-112:2, 112:22-113:15, 115:8-17, 160:9-161:2. Similarly, in my opinion, a person of ordinary skill in the art would have understood that the EMI shield (1005, 1010) in Abdul-Hafiz's detector assembly (1000) blocked at least some stray light from reaching the detector (820/821) because such EMI shielding is normally made of optically opaque material, such as copper. Ex. 2080, 105:8-106:21, 112:9-21; Ex. 1004 ¶¶46-47, FIGS. 10-11.

78. Notably, Apple does not propose removing the EMI shield (1005, 1010) from the detector assembly (1000) of Abdul-Hafiz. A person of ordinary skill in the

art also would not have removed the EMI shield (1005, 1010) from the detector assembly (1000) of Abdul-Hafiz because it beneficially protects the underlying detector (820/821) by reducing the amount of unintended (or stray) light (e.g., ambient light and light piping) and electromagnetic interference that reaches the detector, resulting in more accurate measurements. Ex. 1004, FIGS. 6, 10-11, ¶¶39, 46-47.

79. Therefore, because Abdul-Hafiz’s detector assembly (1000) includes a light-blocking EMI shield (1005) with the **four openings** shown below, it is my opinion that a person of ordinary skill in the art would have understood that Abdul-Hafiz does not disclose a light block with “only one opening” as independent Claims 1 and 19 require.



Ex. 1004, FIG. 11B.

2. **The Board Already Found That Abdul-Hafiz Fails To Disclose an Opening/Window With An Area Smaller Than A Detection Surface Area of the At Least One Detector (Independent Claims 1, 10; Dependent Claim 20)**

80. The Board’s Institution Decision found that Apple’s grounds for independent Claims 1 and 10, and dependent Claim 20, failed because the reference that Apple relies on fails to disclose a limitation of these claims. As the Board explained:

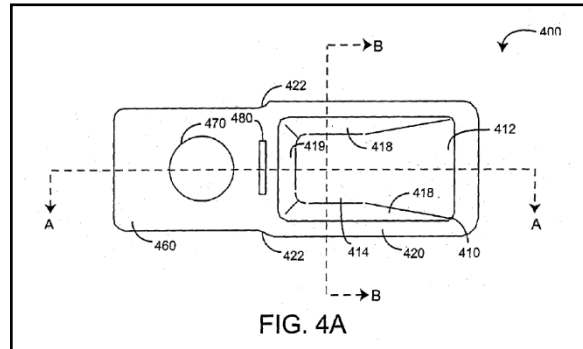
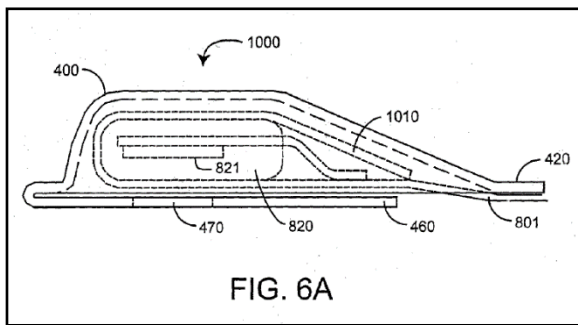
Petitioner argues the entire surface of photodiode chip 821 facing aperture 470 is the recited detection surface area (Pet. 46–47 (citing Ex. 1003 ¶ 101)), and Patent Owner argues only the portion of this surface of photodiode chip 821 that fixed shield 1005 permits light to reach is the recited detection surface area (Prelim. Resp. 42 (citing Ex. 2002 ¶¶ 80–81)). Neither party, however, has provided an express construction for “detection surface area.” Even if we agree with Petitioner that the entire surface of photodiode chip 821 facing aperture 470 discloses the recited detection surface area, *the shape and dimensions of photodiode chip 821 and detector 820 remain unclear from Abdul-Hafiz’s disclosure.*

Paper 8, 44. The Board found that Abdul-Hafiz does not disclose an “opening” or “window” with an area smaller than a detection surface area of the at least one detector (which is a limitation of Claims 1, 10, and 20) because Abdul-Hafiz does not disclose the shape and dimensions of its photodiode (821) and detector (820). *Id.* The Board therefore determined that Apple failed to show obviousness for independent Claim 1 (and its challenged dependent Claims 2-4, 6, 8), independent Claim 10 (and its challenged dependent Claims 11-13, 15, 17), and Claim 20 (which depends from Claim 19 but recites the same area limitation as Claims 1 and 10). *Id.*,

44-47. In my opinion, the Board reached the correct conclusion for at least the reasons I have explained below.

3. Apple Fails To Establish Any Reference Discloses An Opening/Window With An Area Smaller Than A Detection Surface Area Of The At Least One Detector (Independent Claims 1, 10; Dependent Claim 20)

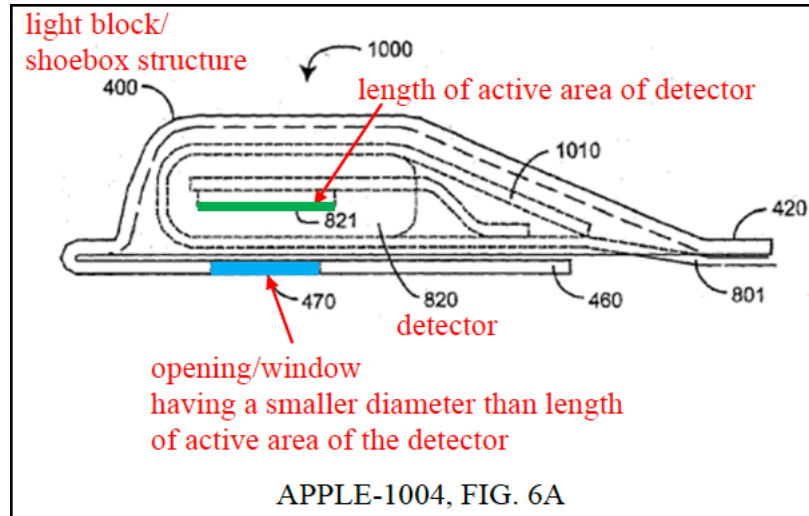
81. Apple relies on the aperture (470) in Abdul-Hafiz’s optical housing (400) as the “opening”/“window” in its grounds. Petition, 35-43, 67-69.



Ex. 1004, FIGS. 6A, 4A. However, in my opinion, Abdul-Hafiz does not disclose an “opening”/“window” with “an area smaller than a detection surface area of the at least one detector,” for the numerous reasons I have explained below.

a. Abdul-Hafiz’s Figures Do Not Disclose The Precise Dimensions Or Sizes Apple Relies On

82. Apple states that “Abdul-Hafiz shows figures where the aperture has a smaller diameter than the length of the active area of the detector, and thus a person of ordinary skill in the art would have understood or found it obvious that Abdul-Hafiz’s aperture [470] (opening/window) has an area smaller than the active area of the photodiode chip 821 (detection surface area).” Petition, 50.



Id., 47 (Apple’s annotations). Apple thus relies on precise dimensions and sizes inferred from Abdul-Hafiz’s figures (primarily FIGS. 6A, 10) to argue that it discloses this element. *Id.*, 46-51, 69. But for numerous reasons, in my opinion, Apple is incorrect.

83. Specifically, in my opinion, Abdul-Hafiz does not disclose the dimensions or sizes that Apple relies on. I understand, and it would have been well-understood to a person of ordinary skill in the art, that patent drawings do not define the precise proportions of the elements or features that they depict and may not be relied on to show particular sizes if the specification is silent on that issue. And as I have explained below, the figures of Abdul-Hafiz figure do not disclose an opening or window with an area smaller than a detection surface area of the detector because Abdul-Hafiz’s specification and figures are silent on the precise dimensions and sizes that Apple relies on for its obviousness ground.

84. Abdul-Hafiz never discloses that its figures are drawn to scale. *See generally* Ex. 1004. In its Petition, Apple does not argue otherwise. Petition, 47-51; Ex. 1003 ¶¶101-106. Therefore, I understand that Apple’s reliance on Abdul-Hafiz’s not-to-scale figures is incorrect and cannot show that Abdul-Hafiz meets the opening-to-detection surface area comparison required by the claims. Apple and its expert have acknowledged as much. In particular, I understand that when challenging other Masimo patents, Apple and its expert, Dr. Kenny, have repeatedly explained the law that “*patent figures should not be interpreted as precise and drawn to scale* unless otherwise stated.” *See, e.g., Apple Inc. v. Masimo Corp.*, IPR2020-01714, Paper 20, 19 (Oct. 29, 2021); *Apple Inc. v. Masimo Corp.*, IPR2020-01714, Ex. 1047 ¶46 (Oct. 29, 2021) (stating the same); *Apple Inc. v. Masimo Corp.*, IPR2020-01538, Paper 27, 18 (Aug. 31, 2021) (stating the same); *Apple Inc. v. Masimo Corp.*, IPR2020-01538, Ex. 1047 ¶42 (Aug. 31, 2021) (stating the same). Therefore, in my opinion, Apple and Dr. Kenny cannot credibly rely on Abdul-Hafiz’s figures as precise or drawn to scale.

