

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

Case IPR2024-00294
U.S. Patent 10,736,507

DECLARATION OF R. JAMES DUCKWORTH, 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: October 7, 2024



R. James Duckworth, Ph.D.

TABLE OF CONTENTS

	Page No.
I. INTRODUCTION	1
II. INFORMATION AND MATERIALS CONSIDERED	1
III. EXPERIENCE AND QUALIFICATIONS	6
IV. APPLICABLE LEGAL STANDARDS	11
A. Priority	11
B. Claim Construction	12
C. Anticipation	13
D. Obviousness	13
V. LEVEL OF ORDINARY SKILL IN THE RELEVANT ART	16
VI. THE PRIORITY DATE OF THE '507 PATENT	19
A. Claim 13 Was Actually Reduced To Practice By August 31, 2011	23
B. Claim 1 Was Actually Reduced To Practice By August 31, 2011	39
VII. CLAIM CONSTRUCTION	46
VIII. SUMMARY OF OPINIONS	48
IX. BACKGROUND OF THE TECHNOLOGY	49
A. Pulse Oximetry	49
B. Overview of the '507 Patent (Exhibit 1001).....	53
C. Apple's Cited References	55
1. Mendelson (Exhibit 1011)	55
2. D'Angelo (Exhibit 1007).....	56
3. Additional References	57
X. INDEPENDENT CLAIMS.....	58
XI. ANALYSIS	60
A. Apple Has Not Shown That Mendelson Discloses An Optical Sensor Outputting "One Or More Signals Responsive To Light" Or A Processing Board Receiving Those Light "Signals"	62
1. Mendelson Does Not Disclose An Optical Sensor Outputting "One Or More Signals Responsive To Light" Or A Processing Board	

TABLE OF CONTENTS
(cont'd)

	Page No.
Receiving Those Light “Signals” Under The Plain Meaning Of “One Or More Signals Responsive To Light” (All Grounds).....	63
2. Mendelson Does Not Disclose An Optical Sensor Outputting “One Or More Signals Responsive To Light” Or A Processing Board Receiving Those Light “Signals” Under Apple’s Construction Of “One Or More Signals” in the Delaware Litigation (All Grounds)	71
B. Apple’s Grounds Based On D’Angelo Fail To Show Obviousness (Grounds 1D-1I, 2D-2I)	73
1. D’Angelo Is Not Prior Art.....	73
2. A POSITA Would Not Have Been Motivated To Modify Mendelson In View of D’Angelo To Make Mendelson’s Receiver Module Draw Power From The PDA	76
C. Apple Has Not Shown Unpatentability For Any Dependent Claims (Grounds 1B-1C, 1E-1I, 2B-2C, 2E-2I).....	91
D. A POSITA Would Not Have Been Motivated To Modify The Mendelson-D’Angelo Combination Based On Goldsmith To Implement The Display Function Of Mendelson’s PDA As A Wristwatch (Grounds 1I, 2I).....	91
XII. CONCLUSION	95

I. INTRODUCTION

1. I, R. James Duckworth, Ph.D. 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 IPR2024-00294, which concerns claims 1-20 of U.S. Patent No. 10,736,507 (“the ’507 Patent”). I understand that Masimo has asserted the ’507 Patent against Petitioner Apple Inc. (“Petitioner” or “Apple”) in *Apple Inc. v. Masimo Corporation and Sound United, LLC*, U.S. District Court for the District of Delaware, Case No. 1:22-cv-01378-MN (“the Delaware Litigation”). I understand that this Declaration is being submitted as Exhibit 2037 in the above-identified IPR proceeding.

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 party to this matter.

II. INFORMATION AND MATERIALS CONSIDERED

3. I have been asked to provide technical expert opinions relating to the validity of the claims of the ’507 Patent. In conducting the analyses and forming the opinions set forth in this Declaration, I have reviewed and considered the ’507 Patent’s claims, specification, and file history. I have also reviewed and considered Apple’s petition for IPR2024-00294 (“the Petition”), the prior art references that

Apple relies on, the declaration of Dr. Thomas Kenny (Exhibit 1003), and all other exhibits that Apple attached to the Petition, including the following:

Exhibit No.	Description
1001	U.S. Patent No. 10,736,507 (“the ’507 patent”)
1002	File History of U.S. Patent No. 10,736,507
1003	Declaration of Dr. Thomas Kenny
1005	U.S. Patent Application Pub. No. 2008/0004904 to Tran (“Tran”)
1006	U.S. Patent No. 6,658,276 to Kianl et al. (“Kianl”) APPLE-1007
1007	Lorenzo T. D’Angelo, et al., A Sensor Network to iPhone Interface Separating Continuous and Sporadic Processes in Mobile Telemedicine, 33rd Annual International Conference of the IEEE EMBS Boston, Massachusetts USA, August 30 - September 3, 2011 (“D’Angelo”)
1008	U.S. Patent No. 7,812,826 to Ording et al. (“Ording”)
1009	U.S. Patent Application Pub. No. 2007/0093786 to Goldsmith et al. (“Goldsmith”)
1010	U.S. Patent Application Pub. No. 2010/0324387 to Moon et al. (“Moon”)
1011	Y. Mendelson, et al., A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring, Proceedings of the 28 th IEEE EMBS Annual International Conference New York City, USA, Aug 30-Sept 3, 2006
1012	Declaration of June Munford
1013	U.S. Patent No. 8,195,848 to Jones (“Jones”)
1014	Exemplary Infringement Claim Chart for the ’507 patent from <i>Apple Inc. v. Masimo Corporation et al.</i> , Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)

Exhibit No.	Description
1015	Exemplary Infringement Claim Chart for the '911 patent from <i>Apple Inc. v. Masimo Corporation et al.</i> , Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)
1060	U.S. District Courts—Combined Civil and Criminal Federal Court Management Statistics (Sep. 30, 2023) United States Courts (uscourts.gov), https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0630.2023.pdf
1061	Memorandum, Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (USPTO June 21, 2022) (“Director’s Guidance”)
1062	Apple’s Complaint for Patent Infringement (Design), <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01377 (D. Del. Oct. 20, 2022)
1063	Apple’s Complaint for Patent Infringement (Utility), <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01378 (D. Del. Oct. 20, 2022)
1064	Defendant Masimo Corporation’s Answer to Complaint and Counterclaims, <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01378 (D. Del. Dec. 12, 2022)
1065	Order Granting Joint Motion to Amend the Case Schedule, <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01378 (D. Del. Sep. 21, 2023)
1066	Stipulation by Apple Inc.
1067	Email Identifying Masimo’s District Court Invalidity Grounds (Nov. 16, 2023)
1068	Excerpt of Apple’s District Court Expert Invalidity Report, <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01378 (Nov. 22, 2023)
1069	Order Granting Unopposed Motion to Stay Certain Patent Counterclaims, <i>Apple Inc., v Masimo Corporation, et al.</i> , Case No. 1-22-cv-01378 (Jan. 10, 2023)

4. I have also reviewed and considered at least the following materials in preparing this Declaration.

Exhibit No.	Description
2002	March 27, 2024 Expert Declaration of R. James Duckworth, Ph.D.
2029	Joint Claim Construction Briefing (August 31, 2023) in <i>Apple Inc. v. Masimo Corp et al.</i> , C.A. 22-1378-MN-JLH
2030	Excerpts of the Transcript of the Deposition of Steven Warren in <i>Apple Inc. v. Masimo Corp et al.</i> , C.A. 22-1378-MN-JLH
2031	Excerpts of the Rebuttal Expert Report of Steven Warren in <i>Apple Inc. v. Masimo Corp et al.</i> , C.A. 22-1378-MN-JLH
2032	Blood Oxygen App On Apple Watch, Apple (retrieved March 12, 2024)
2033	CC1100 Single Chip Low Cost Low Power RF Transceiver, Texas Instruments (June 20, 2006)
2038	Declaration of Bilal Muhsin
2039	Prototype Video (last modified August 31, 2011)
2040	User Interface Summary (last modified August 31, 2011)
2041	<i>Masimo iSpO2™ Pulse Oximeter for iOS Platform (iPhone, iPad & iPod touch) for Consumers to Debut at CES</i> , Jan. 3, 2013, https://investor.masimo.com/news/news-details/2013/Masimo-iSpO2supsup-Pulse-Oximeter-for-iOS-Platform-iPhone-iPad--iPod-touch-for-Consumers-to-Debut-at-CES/default.aspx
2042	iSpO2 Image cited in Exhibit 2041, available at http://photos.prnewswire.com/prnh/20130103/LA36252
2043	IEEE Xplore Webpage for D'Angelo, available at https://ieeexplore.ieee.org/document/6090368/citations?tabFilter=papers#citations
2044	Deposition Transcript of Thomas Kenny, Ph.D.

To the extent not listed above, I have also reviewed any other materials I discuss or cite herein. 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 a person of ordinary skill in the art related to the '507 Patent at the relevant time (i.e., a "POSITA"). I understand the relevant time is August 31, 2011 (at the latest) for Claims 1 and 13 and September 20, 2012 for the remaining claims, as explained below in Section VI of this Declaration. Accordingly, my analyses and opinions are made from that relevant perspective.¹ My testimony herein refers to the knowledge of a POSITA as of the relevant time, unless indicated otherwise.

5. Any figures appearing in this Declaration were prepared with the assistance of counsel and reflect my understanding of the '507 Patent and the materials discussed herein.

¹ Regardless of whether the claims of the '507 Patent are entitled to a priority date of August 31, 2011 or September 20, 2012, it does not change my opinions herein.

III. EXPERIENCE AND QUALIFICATIONS

6. My qualifications are set forth in my curriculum vitae, a copy of which was submitted as Exhibit 2001. A summary of my experience and qualifications is provided below.

7. My academic and professional background is in electrical and computer engineering. I obtained a Bachelor of Engineering degree in Electrical and Electronic Engineering from the University of Bradford, England and a Ph.D. Degree in Electrical and Electronic Engineering from the University of Nottingham, England. My Ph.D. thesis work concerned increasing the speed of data processing using multiple processing elements to complete computations in parallel and triggering computations based on the availability of data. After completing my Ph.D., I was a lecturer in the university's Computer Science Department for two years.

8. For more than 40 years, I have studied, designed, and worked in these fields. My experience includes over 35 years of teaching and research, including in the fields of pulse oximetry and other physiological monitoring technologies, low powered wireless sensor design, embedded system design, wearable technology, and indoor location tracking for first responders, among others.