85. Also, Abdul-Hafiz’s specification never describes the dimensions of the features Apple relies on, i.e., the diameter of the aperture (470) and the length and width of the photodiode chip (821). Ex. 1004 ¶¶5, 7, 33-34, 37, 39, 46. Abdul-Hafiz also never describes the precise sizes of those components or how those component sizes relate to one another. *Id.* Therefore, Abdul-Hafiz’s figures do not define the

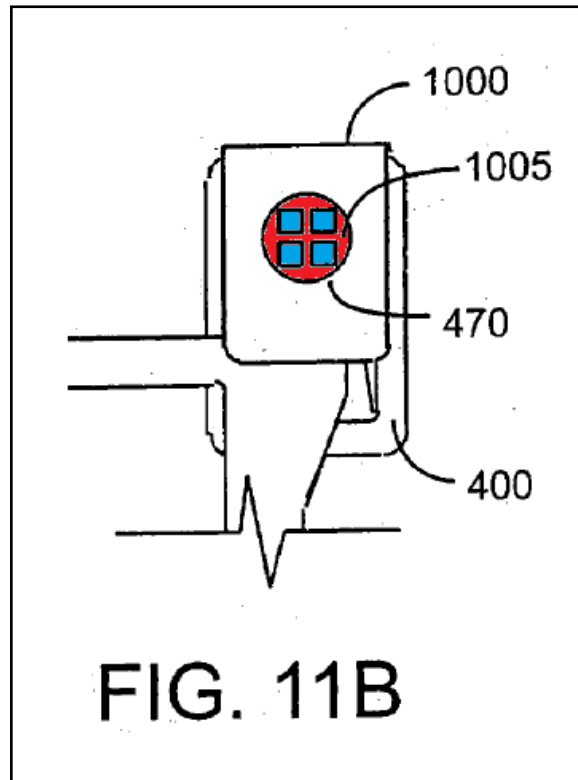
precise proportions of the elements. Because Abdul-Hafiz’s figures do not define the precise proportions of the elements, I understand its figures may not be relied on to show particular sizes of its aperture (470) or detector (820/821) because its specification is silent on this issue. It is therefore my opinion that Apple fails to show that the alleged “opening”/“window” of Abdul-Hafiz has “an area smaller than a detection surface area of the at least one detector.” Thus, I agree with the Board’s finding that Apple’s failure to clearly show “the shape and dimensions of photodiode chip 821 and detector 820” relative to the aperture (470) of Abdul-Hafiz is dispositive of Apple’s obviousness grounds for Claims 1-18 and 20. Paper 8, 44.

86. Additionally, Apple states that FIG. 3 of Abdul-Hafiz “more clearly shows that the aperture 322 has a smaller length than the length of the detector 310.” Petition, 47-48. However, FIG. 3 concerns a different embodiment—it does not include the aperture (470) and/or photodiode (821) of Apple’s “Abdul-Hafiz + Raley” combination. Ex. 1003, FIG. 3. “FIG.3 is a diagram illustrating optical noise sources and a prior art reduced noise sensor.” Ex. 1004 ¶16. In any event, Apple does not propose combining these different embodiments or articulate any motivation for doing so. Petition, 47-48.

b. Apple Improperly Ignores Abdul-Hafiz’s Disclosure

87. Only one figure of Abdul-Hafiz (FIG. 11B) shows both the area of the alleged “opening”/“window” (470) *and* the “detection surface area of the at least one

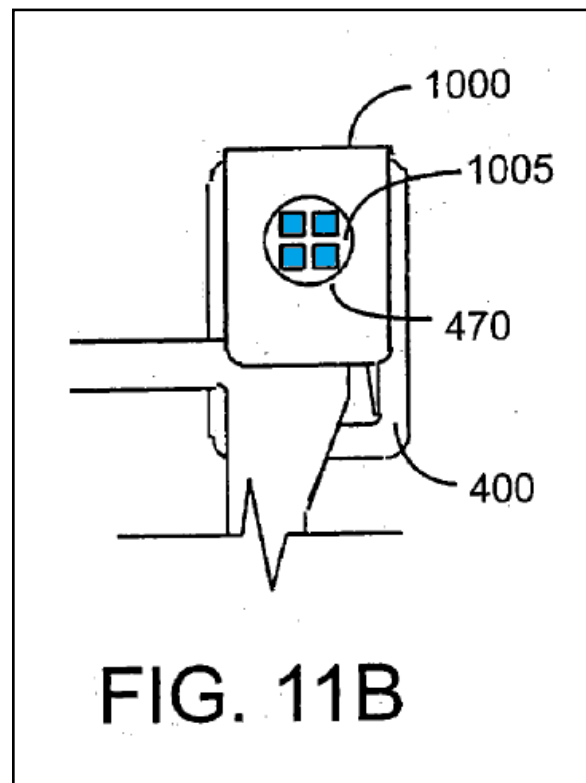
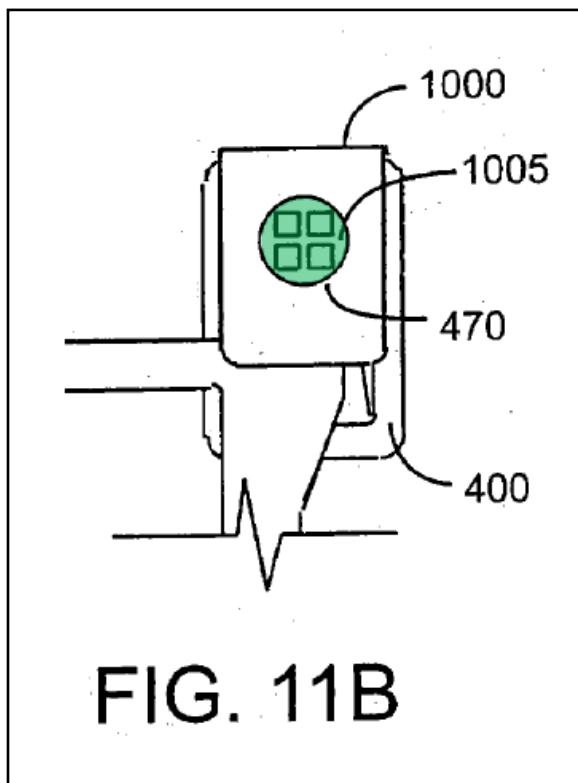
detector” (820/821). Ex. 1004, FIG. 11B, ¶¶46-47. However, FIG. 11B shows that Abdul-Hafiz’s aperture (470) includes a fixed EMI shield (1005, red) that blocks light from reaching all but four areas of the underlying photodiode (820/821, blue). *Supra* Section IX.A.1.



Ex. 1004, FIG. 11B. The EMI shield (1010), which includes fixed shield 1005, is directly folded over the detector (820) to create the EMI “shielded detector assembly” (1000) of Abdul-Hafiz. *Id.* ¶¶46-47. A person of ordinary skill in the art would have understood that the four blue areas shown above are the detection surface area of the detector/photodiode (820/821) because the shield (1005) only permits light to reach those four areas of the detector/photodiode (820/821).

88. A person of ordinary skill in the art would have understood that detector 820 (and thus, its photodiode 821) was only partially obfuscated by fixed shield 1105. *Id.* ¶47. A person of ordinary skill in the art would have understood this because if the shield 1005 completely obfuscated the detector/photodiode (820/821) such that it was no longer visible, the detector/photodiode (820/821) would no longer be able to perform its intended purpose of detecting light from the emitter (830) that has been attenuated by tissue. *Id.* ¶3.

89. Additionally, the area of the “opening”/“window” alleged by Apple (green/left) (Petition, 48-50) is in fact **larger** than the detection surface area (blue/right) disclosed by Abdul-Hafiz.



Ex. 1004, FIG. 11B. The green area includes all of the detection area shaded in blue and more. A person of ordinary skill in the art would have understood the detection surface area (shown in blue above) to be approximately the same size as the four holes in the fixed shield (1005) due to fixed shield's (1005) direct application onto the detector (820). *Id.* ¶¶46-47, FIGS. 6A, 10-11.

90. Apple ignores that Abdul-Hafiz's sensors include this fixed EMI shield (1005). Petition, 44-51. However, I understand that a reference must be read for all that it teaches, not selectively. Accordingly, it is my opinion that selectively ignoring Abdul-Hafiz's fixed EMI shield (1005), as Apple does in its Petition, is improper and does not accurately reflect the understanding of Abdul-Hafiz that a person of ordinary skill in the art would have had.

91. Accordingly, it is my opinion that Abdul-Hafiz does not disclose that its aperture (which Apple alleges is the "opening"/"window") has "an area smaller than a detection surface area of the at least one detector."

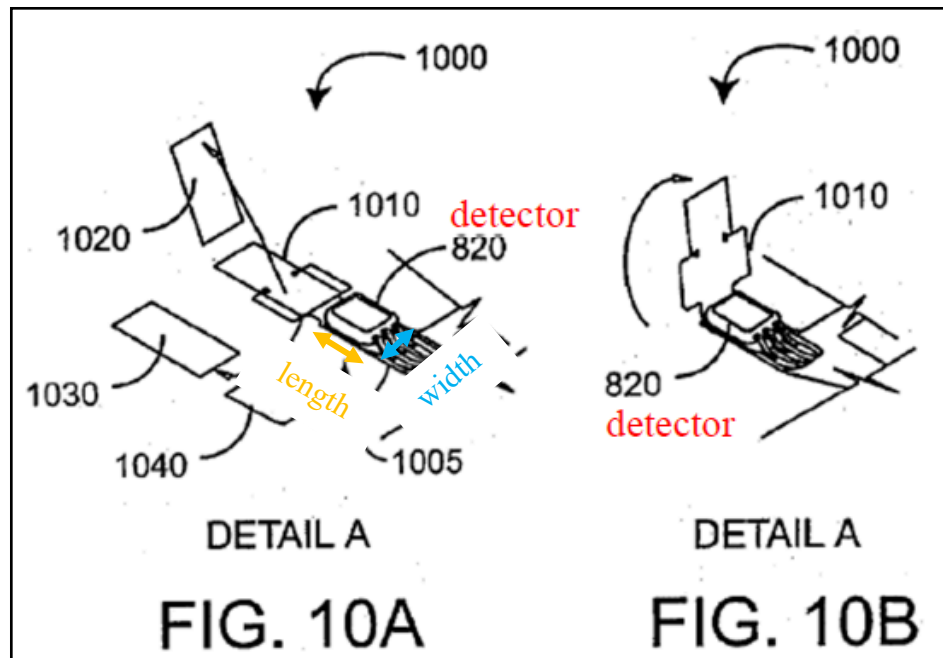
c. Apple Improperly Assumes a Detection Surface Area From Abdul-Hafiz's Figures

92. Apple argues that (1) "Abdul-Hafiz shows figures [FIGS. 3, 6] where the aperture has a smaller diameter than the length of the [detection surface area] of the detector, and thus" (2) "a person of ordinary skill in the art would have understood or found it obvious that Abdul-Hafiz's aperture (opening/window) has an area smaller than the active area of the photodiode chip 821 (detection surface area)."