9. I have been a professor of electrical and computer engineering at Worcester Polytechnic Institute ("WPI") for over 35 years. I joined WPI in January 1987 as an Assistant Professor of Electrical Engineering and was an Associate

Professor of Electrical and Computer Engineering from July 1991 to June 2021.

Presently, I am a Professor Emeritus of Electrical and Computer Engineering at WPI.

10. More recently, my research work has centered on Precision Personnel Location (“PPL”) for First Responders. This project started as a result of a tragic incident in Worcester in 1999, when six firefighters lost their lives in a warehouse fire. The overall goal of the PPL project is to protect the lives of emergency responders and to enhance their ability to accomplish their missions through research and development of systems for personnel location and tracking, movements, physiological and environment status monitoring, and command and control. The PPL project brought together diverse technical capabilities from other centers and laboratories at WPI to address important problems for emergency responders, the most critical of which is precise location and path tracking for each person in a building.

11. From 2005 through 2008, I worked extensively with my colleague at WPI, Professor Yitzhak Mendelson, Ph.D., to research, publish papers about, design, and make, wearable pulse oximetry devices. As part of my work, in 2006, I authored “A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring” along with Professor Mendelson and our student Gary Comtois. This paper is Exhibit 1011 in Apple’s Petition in this IPR and is the primary reference for all of Apple’s grounds of invalidity. Gary Comtois was a Master of Science student at our

University who completed his thesis under our direction on the subject of “Adaptive Noise Cancellation Utilizing Accelerometry to Reduce the Effects of Motion Artifact in Wearable Reflectance Mode Pulse Oximetry.” Also during these years our work was to develop new wearable pulse oximetry devices suitable for military use. We received funding from the USAMRMC (United States Army Medical Research and Development Command) on a multi-year project titled ‘Real-Time Troop Physiological Status Monitoring Systems Using a Common Wireless Network’.

12. In 2007, I formed a company with Professor Mendelson called Advanced Body Sensing to design and build small battery-powered wearable pulse oximeter devices that could be mounted on the forehead with a strap. Our final system design allowed for a number of vital signs to be measured including oxygen saturation (SpO₂) and heart rate (HR). Our system was specifically and expressly designed for remote monitoring in dangerous situations, such as combat casualty care, and emergency triage by first responders. The system was used as part of WPI’s PPL project and well as by the United States Air Force. Due to a change in direction by the principals of the company, Advanced Body Sensing was closed in 2014. My significant experience relating to pulse oximetry sensors and involving Professor Mendelson is discussed in more detail below in Section IX.A.

13. For over 30 years, I developed and taught courses at WPI relevant to the technology disclosed in the ’507 Patent. The classes I developed and taught

included associated laboratory exercises and projects, which I also developed. As reflected in my curriculum vitae (Exhibit 2001), I developed and taught at least the following relevant courses: (1) Microprocessor System Design; (2) Modeling and synthesis of digital system using Verilog and VHDL; (3) VHDL for Modeling and Synthesis; (4) Computer System Design; (5) Multi-processor and Distributed Systems; (6) Advanced Computer System Design; and (7) Advanced Digital System Design with FPGAs. All of these courses pertain to the technology disclosed in the '507 Patent. For example, the "Advanced Digital System Design with FPGAs" course required students to interface peripheral sensors such as a light sensor with an analog-to-digital converter to read information from the sensors and a digital-to-analog converter to convert sensed data into waveforms for processing.

14. In the course of my work at WPI, I have advised hundreds of engineering students in B.S. and M.S. programs and advised or co-advised approximately ten Ph.D. students that have completed Ph.D. degrees.

15. Additionally, I have authored or co-authored dozens of technical papers in refereed journals and conference proceedings and given many conference presentations in the fields I have taught, researched, and worked.

16. Aside from my work at WPI, I have years of experience working with portable, battery powered sensors. During leave in approximately 2000 from WPI, I was the Vice President of Engineering for Adaptive Instruments. At Adaptive

Instruments, I was responsible for designing and manufacturing a line of wireless industrial sensors for use in industrial process control. As a consultant, I helped program a small, battery powered device used to count the number of times an inhaler had been used. Also as a consultant, I helped design and program a wrist-worn device that reminded the user throughout the day of the medications that needed to be taken. My work on the wrist-worn device led to the patent I obtained on a “Low Power Infrared Communication System,” U.S. Patent No. 6,091,530.

17. In addition to U.S. Patent No. 6,091,530, I am a named co-inventor on several relevant patents, including:

- U.S. Patent No. 7,292,189, issued in 2007, titled “Methods and Apparatus for High Resolution Positioning”
- U.S. Patent No. 9,476,963, issued in 2016, titled “Search and Rescue Method and System”
- U.S. Patent No. 9,658,309, issued in 2017, titled “Precision Location Method and System”; and
- U.S. Patent No. 9,846,042, issued in 2017, titled “Gyroscope Assisted Scalable Visual Simultaneous Localization and Mapping.”

18. This short summary describes my experience and qualifications that I believe are 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

experience, qualifications, responsibilities, honors, awards, professional associations, presentations, publications, and patents is included as Exhibit 2001.

IV. APPLICABLE LEGAL STANDARDS

19. 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 '507 Patent and certain prior art to the '507 Patent.