Petition, 46-50. But both arguments fail. Indeed, Apple’s first argument fails because Abdul-Hafiz’s drawings do not disclose precise dimensions or sizes, as I have explained above. *Supra* Section IX.A.3.a.

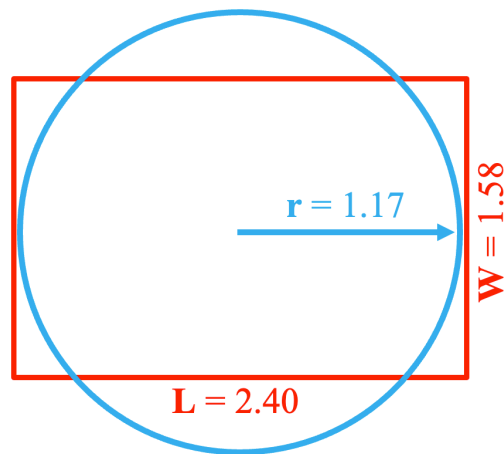
93. Also, Apple’s second argument requires imprecisely (and wrongly) reading FIGS. 10A-10B of Abdul-Hafiz (i.e., that the non-square detector 820 is a “square”) but Apple’s first argument requires reading FIG. 6A precisely (i.e., that the diameter of the aperture (470) is smaller than the width of the detection surface area (821)). Petition, 49-50. Therefore, Apple’s two arguments are inconsistent, which indicates that both arguments cannot be correct.

94. Apple’s second argument also fails. The figures Apple relies on to argue that Abdul-Hafiz’s aperture diameter is smaller than the length of the detection surface area (i.e., FIGS. 3, 6) show only one dimension—the length—of the detector (821). Ex. 1004, FIGS. 3, 6. Therefore, because Abdul-Hafiz does not show the width of the detector (821), Apple argues the detector is “***square*** or rectangular” so that it can assume the detector’s length and width are the same. Petition, 48-50. In my opinion, however, Apple is incorrect. Even if Abdul-Hafiz’s drawings disclosed precise dimensions or sizes (which they do not, as explained above), FIGS. 10A-10B shows that the detector has a ***non-square rectangular shape***, not a “***square***” shape as Apple wrongly assumes.



Ex. 1004, FIGS. 10A-10B. Therefore, Apple provides no basis for its assumption that the detection surface area of the detector (820) is a square. Therefore, in my opinion, Apple's unsupported assumption that Abdul-Hafiz somehow discloses a square detector (820) shows the impermissible hindsight underlying Apple's analysis.

95. Also, even if Abdul-Hafiz's drawings disclosed precise dimensions or sizes (which again, is incorrect), FIGS. 10A-10B (above) show that the width of Abdul-Hafiz's rectangular detector is smaller than the diameter of the aperture (470). *Id.* Thus, a person of ordinary skill in the art would have understood that Abdul-Hafiz's aperture area (blue) is not necessarily smaller—and may be larger—than its detection surface area (red), as I have shown in the following example.

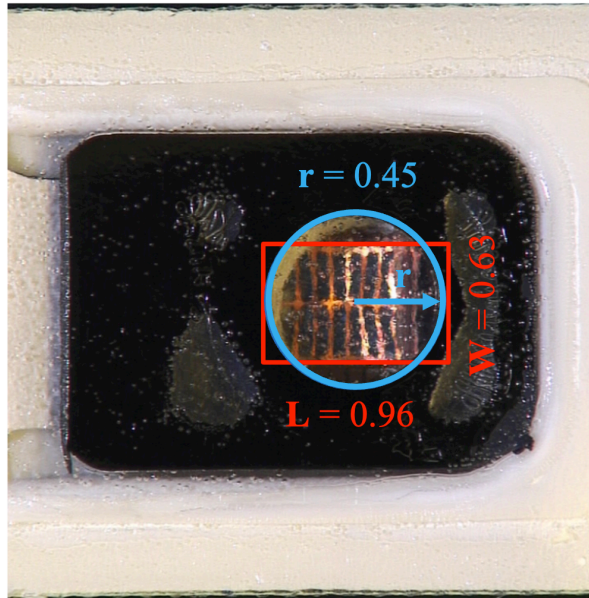


Area of Aperture
 $\pi \times r^2 = \pi \times 1.17^2 = 4.30 \text{ units}^2$

is greater than

Detection Surface Area
 $L \times W = 2.40 \times 1.58 = 3.79 \text{ units}^2$

96. The above depiction of Abdul-Hafiz’s aperture (blue) relative to its detection surface area (red) accurately represents the proportions/sizes from its figures. Without explanation, Apple’s depiction of these features shows a square detector, which does not accurately depict the proportions/sizes of the detector shown in Abdul-Hafiz. Petition, 49-50. Accordingly, if Abdul-Hafiz’s drawings disclosed precise dimensions or sizes, the alleged “opening”/“window” of Abdul-Hafiz would have an area that is larger, not “smaller,” than the detection surface area. Indeed, that would be consistent with the Masimo LNOP sensor covered by the Abdul-Hafiz patent, which has an aperture with an area *larger than* the detection surface area, as shown below.



Area of Aperture

$$\pi \times r^2 = \pi \times 0.45^2 = 0.64 \text{ units}^2$$

is greater than

Detection Surface Area

$$L \times W = 0.96 \times 0.63 = 0.60 \text{ units}^2$$

Ex. 2045.

97. Apple also assumes that Abdul-Hafiz’s aperture (470) has “a diameter that is equal to or smaller than each side length of [the] square or rectangle” detection surface area. Petition, 49-50. Again, Apple is wrong, for at least the reasons I have explained above, because Abdul-Hafiz also does not disclose a “square” detection surface area. Apple also relies on Abdul-Hafiz’s statement (regarding FIG. 6A) that “[a] detector 820 is enclosed in the optical housing 400, 500 so that the active area 821 is aligned with the housing aperture 470, 670.” Ex. 1004 ¶¶37, 39. But “aligned with” does not teach the shape of the detector/detection surface area or even suggest that the aperture (470) is smaller than the detection surface area. *Id.* Accordingly, in my opinion, Apple fails to show that the area of the Abdul-Hafiz’s aperture (470) (the alleged “opening” or “window”) is smaller than the detector surface area of its detector (820/821). *See also* Paper 8, 43-44.

B. Apple Fails to Establish that a POSITA Would Have Been Motivated to Modify Abdul-Hafiz to Have Only One Opening or a Smaller Opening/Window or Reasonably Expected Such Modifications to Succeed

98. Apple fails to establish that a person of ordinary skill in the art would have been motivated to modify Abdul-Hafiz to have an “opening”/“window” with “an area smaller than a detection surface area of the at least one detector” (Claims 1, 10, 20) or a light block with “only one opening” (Claims 1, 19), or reasonably expected such modifications to succeed. In my opinion, Grounds 1A-1B fail for these reasons.

1. Modifying Abdul-Hafiz To Have Only One Opening (Independent Claims 1, 19)

99. As I have explained above, a person of ordinary skill in the art would have understood that Abdul-Hafiz does not include a light block with “only one opening,” which is required by Claims 1 and 19. *Supra* Section IX.A.1. Additionally, Apple does not argue or show that a person of ordinary skill in the art would have been motivated to modify Abdul-Hafiz’s alleged light block to include “only one opening” or reasonably expected that modification to succeed. *See generally* Petition, 44-51. Thus, in my opinion, Apple’s Petition fails to establish that Claims 1 and 19 would have been obvious to a person of ordinary skill in the art.

**2. Modifying Abdul-Hafiz To Have A Smaller Opening/Window
(Independent Claims 1, 10; Dependent Claim 20)**

100. Apple relies on Abdul-Hafiz's aperture (470) as the claimed "opening"/"window." Petition, 41-43. Apple states that a person of ordinary skill in the art "would have understood or found it obvious that Abdul-Hafiz's aperture" meets the claim language. *Id.*, 50. However, as discussed above, Abdul-Hafiz does not disclose that aperture (470) has "an area smaller than a detection surface area of the at least one detector." *Supra* Sections IX.A.2-3. And Apple does not propose modifying Abdul-Hafiz or combining it with another reference to have a smaller "opening"/"window." Petition, 50-51.

101. Apple, therefore, does not assert, much less show, that a person of ordinary skill in the art would have been motivated to modify/combine Abdul-Hafiz to have a smaller "opening"/"window," or reasonably expected any such modification/combination to succeed. Therefore, the Petition fails to establish that Claims 1, 10, and 20 would have been obvious to a person of ordinary skill in the art.

102. Accordingly, for the reasons in this Section (IX.B), it is my opinion that Apple's Petition fails to establish obviousness for Claims 1, 10, and 19 (and their challenged dependent claims) and thus Grounds 1A-1B fail.

C. The Proposed Combination Of Abdul-Hafiz And Raley Does Not Render Obvious Any Challenged Claim (Independent Claims 1, 10, 19)

103. Every independent claim requires “at least three LEDs configured to emit light of at least three different wavelengths” (Claims 1, 10) or that “at least three wavelengths of light are emitted from the at least three LEDs” (Claim 19).

104. Apple concedes that Abdul-Hafiz’s pulse oximeter has only two LEDs and emits light of only two wavelengths (“red and infrared”). Petition, 8, 19-20; Ex. 1004 ¶2. Apple therefore proposes modifying Abdul-Hafiz based on Raley. Petition, 14-59. Apple proposes modifying the two-wavelength pulse oximeter of Abdul-Hafiz based on Raley by adding two LEDs of different (and unspecified) wavelengths (resulting in four LEDs of different wavelengths), “a data processing circuit,” and “data processing instructions.” *Id.*, 15-20, 55-59. As for alleged motivations, Apple argues that a person of ordinary skill in the art would have modified Abdul-Hafiz as proposed because “using at least four LEDs to measure at least four of oxygen saturation, oxyhemoglobin, deoxyhemoglobin, carboxyhemoglobin, and methemoglobin was common practice.” *Id.*, 55; *see id.*, 15-20, 55-59. Apple also argues that a person of ordinary skill in the art would have modified Abdul-Hafiz based on Raley as Apple proposes because carboxyhemoglobin and methemoglobin measurements “may” or “can” be useful” or can be used to “compensate for errors in the measurement of oxygen saturation.” *Id.*, 15-20, 55-59.

105. As I have explained further below in detail, Apple's arguments fail because: (1) Raley (and the rest of the prior art) did not enable a person of ordinary skill in the art to measure at least oxygen saturation, carboxyhemoglobin, and methemoglobin with four LEDs of four different wavelengths; (2) a person of ordinary skill in the art would not have reasonably expected Apple's proposed modification of Abdul-Hafiz based on Raley to succeed; and (3) a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz based on Raley as proposed. Apple fails to show any device that could measure carboxyhemoglobin or methemoglobin with LEDs of only four wavelengths (and does not so much as identify which four wavelengths would be required for such measurements). Moreover, even today, Masimo remains the only company that has released any commercial product that noninvasively measures carboxyhemoglobin or methemoglobin, and Masimo uses at least eight wavelengths for such measurements—not only four wavelengths as Apple proposes. Therefore, in my opinion, Grounds 1A-1B fail to show the obviousness of any claim of the '911 Patent for every reason in this Section.

1. **Raley And The Prior Art Did Not Enable Measuring Oxygen Saturation, Carboxyhemoglobin, And Methemoglobin Using Only Four LEDs Of Four Different Wavelengths**

106. I understand that the prior art must enable a person of ordinary skill in the art to make and use the specific disclosures being relied upon for obviousness. I

also understand that any presumption that the prior art is enabling can be overcome by coming forward with evidence that the prior art either would not produce or would not be expected to produce the disclosure relied upon for obviousness of the claimed subject matter.

107. Apple proposes modifying Abdul-Hafiz’s two-wavelength pulse oximeter based on Raley into a four-wavelength sensor that measures “three or more” or “at least four” blood analytes including oxygen saturation, carboxyhemoglobin, and methemoglobin. *See, e.g.*, Petition, 15-20, 55-59. Therefore, measuring at least oxygen saturation, carboxyhemoglobin, and methemoglobin is central to each of Apple’s alleged motivations to modify Abdul-Hafiz based on Raley. *Id.*

108. Apple’s obviousness theory relies on specific disclosures of Raley (and non-ground prior art) about using four wavelengths of light to measure the parameters underlying its alleged motivations to modify. *Id.* In its Institution Decision, the Board previously stated that Masimo “does not challenge the enablement of Raley’s teaching.” Paper 8, 30. However, that statement is incorrect. The teachings of Raley (and Apple’s other prior art) are directly challenged because, in my opinion, Raley (and the Apple’s other prior art) is not enabling on this point. Specifically, in my opinion, the teachings of Raley (and Apple’s other prior art) are challenged because none of that prior art enabled a person of ordinary skill in the art to measure the identified analytes using only four different wavelengths of light.

109. Prior to the '911 Patent, no one had ever developed a device that achieve what Apple proposes modifying Abdul-Hafiz to do. By proposing to add two LEDs to Abdul-Hafiz to measure the specified analytes using four wavelengths of light, Apple proposes making Abdul-Hafiz's pulse oximeter into a different device called a pulse CO-oximeter. Ex. 1011, 45. And *Masimo was the first* to make such a device—the Rad-57™ pulse CO-oximeter—which was not released or announced until after the '911 Patent. Ex. 2046 (March 2005 press release announcing Rad-57™ is the “First Device to Noninvasively Measure Carbon Monoxide in the Blood....”); Ex. 2047 (late-2006 study explaining “[t]he Masimo Rad-57 is the first commercially available pulse oximeter that can measure methemoglobin and carboxyhemoglobin.”); Ex. 2057, 129. For years after the '911 Patent, the Rad-57™ remained the only device that could noninvasively measure the parameters central to Apple's obviousness theory (i.e., oxygen saturation, carboxyhemoglobin, and methemoglobin). *See, e.g.*, Ex. 2047 (2006 study); Ex. 2048 (2009 article stating that “[o]nly one prehospital device is presently capable of measuring both CO and MET: the RAD-57™....”); Ex. 2049, 125 (2009 study). Moreover, those of skill in the art recognized that a critical feature of the Rad-57™ was that it “*uses eight wavelengths of light* instead of the usual two and is thereby able to measure more than two species of human hemoglobin.” Ex. 2047, 892; Ex. 2046, 1. Apple itself recognizes that like the Rad-57™, the '911 Patent describes using ““*eight LEDs* ... for measuring HbCO

(carboxyhemoglobin) and/or METHb (methemoglobin) in addition to SpO₂ (oxygen saturation) and pulse rate.” Petition, 4-5 (quoting Ex. 1001, 8:7-13, 2:28-30, 3:19-26). Therefore, in my opinion, the real-world development of noninvasive monitoring confirms that at the time of the ’911 Patent, a person of ordinary skill in the art would not have been able to use four wavelengths of light to measure the parameters Apple identifies (at least oxygen saturation and carboxyhemoglobin and/or methemoglobin) without undue experimentation.

110. Apple ignores this reality of noninvasive physiological monitoring. Instead, Apple focuses on theory mentioned in Raley as well as in other references that are not part of its grounds. Apple speculates that using four total wavelengths would have made it a “standard algebra problem” to solve four equations for four “unknowns” (“four of oxygen saturation, oxyhemoglobin, deoxyhemoglobin, carboxyhemoglobin, and methemoglobin”). Petition, 57-58. However, that “standard algebra problem” has never been solved, even today. Further, Raley and the non-ground prior art (Jarman, etc.) that Apple relies on did not enable a person of ordinary skill in the art to measure these four analytes with four wavelengths of light.

111. Apple first relies on Raley. Petition, 15-20, 25-27, 55-59. Raley generically mentions that its sensor could be used with a monitor that executed “data processing instructions stored in memory ... to determine an estimate of the blood analyte levels.” Ex. 1005, 3:52-4:46. Raley hypothesizes that it is mathematically

“possible to measure additional analytes ... with one additional wavelength for each component.” Ex. 1005, 3:33-36. Raley also vaguely mentions that its FIG. 3 sensor with four emitters (21-24) theoretically “would be useful” for measuring “blood analytes such as such as oxyhemoglobin, deoxyhemoglobin, carboxyhemoglobin and methemoglobin.” Ex. 1005, 5:63-6:2, 1:41-45, 3:33-36. Although Raley postulates about what the future of noninvasive monitoring “will” hold, Raley does not explain how to measure four of the identified blood analytes using only four wavelengths of light. Ex. 1005. Raley’s failure to disclose such details would have been unsurprising to a person of ordinary skill in the art, because such a device did not exist at the time of the ’911 Patent, as I have explained above.

112. Apple also relies on Jarman, which is a non-ground reference. Petition, 18-20, 55-59. Jarman, like Raley, merely states that four LEDs of different wavelengths theoretically “could” be used to measure the concentration of four analytes, namely “O₂Hb [oxyhemoglobin], RHb [deoxyhemoglobin], COHb [carboxyhemoglobin], and MetHb [methemoglobin].” Ex. 1007, 3:21-27, 5:21-6:16. Jarman is also a Datex-Ohmeda reference, as is Raley. *Compare* Ex. 1005, 1 *with* Ex. 1007, 1 *and* Ex. 2050. But a person of ordinary skill in the art would have recognized that Datex-Ohmeda never released a device that could measure oxygen saturation and at least one of carboxyhemoglobin and methemoglobin using four (or even any number of) wavelengths. Even today, Datex-Ohmeda has no such device.

Therefore, a person of ordinary skill in the art would not have expected to be able to measure those analytes using the aspirational-at-best discussion of a four-wavelength device in Datex-Ohmeda's patents (e.g., Raley, Jarman). *Id.*

113. Apple also relies on Jarman, Aoyagi, and Kuenster (all non-ground references) to argue that that measuring the identified blood analytes is as simple as using optical measurements at four wavelengths to solve for four unknowns (the analytes) with four equations. Petition, 55-59. According to Apple, noninvasively measuring the identified parameters is merely “the solution of a standard algebra problem” that requires only a “well-established basic understanding.” *Id.*, 58. In my opinion, if Apple were correct, someone would have developed such a device long before the time of the '911 Patent. Yet, importantly, a person of ordinary skill in the art would have known that no one, before or after the '911 Patent, was able to measure the parameters that Apple relies on using only four wavelengths of light, because those measurements are very difficult to achieve. *Id.* As I have explained above, Masimo was the first to achieve such measurements, and could only do so after the '911 Patent and using ***eight*** wavelengths. Therefore, in my opinion, Apple greatly over-simplifies the measurements that allegedly would have motivated its proposed modification of Abdul-Hafiz, and the only reason for Apple's over-simplification is hindsight.