20. Although I have been involved as a technical expert in patent matters before, I am not an expert in patent law. Therefore, 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. Priority

21. I understand from counsel that the date of invention of a patent (or “priority date”) is either (1) when the invention was reduced to practice or (2) when the invention was conceived, provided the inventor(s) were diligent in reducing the invention to practice. I understand that conception is defined as formation in the mind of the inventor of every claim limitation. I further understand from counsel there are two ways an invention can be reduced to practice, actual reduction to practice or constructive reduction to practice. Actual reduction to practice refers to

the creation of an embodiment of the invention. Constructive reduction to practice occurs when the inventors file a patent application.

B. Claim Construction

22. I understand that, in assessing the patentability of a patent claim, the Patent Office generally construes claim terms by giving them their ordinary and customary meaning, as they would have been understood by a POSITA at the time of the invention in view of the intrinsic record (patent specification and file history). However, I understand that the inventors may, in the patent specification, expressly define a claim term to have a meaning that differs from the term's ordinary and customary meaning. I also understand that the inventors may disavow or disclaim certain claim scope, thereby departing from the ordinary and customary meaning, when the intrinsic record demonstrates that a clear and unambiguous disavowal or disclaimer has occurred. I understand that extrinsic evidence, such as relevant technical literature and dictionaries, may be useful in ascertaining how a POSITA would have understood a claim term, but the intrinsic record is the primary source for determining the meaning of claim terms. For the purposes of this review, and to the extent necessary, I have interpreted each claim term in accordance with the principles set forth in this paragraph.

23. I understand that the preamble of a claim is limiting where it supplies antecedent basis for a subsequent claim limitation.

C. Anticipation

24. It is my understanding that a claim is unpatentable as “anticipated” under 35 U.S.C. § 102 if a single prior art reference discloses every limitation of the claim, arranged as in the claim. I understand that a prior art reference does not anticipate a claim, however, when it discloses multiple, distinct teachings that a POSITA might somehow combine to achieve the claimed invention.

25. Applying these legal standards to Claims 1-20 of the ’507 Patent, I believe Claims 1-20 would not have been anticipated based on the grounds asserted by Apple in its petitions, as discussed below.

D. Obviousness

26. 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 POSITA 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 non-obviousness,” also referred to as secondary considerations of non-obviousness. 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.

27. 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.

28. 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 POSITA 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.

29. 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 POSITA to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

30. I understand that the obviousness analysis must be performed from the perspective of a POSITA 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 POSITA, 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.

31. 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 POSITA at the time of the invention. In other

words, a reference discloses or teaches a claim limitation if a POSITA 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.

32. I understand that the obviousness analysis also must show that the prior art, taken as a whole, enables a POSITA to make and use the claimed invention.

33. Applying these legal standards to Claims 1-20 of the '507 Patent, I believe Claims 1-20 would not have been obvious to a POSITA based on the ground asserted by Apple in its petitions, as discussed below.

V. LEVEL OF ORDINARY SKILL IN THE RELEVANT ART

34. The field of art relevant to the '507 Patent is devices and sensors for the non-invasive measurement of physiological parameters, such as oxygen saturation.

35. I understand that obviousness must be evaluated from the perspective of what would have been known or understood by a POSITA at the time of the invention. I have been informed by counsel and understand that September 20, 2012 is the earliest effective filing date of the patent. I also understand that Apple has not

alleged that the '507 Patent is entitled to an effective filing date other than September 20, 2012. However, as explained below in Section VI, the priority date for independent Claims 1 and 13 is August 31, 2011 at the latest because the inventions recited in those claims were actually reduced to practice by that time. For the remaining claims, the priority date is September 20, 2012 at the latest.

36. In my opinion, a POSITA at the time of the '507 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.

37. I understand that Apple has proposed the following definition of a POSITA with respect to the '507 Patent:

[A] person of ordinary skill in the art as of the Critical Date of the '507 Patent (hereinafter a "POSITA") would have been a person with a working knowledge of physiological monitoring technologies. The person would have had at least a bachelor's degree in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field, and would have had

at least two years of relevant work experience with physiological monitoring technologies and devices, including user interfaces and capture and processing of physiological information, or equivalents thereof. Alternatively, the person could have also had a Master of Science degree in a relevant academic discipline to compensate for less related work experience in the same discipline or vice versa.

Exhibit 1003 ¶¶32-33.

38. I disagree with Apple's proposed definition of a POSITA because it requires no coursework, training, or experience with optics or optical physiological sensors and focuses on general physiological monitoring rather than optical sensors. I also disagree with Apple's proposed definition of a POSITA because, as Apple's expert confirmed at his deposition, Apple's definition could be satisfied by "a person who exclusively had experience with invasive physiological monitoring devices." Exhibit 2044, 20:3-9. However, my opinions would not change if I were to apply Apple's definition of a POSITA.

39. I understand the capabilities of a POSITA as of August 2011 and September 2012. Indeed, I possessed those capabilities myself before, during, and after that time. As a professor of electrical and computer engineering for over three decades, I have taught many such POSITAs and understand the level of knowledge and skill that persons with such academic experience would have possessed in August 2011 and September 2012. Through my education and decades of experience, such as teaching relevant engineering courses and working with Professor Yitzhak Mendelson in designing and developing pulse oximetry devices, I am familiar with

what a POSITA would have understood in August 2011 and September 2012, and am qualified to provide opinions from the perspective of a POSITA at the relevant time.

40. My opinions remain the same under both my own and Apple's definition of POSITA, and regardless of whether an August 2011 or September 2012 priority date is applied.

VI. THE PRIORITY DATE OF THE '507 PATENT

41. As explained in detail below, every limitation of independent Claims 1 and 13 of the '507 Patent was actually reduced to practice on or before August 31, 2011. Therefore, the priority date is August 31, 2011 for at least Claims 1 and 13.² I have organized my analysis of reduction to practice according to the limitations of Claims 1 and 13.

42. My opinion that the identified claims were actually reduced to practice by August 31, 2011 is based on the supporting declaration of '507 Patent co-inventor Bilal Muhsin (Exhibit 2038) as well as a corroborating video (the "Prototype Video," Exhibit 2039) and corroborating document (the "User Interface Summary," Exhibit 2040).

² For all other claims of the '507 Patent (Claims 2-12, 14-20), the priority date is at least as early as the earliest effective filing date of the '507 Patent, which I understand is September 20, 2012.

43. I understand that the Prototype Video was last modified on August 31, 2011. Exhibit 2038 ¶7. The Prototype Video demonstrates the operation of a prototype system that was created by August 31, 2011 at the latest, including an optical sensor, processing module, and iPhone running a mobile application, as shown below.

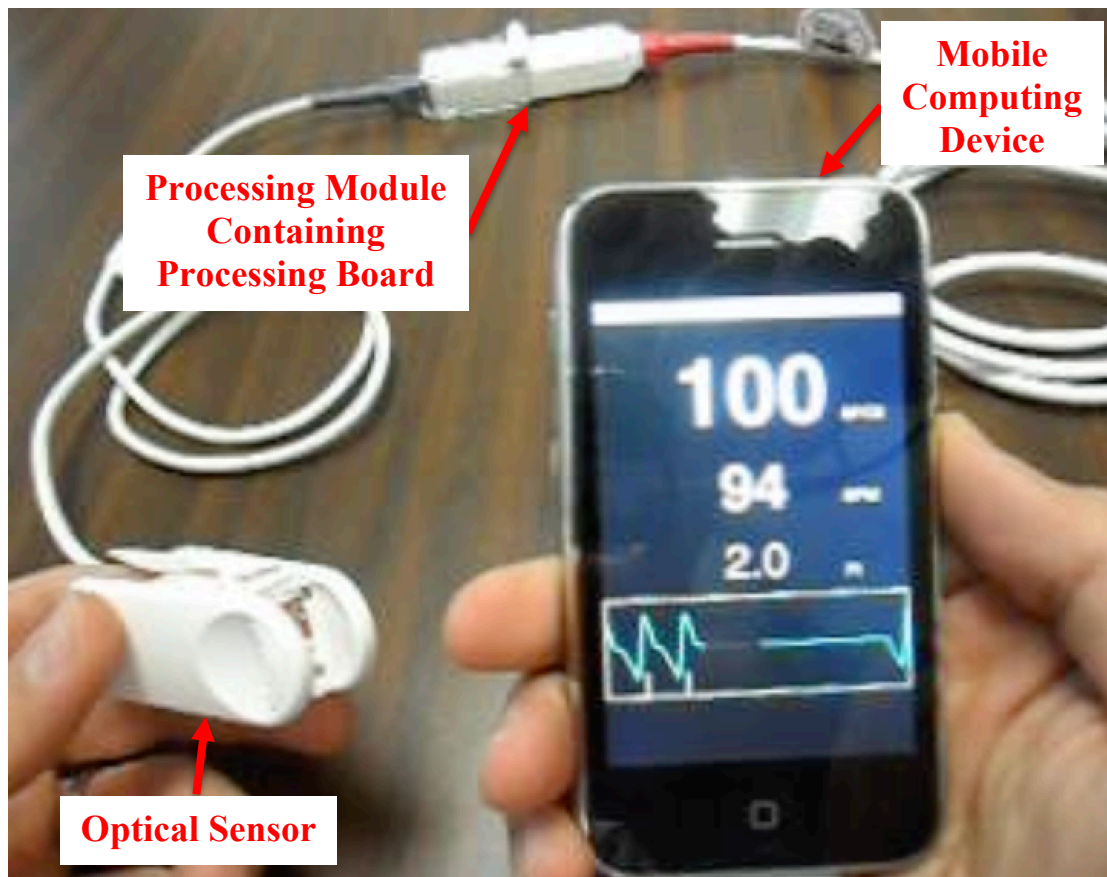


Exhibit 2039, 00:27; Exhibit 2038 ¶7. I understand from Mr. Muhsin that the processing module shown above contains a processing board that computes the measurements of physiological parameters that are ultimately displayed through an application running on the iPhone. Exhibit 2038 ¶7. The processing board (in the

processing module) receives signals from the optical sensor, processes those signals to calculate several measurements, and outputs the calculated measurements to the mobile computing device (iPhone) for display. Exhibit 2038 ¶7; Exhibit 2039. The mobile computing device (iPhone) receives those measurements from the processing module and displays them on the user interface generated by an application running on the iPhone, as shown in the Prototype Video. Exhibit 2038 ¶7; Exhibit 2039. Specifically, as shown from top to bottom on the user interface in the image above, the user interface of the iPhone application displays the user's oxygen saturation ("SpO2"), heart rate ("BPM"), perfusion index ("PI"), and PPG waveform. Exhibit 2039, 0:27; Exhibit 2038 ¶7.