114. Further, Apple's algebra argument is technically incorrect. A person of ordinary skill in the art would have understood that measuring the "at least four" parameters Apple relies on with four wavelengths depends on more than four unknowns. Ex. 1007, 5:38-40; Ex. 2051, 8:53-60; Ex. 2052, 3:37-55. Apple's "standard algebra problem" argument is an unrealistic oversimplification, as shown by, for example, the fact that oxygen saturation is a single parameter but measuring it requires at least two wavelengths of light. Also, Raley ignores other potential problems such as path length, and Jarman merely assumes path length (ΔL) is constant and ignores it. *See generally* Ex. 1005; Ex. 1007, 5:38-40; *id.*, 5:21-6:28. However, a person of ordinary skill in the art would have understood that path length readily changes for many reasons (e.g., variations in tissue structure, motion, etc.) and is another unknown variable in the analyte measurements Apple relies on. Ex. 2051, 8:53-60; Ex. 2052, 3:37-55; Ex. 1006, 2:64-3:4. Apple fails to show that the number of unknown analytes matches the number of wavelengths because that is an oversimplification. In reality, the analytes Apple relies on to supply a motivation to modify Abdul-Hafiz had never been noninvasively measured at the relevant time outside Masimo, and even Masimo needed eight wavelengths for those measurements. A person of ordinary skill in the art would not have been able to use only four wavelengths of light to measure the analytes Apple relies on, including at

least oxygen saturation, carboxyhemoglobin, and methemoglobin, without undue experimentation.

115. Apple's other references also do not enable the measurements mentioned in Raley that Apple relies on. Abdul-Hafiz does not mention the additional parameters Apple relies on. *See generally* Ex. 1004. Aoyagi and Kuenster both use at least five wavelengths to measure four parameters. Ex. 1010, 7:33-8:22, 8:47-51; Ex. 1012, 4:30-38, 5:27-29, 4:5-17. Barthelemy discloses three wavelengths, does not measure methemoglobin, and was never implemented in a "commercially acceptable [PPG] device." Ex. 1008, Figure, 6:35-49; Ex. 1007, 2:36-41. Webster simply mentions his student's project (Buinevicius). Ex. 1011, 54-55. However, Buinevicius' rudimentary pulse oximeter used "three wavelength[s]" and did not calculate methemoglobin. Ex. 2056, 3 (describing only "theoretical approximations and calculations"), 15. Therefore, in my opinion, the prior art did not enable a person of ordinary skill in the art to use four wavelengths of light to measure the parameters mentioned in Raley and relied on by Apple. Because Apple's obviousness theory relies on specific disclosures of Raley and other references that a person of ordinary skill in the art would not have been able to make and use without undue experimentation, it is my opinion that Grounds 1A-1B fail. *Id.* Further, in my opinion, Apple's argument that a person of ordinary skill in the art would have

modified Abdul-Hafiz in order to achieve non-enabled measurements shows that the Apple's analysis is based in hindsight.

2. A POSITA Would Not Have Reasonably Expected the Proposed Combination of Abdul-Hafiz to Succeed

116. For several reasons, a person of ordinary skill in the art would not have reasonably expected Apple's proposed combination of Abdul-Hafiz and Raley to succeed.

117. For at least the same reasons that the prior art did not enable the disclosures that Apple relies on for its obviousness theory, a person of ordinary skill in the art would not have reasonably expected to succeed at what Apple's proposed modification requires—using four wavelengths of light physiological parameters to measure the identified parameters such as carboxyhemoglobin with Abdul-Hafiz's pulse oximeter. *Supra* Section IX.C.1. For example, a person of ordinary skill in the art would not have reasonably expected success in the proposed modification of Abdul-Hafiz and Raley because ***no one***, not even the company behind Raley and Jarman, was able to develop a device using four (or any number of) wavelengths to measure oxygen saturation, carboxyhemoglobin, and methemoglobin before the '911 Patent. *Supra* Section IX.C.1.

118. Moreover, the Board previously found that Masimo's reasonable expectation of success arguments were "not commensurate with the scope of the claims" because the "claimed invention does not require measuring

carboxyhemoglobin or methemoglobin or specific any particular accuracy.” Paper 8, 31. However, because Apple’s obviousness combination is based on information from a combination of sources, I understand that the relevant inquiry is whether a person of ordinary skill in the art would have been motivated to select and combine the relied upon information with a reasonable expectation of achieving the desired result. Here, the desired result of Apple’s obviousness combination is “using at least four wavelengths ... provided by the four LEDs to measure at least” oxygen saturation, carboxyhemoglobin, and methemoglobin. Petition, 54-59. A person of ordinary skill in the art would not have reasonably expected to achieve that desired result of Apple’s combination for the reasons I have explained above. Therefore, in my opinion, Apple fails to show obviousness for any challenged claim of the ’911 Patent.

119. Further, I understand that because Apple’s obviousness combination is based on information from a combination of sources, the relevant inquiry is whether a person of ordinary skill in the art would have been motivated to select and combine the information Apple relies upon with a reasonable expectation of achieving the allegedly desired result. Here, the desired result of Apple’s obviousness combination is “using at least four wavelengths ... provided by the four LEDs to measure at least” oxygen saturation, carboxyhemoglobin, and methemoglobin. Petition, 54-59. And a person of ordinary skill in the art would not have reasonably expected to achieve the

desired result of Apple’s combination for the reasons I have explained above.

Accordingly, Apple fails to show obviousness for any claim.

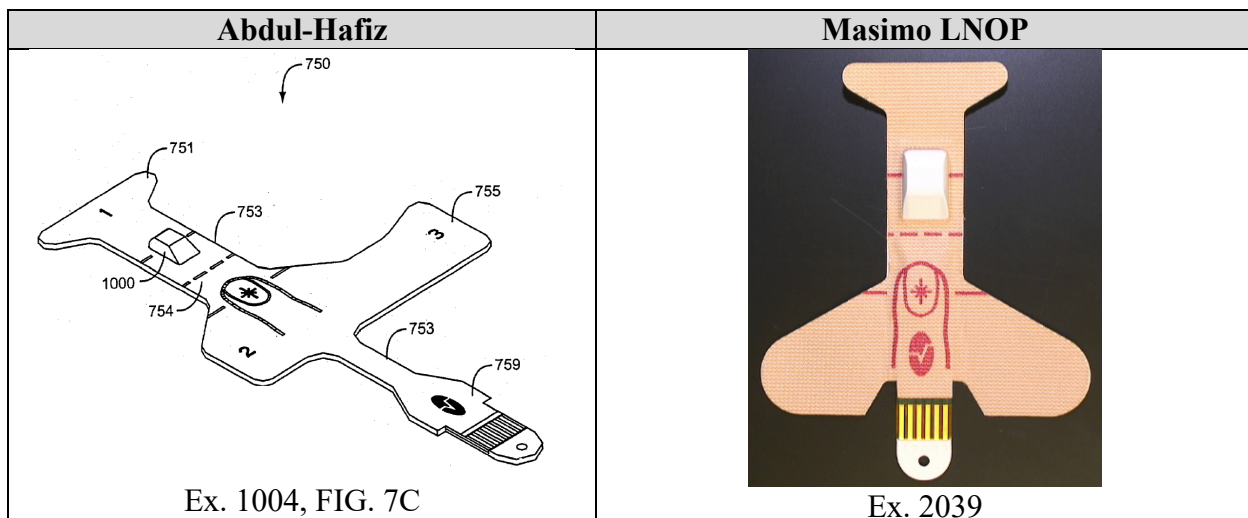
3. **A POSITA Would Not Have Been Motivated to Combine Abdul-Hafiz With Raley as Proposed**

a. **Measuring More Blood Analytes Would Not Have Motivated A POSITA To Modify Abdul-Hafiz As Proposed**

120. Measuring three or four blood analytes would not have motivated a person of ordinary skill in the art to modify Abdul-Hafiz based on Raley as Apple proposes (i.e., to achieve a sensor that uses four different wavelengths of light) for at least the reasons that a person of ordinary skill in the art would not have been able to measure, or reasonably expected to succeed in measuring, three or four blood analytes using only four wavelengths of light. *Supra* Sections IX.C.1-2.

121. In addition, it is my opinion that a person of ordinary skill in the art would not have modified Abdul-Hafiz as Apple proposes because doing so would frustrate Abdul-Hafiz’s intended purpose.

122. Specifically, Abdul-Hafiz, like the Masimo LNOP sensor it describes, was intended to be the low-cost disposable sensor made of a fabric “tape stock” that is shown below. Ex. 1004, FIGS. 7A-7C, ¶11, claim 20; Ex. 2038.



Further, a person of ordinary skill in the art would have understood that low-cost disposable sensors like Abdul-Hafiz and the Masimo LNOP (shown above) were preferred by hospitals because the entire device could simply be thrown out after use with a single patient, which reduced the risk of cross-contamination between patients. Ex. 2058; Ex. 1005, 1:22-25. A person of ordinary skill in the art also would have understood that disposable sensors like Abdul-Hafiz reduced the complexity of patient care by allowing the sensor to be thrown away instead of having to be cleaned, tracked, stored, and then reused. Ex. 1005, 1:17-31, 2:64-67. Also, Abdul-Hafiz, like the Masimo LNOP sensor it covers, accurately measured oxygen saturation while keeping costs low enough to achieve the benefits of a disposable sensor. Indeed, the accuracy of the Masimo LNOP (and thus, Abdul-Hafiz) sensor design was highly regarded in the art, as I explain further below. *Infra* Section IX.C.3.b.

123. A person of ordinary skill in the art would have understood that the modifications Apple proposes would have resulted in a sensor that was more complex, included more parts, and thus was more expensive to make. A person of ordinary skill in the art also would have understood that including the sensor's LEDs in a separate reusable component (e.g., Raley's connector-end (25)) as Apple proposes would have further increased cost because of the need to inspect and clean that component between patients. Apple's proposed combination thus would have frustrated Abdul-Hafiz's intended purpose by transforming its low-cost, fully disposable sensor into a more expensive, partly reusable sensor. Accordingly, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz's as Apple proposes. *Id.*

124. Further, I understand that in the obviousness analysis, both the benefits lost and the benefits gained from the proposed combination or modification should be weighed against each other. The above-described costs and inconvenience imposed by Apple's proposed modifications would have at least cautioned a person of ordinary skill in the art against modifying Abdul-Hafiz as proposed. Additionally, the prior art did not enable a person of ordinary skill in the art to measure oxygen saturation as well as two or three additional blood analytes (e.g., carboxyhemoglobin, methemoglobin) with only four wavelengths of light. *Supra* Section IX.C.1. And a person of ordinary skill in the art would not have reasonably expected such

measurements to succeed at the time of the '911 Patent. *Supra* Section IX.C.2. Thus, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz as Apple proposes because he or she would have understood that the added cost and inconvenience of doing so were not outweighed by any countervailing benefit.

b. Measuring Carboxyhemoglobin and Methemoglobin Contradicts Abdul-Hafiz's Purpose And Would Not Have Motivated The Proposed Modification

125. Apple asserts that measuring two additional blood analytes—carboxyhemoglobin and methemoglobin—would have also motivated its proposed modification of Abdul-Hafiz based on Raley. Petition, 18-20, 25-27, 58-59. Apple asserts that “compensat[ing] for errors in the measurement of oxygen saturation due to the presence of carboxyhemoglobin and methemoglobin” would have motivated a person of ordinary skill in the art to combine Abdul-Hafiz and Raley. *Id.*, 18, 59. However, for multiple reasons, measuring carboxyhemoglobin and methemoglobin would not have motivated Apple's proposed modification.

126. As a first reason: As I have explained above, the prior art did not enable a person of ordinary skill in the art to measure, and a person of ordinary skill in the art would not have reasonably expected success in measuring, analytes included carboxyhemoglobin and methemoglobin using only four wavelengths of light. *Supra* Sections IX.C.1-2. Further, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz as Apple proposes because doing so frustrated

Abdul-Hafiz's intended purpose as a low-cost disposable sensor and such negative consequences were not outweighed by any countervailing benefit. *Supra* Section IX.C.3.a. For at least those reasons, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz as Apple proposes.

127. As a second reason: Apple fails to identify a single example where carboxyhemoglobin and methemoglobin were used to improve the accuracy of oxygen saturation measurements. *See generally* Petition. Kenny testified that he could not find such a device in the prior art. Ex. 2080, 88:9-89:9. Indeed, Masimo's Rad-57TM Pulse CO-oximeter was the first device that could non-invasively measure carboxyhemoglobin and methemoglobin, and the Rad-57TM was not released until after the '911 Patent. *Supra* Section IX.C.1. And not even Masimo's Rad-57TM could measure all of the blood analytes Apple proposes with only four wavelengths—eight wavelengths were required. *Id.* Therefore, in my opinion, using measurements of carboxyhemoglobin and methemoglobin to improve oxygen saturation measurement accuracy in a four-wavelength sensor would not have motivated Apple's proposed modifications.

128. Further, a person of ordinary skill in the art at the time of the '911 Patent would have understood that carboxyhemoglobin and methemoglobin could not be measured with only four wavelengths at that time and thus could not be used to improve the accuracy of oxygen saturation measurements in a four-wavelength

device as Apple proposes. *Supra* Section IX.C.1. Kenny gave a contrary opinion at this deposition, but Kenny's opinion was based on at least two levels of assumption. Ex. 2080, 87:11-88:8 ("I'm assuming...."; "[I]f I can...."). In my opinion, Kenny's assumptions do not show that a person of ordinary skill in the art would have been motivated (or able) to use these complex measurements to somehow improve SpO₂ measurement accuracy at the time of the '911 Patent. Kenny also testified, without explanation, that "[he] can use the signal for the carboxyhemoglobin" to somehow improve SpO₂ measurement accuracy. Ex. 2080, 87:11-88:8. However, I understand that Kenny's conclusory testimony is not evidence that a person of ordinary skill in the art would have understood how to use carboxyhemoglobin and methemoglobin to improve oxygen saturation measurement accuracy as Apple proposes. Kenny also failed to explain how he proposes to "independently measure" carboxyhemoglobin and oxygen saturation using the same sensor applied the same tissue, or what "the signal for the carboxyhemoglobin" even refers to. *Id.* In my opinion, Kenny's testimony, and Apple's argument, that using carboxyhemoglobin and methemoglobin could somehow improve oxygen saturation measurement accuracy is not supported by the art and is instead based on impermissible hindsight.

129. As a third reason: Apple presumes there was a problem with the accuracy of Abdul-Hafiz's oxygen saturation measurements. Petition, 18-20. But that is incorrect. Abdul-Hafiz covers the Masimo LNOP sensor, as I have explained

above. *Supra* Section VII.A. The superior accuracy of the Abdul-Hafiz design (i.e., Masimo’s LNOP sensors) was known among those of ordinary skill in the art and highly regarded in the industry. *See, e.g.*, Ex. 2061, 3 (“Over 40 clinical studies have been published and presented in internationally respected forums documenting the significantly superior performance of Masimo SET Pulse Oximetry.”; showing Masimo SET outperformed competitors), 5 (“Masimo SET should clearly become the new standard for pulse oximetry.”); Ex. 2038, 1-2 (“The signal integrity of Masimo LNOP sensors and the advanced signal processing of Masimo SET combine to provide accurate and reliable tracking of the patient’s true physiology, even during motion and low perfusion.”); Ex. 2062, 1. Indeed, Kenny admitted at his deposition that Abdul-Hafiz says nothing about its pulse oximetry system suffering from inaccuracy. Ex. 2080, 154:13-155:4. In view of the widely acclaimed accuracy of Abdul-Hafiz’s sensor design, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz based on Raley to somehow improve accuracy.

130. Further, in my opinion, Apple’s insistence on solving an oxygen saturation accuracy problem in Abdul-Hafiz that did not exist with Apple’s proposed-but-unexplained “compensation” reveals the hindsight in Apple’s analysis. A generic interest in improving accuracy, even if it existed, would not have motivated a person of ordinary skill in the art to make the specific modifications that Apple relies upon

because the Abdul-Hafiz sensor was known to be very accurate, as I have explained above.

131. As a fourth reason: Apple’s proposed modification is based on Raley, which is a reference assigned to Datex-Ohmeda. Petition, 14-31; Ex. 1005. But a person of ordinary skill in the art would have recognized that Datex-Ohmeda’s pulse oximeters were calibrated to be “more insensitive to changes of carboxyhemoglobin and methemoglobin concentrations in blood” than other available sensors. Ex. 2063, 9. However, in my opinion, since devices like Raley were already “more insensitive” to carboxyhemoglobin and methemoglobin, a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz based on Raley to “compensate for errors in the measurement of oxygen saturation due to [these analytes].” Petition, 14-31.

132. As a fifth reason: Apple and Kenny speculate that “[a]n accurate measurement of carboxy[]hemoglobin [sic] ... *may* be needed when the patient is a smoker or if carbon monoxide poisoning is suspected” and “elevated methemoglobin levels in the blood *can* be caused by various medications, illegal drugs, and certain pathological conditions such as sickle cell anemia.” Petition, 18-20, 25-27; Ex. 1003 ¶67. Kenny also explained why carboxyhemoglobin and methemoglobin “might” have motivated the proposed modifications of Abdul-Hafiz. Ex. 2080, 81:18-22 (“These [parameters] are examples of what one *might* be excited about.”); 81:83:16-

84:15 (“And here’s some examples that *might* be the ones that a [POSITA] would pursue.”; “Raley describes some reasons why these parameters *might* be important.”), 85:20-86:9. However, in my opinion, Apple’s and Kenny’s arguments that these other measurements “*might*” be useful do not show that a person of ordinary skill in the art **would have been motivated** to modify Abdul-Hafiz to measure the identified parameters.

133. As a sixth reason: In its institution decision, the Board stated there was generic need to compensate for oxygen saturation measurement errors due to the presence of carboxyhemoglobin and methemoglobin, and that this generic need would have motivated modifying Abdul-Hafiz based on Raley as Apple proposes. Paper 8, 34. However, in my opinion, that finding was incorrect. Specifically, even if there was such a generic need, that need would not have motivated Apple’s proposed modification of Abdul-Hafiz because measuring carboxyhemoglobin and methemoglobin was (1) not enabled by Raley (or any prior art) and (2) not something a person of ordinary skill in the art would have reasonably expected to succeed doing with only four wavelengths. Further, in my opinion, even if the generic need identified by the Board actually existed at the relevant time, it would have been outweighed by the countervailing reasons I have explained above that a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz based on Raley to measure the other analytes relied on by Apple.

134. Therefore, for at least the reasons I have explained above, it is my opinion that a person of ordinary skill in the art would not have been motivated to modify Abdul-Hafiz based on Raley as Apple proposes, and as such, Grounds 1A-1B fail to show obviousness of any claim.