44. I understand that the User Interface Summary was last modified on August 31, 2011. Exhibit 2038 ¶8. The User Interface Summary shows additional user interface screens generated by the mobile application of Masimo's prototype system. *Id.*; Exhibit 2039.

45. I understand that a working prototype of the system reflected in the Prototype Video and User Interface Summary was created by the '507 Patent inventors by August 31, 2011 at the latest. Exhibit 2038 ¶9.

46. I further understand that after the prototype system shown in the Prototype Video was reduced to practice, the system was swiftly made into a commercial product (called the Masimo iSpO2) that was announced and sold in 2013.

Id. ¶10; Exhibit 2041. As shown below and Mr. Muhsin confirms, the commercialized Masimo iSpO2 product was basically identical to the prototype system from the Prototype Video. Exhibit 2038 ¶10; Exhibit 2039; Exhibit 2041. The Masimo iSpO2 product (shown below) included a finger-clip optical sensor connected to a processing module (with a processing board) that in turn connected to the iPhone via a 30-pin connector, with the iPhone running an application to generate a user interface that displayed measurements (SpO₂, pulse rate, perfusion index, PPG waveform) on one portion of the user interface and user inputs on a different portion of the user interface.

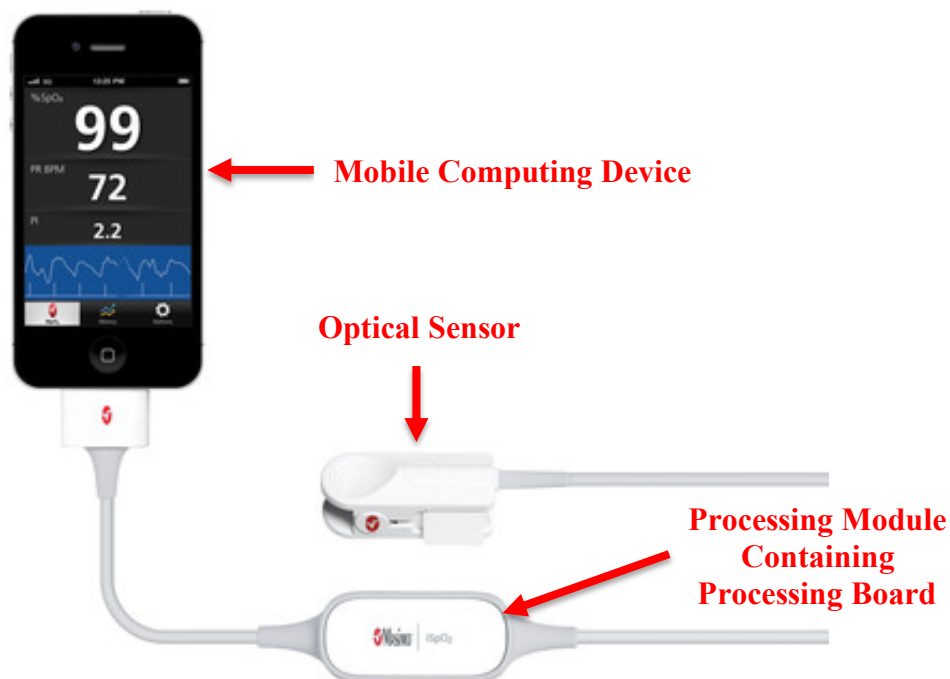


Exhibit 2042 (image cited in Exhibit 2041); Exhibit 2041; Exhibit 2038 ¶10. In the following two subsections, I analyze whether Claims 1 and 13 were actually reduced

to practice earlier than September 20, 2012, such that those claims are entitled to a priority date earlier than September 20, 2012. My reduction to practice analysis begins with Claim 13 before turning to Claim 1 because both claims share numerous similar limitations, but Claim 1 recites additional features.

A. Claim 13 Was Actually Reduced To Practice By August 31, 2011

47. As explained in detail below, every limitation of Claim 13 of the '507 Patent was actually reduced to practice on or before August 31, 2011.

1. Limitation [13PRE] (“A computer-implemented method of informing a user of mobile measurement of oxygen saturation (“SpO2”), the computer-implemented method comprising.”)

48. I understand from counsel that the preamble of Claim 13 is not limiting and that neither Masimo nor Apple contends it is limiting in this proceeding.

49. However, I understand that in the Delaware Litigation, Apple proposes that “mobile measurement” in the preamble means “measurement through motion.”³ I take no position on the propriety of Apple’s proposed construction. But even under Apple’s proposed construction, the evidence shows that the preamble of Claim 13 was actually reduced to practice. For example, I understand that the Masimo Low Power SET Board was the processing board contained within the processing module of the prototype system shown in the Prototype Video. Exhibit 2038 ¶11. I also

³ The various claim constructions that Apple proposes in the Delaware Litigation are provided further below in Section VII of my declaration.

understand that that processing board measures through motion and did so when using the prototype system shown in the Prototype Video by August 31, 2011 at the latest. *Id.*

50. Further, as shown in the Prototype Video, the prototype system is a mobile system for taking measurements. Exhibit 2039. The optical sensor worn on the user's finger is connected to the small processing module that in turn is connected to the iPhone, with no additional connections that prevented the system from being used to take a mobile measurement. *Id.*

51. As described below with respect to the limitations of Claim 13, the system shown in the Prototype Video is a computer-implemented system for informing a user of oxygen saturation measurements, and by using the system to measure oxygen saturation, the system likewise perform a computer-implemented method of informing a user of oxygen saturation measurements.⁴ The prototype system shown in the Prototype Video is computer-implemented, at least because it uses a processing board to calculate measurements and an application operated by the

⁴ I understand that a system claim covers a combination of components and a method claim covers a series of steps for performing a function. The system shown in the Prototype Video is a computer-implemented system for informing a user of oxygen saturation measurements, and using the system shown in the Prototype Video performs a computer-implemented method of informing a user of oxygen saturation measurements, as explained herein.

mobile computing device (iPhone) to display the calculated measurements.

Exhibit 2038 ¶¶7-8; Exhibit 2039.

52. Accordingly, to the extent the preamble of Claim 13 is limiting, “[a] computer-implemented method of informing a user of mobile measurement of oxygen saturation (“SpO2”), the computer-implemented method comprising:” was actually reduced to practice on or before August 31, 2011.

2. **Limitation [13A] (“outputting, from an optical sensor of an SpO2 measurement system, one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and”)**

53. The Prototype Video shows that the finger-clip optical sensor emits light. Exhibit 2039, 0:18-0:23. The Prototype Video shows, for example in the below image, that the optical sensor emitted red light when in use.



Id., 00:18. I understand that the prototype system's optical sensor included red and infrared LEDs that emitted red and infrared LED into the user's finger when in use. Exhibit 2038 ¶12. However, only the emitted red light is visible in the Prototype Video because infrared light is not visible to the human eye.

54. I understand the prototype system's optical sensor also contained a detector that received emitted light after it passed through and was attenuated by the user's finger. Exhibit 2038 ¶13. The detector of the sensor generated one or more signals based on the light it detected, and output those one or more signals to the processing board via the cable. *Id.*; Exhibit 2039, 00:30. The one or more signals output by the finger-clip optical sensor were responsive to the user's oxygen saturation because the processing board (in the processing module) could (and did)

use those signals to calculate measurements of the user, including the user's oxygen saturation. Exhibit 2039; Exhibit 2038 ¶13.

55. Accordingly, “outputting, from an optical sensor of an SpO₂ measurement system, one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue” was actually reduced to practice on or before August 31, 2011.

3. **Limitation [13B] (“via a processing board of the SpO₂ measurement system, the processing board in data communication with the optical sensor and a mobile computing device including a display:”)**

56. As shown in the Prototype Video, the processing board (within the processing module) is connected via cable to, and thus in data communication with, the finger-clip optical sensor and a mobile computing device (iPhone) that has a display. Exhibit 2039. Specifically, as Mr. Muhsin confirms, the one or more signals from the detector of the system's optical sensor are output through the cable to the processing board in the processing module. *Id.*; Exhibit 2038 ¶14. The measurements computed by the processing board are then output through another cable to the mobile computing device (iPhone) for display using the iPhone's display. *See, e.g.*, Exhibit 2039, 0:30 (iPhone displaying SpO₂ measurement); Exhibit 2038 ¶14.

57. Accordingly, “via a processing board of the SpO₂ measurement system, the processing board in data communication with the optical sensor and a mobile computing device including a display” was actually reduced to practice on or before August 31, 2011.

4. **Limitation [13C] (“[via a processing board] ... receiving said one or more signals from the optical sensor;”)**

58. The Prototype Video shows, and Mr. Muhsin confirms, that the processing board (in the processing module) receives the one or more signals from the finger-clip optical sensor (specifically, from its detector). Exhibit 2039; Exhibit 2038 ¶15. Specifically, the processing board received those signals from the optical sensor and calculated the measurements (of the user’s including SpO₂, pulse rate, perfusion index, and the PPG waveform) that are ultimately displayed via the user interface of an application on the iPhone. *See, e.g.*, Exhibit 2039, 0:31; Exhibit 2038 ¶15. The Prototype Video shows the cable used for the processing board to receive the one or more signals from the optical sensor.