X. GROUND 1B FAILS TO DEMONSTRATE OBVIOUSNESS

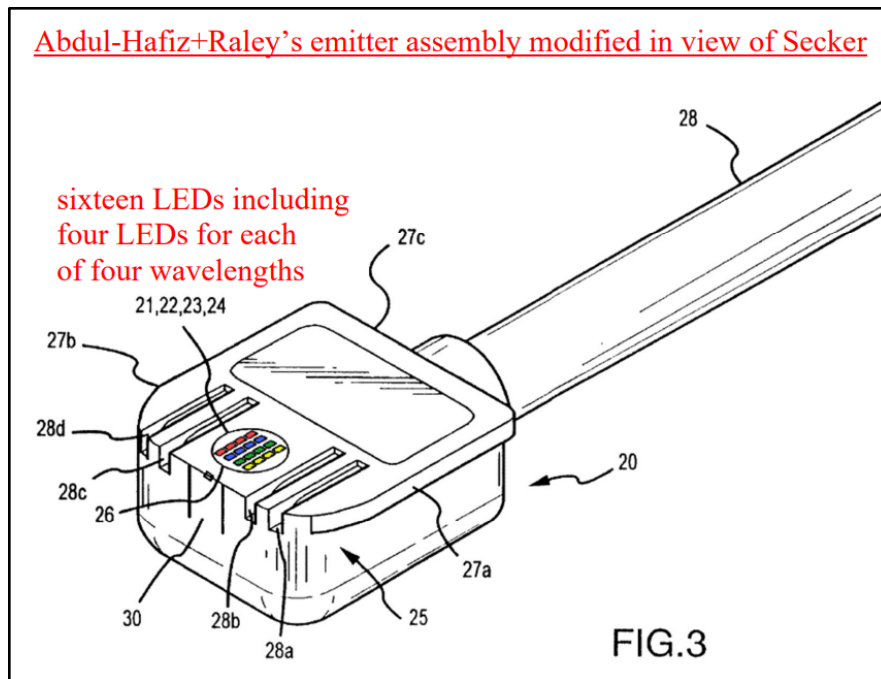
135. In Ground 1B, Apple argues that modifying its Abdul-Hafiz + Raley combination sensor based on Secker renders obvious the additional limitations of dependent Claims 2-4, 11-13, and 23-25. Petition, 74-90. Apple does not argue that Secker itself satisfies any limitations of independent Claims 1, 10, and 19. *Id.* Therefore, in my opinion, Ground 1B fails to demonstrate obviousness of the identified dependent claims (i.e., Claims 2-4, 11-13, and 23-25) for at least the same reasons discussed above for independent Claims 1, 10, and 19 with respect to Ground 1A.

136. In my opinion, Ground 1B also fails to demonstrate obviousness for the additional reasons that I have explained below. None of Apple's references disclose the at least eight or twelve LEDs comprising three different wavelengths required by Claims 2-4, 11-13, and 23-25. Further, Apple fails to show that "accommodating different sized patients or different tissue site thicknesses" would have motivated a person of ordinary skill in the art to modify the Abdul-Hafiz + Raley combination sensor into the four wavelength, sixteen-LED device that Apple proposes.

**A. No Reference Discloses At Least “Eight” Or “Twelve” LEDs
Comprising “At Least Three” Different Wavelengths
(Dependent Claims 2-4, 11-13, 23-25)**

137. Independent Claims 1, 10, and 19 each require “at least three LEDs” configured to emit light of “at least three” different wavelengths. Claims 2-4, 11-13, and 23-25 require at least eight or twelve LEDs configured to emit light at three different wavelengths. In particular, Claims 2, 11, and 23 further require that the at least three LEDs comprise “at least eight LEDs”; Claims 3, 12, and 24 further require that “the at least eight LEDs comprise[] at least two LEDs of the same wavelength”; and Claims 4, 13, and 25 further require that the at least three LEDs comprise “at least twelve LEDs.”

138. Apple concedes that Abdul-Hafiz and Raley (and the Abdul-Hafiz + Raley combination that it relies on for independent Claims 1, 10, and 19) do not disclose the additional limitations of Claims 2-4, 11-13, and 23-25. Petition, 74-90. Instead, in an attempt to meet these limitations, Apple relies on Secker to propose including four of each of the LEDs in its Abdul-Hafiz + Raley combination. *Id.*, 82; Ex. 2080, 148:8-13. Apple proposes modifying its Abdul-Hafiz + Raley combination in view of Secker to “result in sixteen LEDs including four sets of four LEDs for each of four wavelengths arranged on the sensor that are selectable by the oximeter,” as shown below. *Id.*, 82.



Id., 82. However, in my opinion, Apple fails to show obviousness because none of its references disclose a physiological monitoring device comprising at least eight LEDs, much less at least twelve LEDs, with LEDs of “at least three” different wavelengths.

139. Apple argues that a person of ordinary skill in the art would have modified the Abdul-Hafiz + Raley combination sensor in view of Secker to arrive at a device with four sets of four LEDs of different wavelengths (for a total of sixteen LEDs). Petition, 76-90. However, Apple does not argue or shows that Secker discloses at least eight or twelve LEDs comprising at least three different wavelengths. *Id.* Although Secker describes a sensor with up to sixteen LEDs, Secker’s disclosure is limited to a pulse oximeter with only two different wavelengths, red and infrared. Ex. 1006, Abstract, 1:33-35, 11:58-66, 12:10-14,

13:4-6, 13:18-21, 13:45-49, 14:34-40, 15:39-57. Apple’s own expert likewise explains that Secker’s disclosure is limited to “LEDs of one wavelength” and “LEDs of a second wavelength.” Ex. 1003 ¶168.

140. Apple’s other references suffer the same shortcoming. Apple does not contend that Abdul-Hafiz or Raley discloses the LEDs required by Claims 2-4, 11-13, and 23-25. Petition, 76-90. Indeed, neither reference has at least eight or twelve LEDs comprising at least three different wavelengths. Abdul-Hafiz has only two LEDs comprising two different wavelengths. Ex. 1004 ¶2. Raley has only up to four LEDs comprising up to four different wavelengths. Ex. 1005, FIG. 3, 5:63-66.

141. Therefore, in my opinion, none of Apple’s combination references teach at least eight or twelve LEDs comprising at least three different wavelengths.

B. Apple Fails To Establish That A POSITA Would Have Been Motivated To Add More LEDs To The Abdul-Hafiz + Raley Combination

142. Based on Secker, Apple proposes modifying the Abdul-Hafiz + Raley combination sensor to include four times as many LEDs. Petition, 76-90. Apple argues that “providing a sensor with multiple detector-LED spacings that automatically accommodates different sized patients or different tissue site thicknesses” would have motivated its proposed modification. *Id.*, 79-80; *id.*, 81-85. However, in my opinion, a POSITA would not have been motivated to modify the

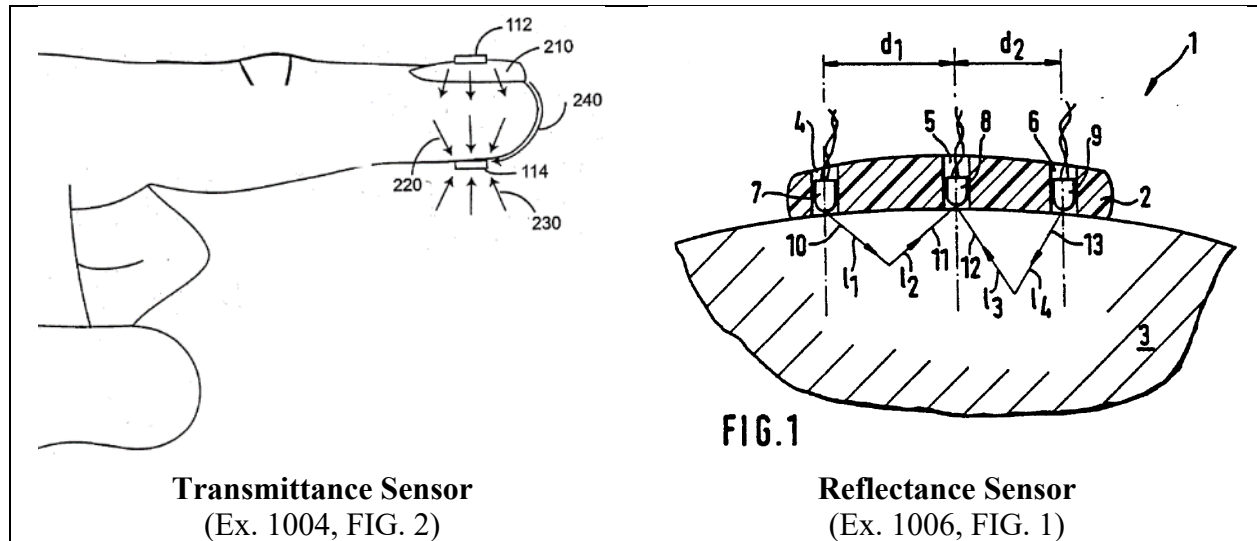
Abdul-Hafiz + Raley sensor as Apple proposes, for at least the reasons I discuss below.

1. **Secker Describes An Approach Limited To Reflectance Sensors That Would Not Have Motivated A POSITA To Add More LEDs To The Transmittance Sensor Of Abdul-Hafiz + Raley**

143. Secker describes a particular approach of using more LEDs to solve a problem that was limited to reflectance sensors. However, Apple relies on Secker’s approach to propose adding LEDs to the Abdul-Hafiz + Raley sensor—a different type of sensor known as a transmittance sensor. As such, Secker’s approach would not have motivated a person of ordinary skill in the art to add more LEDs to the Abdul-Hafiz + Raley sensor.

144. Apple’s Abdul-Hafiz + Raley combination relies on a type of sensor known as a “transmittance” sensor. Petition, 22-31. Specifically, Apple’s combination is based on the adult finger-worn pulse oximetry sensor (750) in FIG. 7C of Abdul-Hafiz. *See, e.g., id.*; Ex. 2080, 142:4-10, 143:18-144:4. As shown below (left), transmittance sensors like Abdul-Hafiz have the light source and detector are on opposite sides of the tissue, such that some emitted light transmits through the tissue and is detected on the other side. Ex. 1004, FIG. 2, ¶2. But in “reflectance” sensors such as Secker (right), the light source and detector are on the same side of the tissue such that some emitted light transmits into the tissue, reflects

back to the sensor, and is detected on the same side. Ex. 1006, 1:27-31, 2:41-47, FIGS. 1-10.



145. Secker states that “[t]he present invention relates to a sensor ... for performing non-invasive measurements of oxygen saturation ***based on the reflection technique.***” Ex. 1006, 1:6-9; 2:56-59. And Secker recognizes a unique problem faced by reflectance sensors. Specifically, Secker explains that in reflectance sensors, “the depth of penetration of human tissue is not identical for all wavelengths, i.e., the length of the light paths at various wavelengths is different.” *Id.*, 2:62-3:6. Secker explains that this problem of “differing depth of penetration at various wavelengths” is limited to reflectance sensors and “does *not* apply” to transmission sensors (which it calls “transmission” sensors). Ex. 1006, 3:28-45. Secker also explains that different penetration depths for different wavelengths is a problem for reflectance sensors because it causes errors and “unsatisfying performance.” Ex. 1006, 2:62-3:6,

3:32-34. Accordingly, Secker describes techniques to solve this reflectance problem by adding more LEDs that can be “selected such that the lengths of the light paths through the human tissue at both different wavelengths are substantially equal.” *See, e.g.,* Ex. 1006, 3:7-32, Abstract.

146. Having different penetration depths for different wavelengths is only a problem for reflectance sensors, and so Secker repeatedly explains that its technique for achieving equal light paths for two different wavelengths is limited to reflectance sensors and not for transmission sensors. For example, it states that its “major objective” is “to provide a sensor and an apparatus for measuring ... based on the reflection technique....” Ex. 1006, 2:56-61. Secker also states its disclosure is “more important for application in reflection oximetry, than it is for transmission oximetry” and “useful for reflection oximetry where the signal quality is worse than in transmission oximetry.” Ex. 1006, 3:43-45, 8:56-60.

147. Secker mentions transmission sensors just five times. The first four times, Secker merely mentions transmissions sensors to distinguish them from reflectance sensors and the associated wavelength penetration depth issue Secker sought to solve. Ex. 1006, 2:30-36; 3:28-45, 8:56-58. The fifth time, Secker simply states that its “method of performing an autocorrelation on the received signal, extracting the frequency thereof, selecting a standard function,” etc., is “even very useful for transmission oximetry.” Ex. 1006, 8:60-9:2. But Apple does not even

propose combining Secker's "autocorrelation" method with the Abdul-Hafiz + Raley sensor.

148. Regardless, Secker explains that its (a) its approach for adding/selecting LEDs and (b) autocorrelation method are separate solutions for separate problems. While Secker's LED selection approach is for the problem with different wavelength penetration in reflectance sensors (Ex. 1006, 14:52-15:63), Secker's autocorrelation method is merely a signal processing technique applied to reduce the impact of "a noisy signal or a signal containing artefacts" on oxygen saturation measurements. Ex. 1006, 7:64-8:55, 15:64-18:41, Abstract, FIGS. 11-13. That signal processing technique does not involve adding LEDs (or any hardware) to the sensor. *Id.* Thus, a person of ordinary skill in the art would have understood that Secker's autocorrelation method provides no reason to add LEDs to the Abdul-Hafiz + Raley sensor. Ex. 1006, 8:60-9:2; Ex. 2080, 151:2-14.

149. Moreover, Apple identifies nothing in Secker that supports adding more LEDs to a transmission sensor. Apple relies on various passages of Secker up through column 7, line 40. Petition, 76-90 (relying on Ex. 1006, 6:4-20 and 6:38-7:40 several times); Ex. 1003 ¶¶154-172 (relying on same passages of Ex. 1006). But Apple ignores Secker's confirmation in the next line that only "reflection sensors [are] described up to now." Ex. 1006, 7:41-43. Apple also relies on 8:67-68 of Secker (Petition, 76-90), but that only concerns the irrelevant autocorrelation method

discussed above. Apple further relies on 14:52-15:29 and 15:35-46 of Secker. *Id.* But those passages merely discuss the reflectance sensors of FIGS. 7-10 and the associated approach of using selectable LEDs to solve the reflectance sensing problem of different wavelengths penetrating different depths. Ex. 1006, 14:52-15:46, FIGS. 7-10.

150. Overall, Secker never describes or even suggests taking its approach to resolving the reflectance sensor problem of differing penetration depths at different wavelengths and applying that approach to transmission sensors. Ex. 1006, 6:4-20, 6:38-7:40, 8:67-68, 14:52-15:29, 15:35-46. Moreover, a person of ordinary skill in the art would have understood that differing penetration depths at different wavelengths was not a problem in transmission sensors, where detected light passes all the way through the tissue. Ex. 1006, 3:34-41. Therefore, in my opinion, Secker would not have motivated a person of ordinary skill in the art to add more LEDs to the transmittance sensor (Abdul-Hafiz + Raley) that Apple relies on.

2. **Abdul-Hafiz Does Not Motivate Or Even Suggest
Apple's Proposed Modification Of The Abdul-Hafiz + Raley
Sensor**

151. Apple asserts that FIGS. 11A-E of Abdul-Hafiz motivate or suggest its proposed modification of the Abdul-Hafiz + Raley sensor. Petition, 78-80. Specifically, Apple argues that “[t]o further Abdul-Hafiz’s goal,” a person of ordinary skill in the art would have looked to Secker to make “a sensor ... that

automatically accommodates different sized patients or different tissue site thicknesses.” *Id.*, 79-80. However, in my opinion, Apple misreads Abdul-Hafiz.

152. Abdul-Hafiz never describes or suggests a single sensor that accommodates different sized patients or tissue thicknesses, much less sets that functionality as its “goal.” Instead, Abdul-Hafiz describes that each of its sensors is for *one patient size/tissue thickness only*—adult, infant (3-10 kg), or neonate (< 3 kg). Ex. 1004 ¶¶40 (“FIGS. 7A-B illustrate ... neonate sensor 700.”), 41 (“FIG. 7C illustrates ... adult sensor 750.”), 47 (referring to “an infant sensor (not illustrated)”). Indeed, the sensor 750 (FIG. 7C) that Apple relies on is especially designed only for an adult finger, whereas the sensor 700 (FIGS. 7A-B) has a very different design that is only for a neonate’s foot. Ex. 1004 ¶¶2-3, 47, 49. Thus, a person of ordinary skill in the art would have understood that Abdul-Hafiz does not even suggest one sensor that accommodates different patient sizes/tissue thicknesses. *Id.*

153. Abdul-Hafiz does not disclose or suggest otherwise in FIGS. 11A-E. Instead, those embodiments simply describe techniques that allow two sensors, each of which is for *one patient size/tissue thickness only*, to “be manufactured from a single flex circuit part.” Ex. 1004 ¶¶47, 49. FIGS. 11A-B describe a technique that allows one flex circuit to be made into (1) a sensor “appropriate for a neonate” and (2) a sensor “appropriate for an infant.” Ex. 1004 ¶47. And FIGS. 11C-E describe a

technique that allows one flex circuit to be made into (1) “a pediatric sensor” and (2) “an adult sensor.” Ex. 1004 ¶49.

154. As such, in my opinion, a person of ordinary skill in the art would have understood that Abdul-Hafiz provides no motivation or suggestion to modify the Abdul-Hafiz + Raley sensor into one that accommodates different patient sizes/tissue thicknesses with only one sensor. In my opinion, Apple’s contrary argument is based on hindsight, not the disclosure of Abdul-Hafiz.

3. Secker Does Not Even Describe Using More LEDs To Accommodate Different Patient Sizes Or Tissue Thicknesses

155. Apple argues that the motivation it relies on (i.e., adding “multiple detector-LED spacings that automatically accommodat[e] different sized patients or different tissue site thicknesses” is “described by Secker.” 80; *id.*, 76-90. In my opinion, Apple is wrong.

156. Secker discusses an approach of automatically selecting LEDs to obtain equal tissue penetration depth by different wavelengths in reflectance sensors, as I have explained above. However, Secker never describes or suggests using that approach to accommodate different sized patients or tissue thicknesses. Ex. 1006. Instead, Secker explains that its approach is “for very precise manual or automatic adaptation to different kinds of measurement.” Ex. 1006, 15:42-46. Specifically, Secker explains that its automatic LED selection approach is for sensors used on

either (1) “*different places of application*” or (2) “*different tissue characteristics*.”

Ex. 1006, 14:41-42; *id.*, Abstract, 7:16-40, 14:52-15:46. Secker also clarifies that “tissue characteristics” means “extinction coefficients.” Ex. 1006, 12:34-39.

157. In my opinion, a person of ordinary skill in the art would have understood that both use cases of Secker’s approach are inapplicable to the Abdul-Hafiz + Raley sensor. The Abdul-Hafiz + Raley sensor that Apple relies on is not used for different places of application—it is for one particular patient size/tissue thickness only (the adult finger), as I have explained above. The Abdul-Hafiz + Raley sensor is also not applied to different tissue characteristics (extinction coefficients) because it is only applied to the finger, where the extinction coefficients “are quite precisely known.” Ex. 1006, 13:28-31. Because neither use case applies, a person of ordinary skill in the art would not have been motivated to incorporate Secker’s automatic LED selection approach into the Abdul-Hafiz + Raley sensor.

158. Therefore, in my opinion, for at least the reasons discussed in this Section, a person of ordinary skill in the art would not have been motivated to modify the Abdul-Hafiz + Raley sensor in view of Secker as Apple proposes, and thus Ground 1B fails.

XI. CONCLUSION

159. For at least the reasons I have explained, it is my opinion that Apple's Petition fails to show that any challenged claims of the '911 Patent would have been obvious to a person of ordinary skill in the art at the relevant time in March 2005.