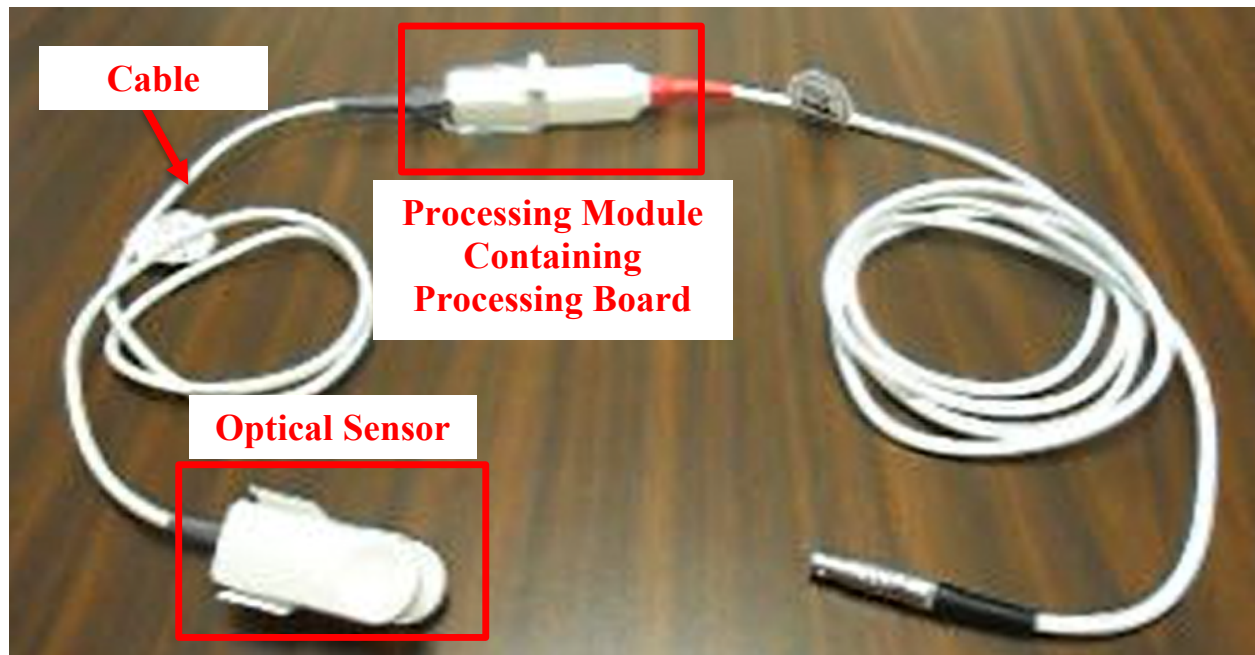


Exhibit 2039, 0:01.

59. Accordingly, “[via a processing board] ... receiving said one or more signals from the optical sensor” was actually reduced to practice on or before August 31, 2011.

5. **Limitation [13D] (“[via a processing board] . . . processing said one or more signals to generate the SpO₂ measurement values; and”)**

60. Mr. Muhsin confirms that the prototype system’s processing board used the one or more signals received from the finger-clip optical sensor to calculate measurement values, including values of SpO₂, pulse rate, perfusion index, and the PPG waveform. Exhibit 2038 ¶16. Specifically, Mr. Muhsin explains that measurement values were calculated only on the processing board, and the iPhone only ran the application used to display the already-calculated values. *Id.*

Mr. Muhsin further explains that performing all of the signal processing with the processing board was a main purpose of the inventions in the '507 Patent, and that the prototype system shown in the Prototype Video operated in this way. *Id.* He concludes that the SpO₂ and other measurement values ultimately displayed on the iPhone (shown below) were actually calculated by the processing board. *Id.*



Exhibit 2039, 00:33.

61. Accordingly, “[via a processing board] . . . processing said one or more signals to generate the SpO₂ measurement values” was actually reduced to practice on or before August 31, 2011.

6. **Limitation [13E] (“[via a processing board] ... outputting the SpO2 measurement values to the mobile computing device; and”)**

62. The Prototype Video shows that the processing board (within the processing module) was connected through a cable to the mobile computing device (iPhone). Exhibit 2039. Mr. Muhsin confirms that the measurement values calculated by the prototype system’s processing board (SpO₂, pulse rate, perfusion index, and the PPG waveform) were output by that processing board, through the cable, to the mobile computing device (iPhone), where the measurements were displayed on the user interface of an application executed by the iPhone. Exhibit 2038 ¶17. Consistent with Mr. Muhsin’s description, the Prototype Video shows that measurement values output by the processing board (SpO₂, pulse rate, perfusion index, and the PPG waveform) were received by the iPhone and displayed via the application running on the iPhone. Exhibit 2039, 0:30-0:40.

63. Accordingly, “[via a processing board] ... outputting the SpO₂ measurement values to the mobile computing device” was actually reduced to practice on or before August 31, 2011.

7. **Limitation [13F] (“via an application configured to execute commands on the mobile computing device:”)**

64. The Prototype Video shows a mobile application being run on the mobile computing device (iPhone) to generate a graphical user interface that displayed the measured values received from the processing board. Exhibit 2039,

0:20-0:40. The mobile application was run on, and executed commands on, the iPhone's processor. *Id.* Consistent with the Prototype Video, Mr. Muhsin confirms that the prototype system used a mobile application that was executed by the iPhone's processor to execute commands on the iPhone, including displaying measured values on the iPhone's display. Exhibit 2038 ¶18.

65. Accordingly, "via an application configured to execute commands on the mobile computing device" was actually reduced to practice on or before August 31, 2011.

8. **Limitation [13G] ("[via an application] ... generating a graphical user interface having a plurality of display portions;")**

66. The Prototype Video shows the prototype system's mobile application being run on the mobile computing device (iPhone) to generate a graphical user interface that displayed the measured values (received from the processing board) on the screen of the iPhone. Exhibit 2039, 0:20-0:40. For example, below is one graphical user interface generated by the prototype system's mobile application being run on the iPhone. The plurality of generated display portions are shown using different colored boxes below.



Id., 00:33. I understand that the User Interface Summary shows the various user graphical user interface screens generated by the prototype system's mobile application that was executed on the iPhone. Exhibit 2040; Exhibit 2038 ¶19. Consistent with the Prototype Video, Mr. Muhsin confirms that the prototype system used an application that was executed by the iPhone's processor to generate a graphical user interface that displayed measured values. Exhibit 2038 ¶19. Mr. Muhsin also confirms that the graphical user interface screens shown in the User Interface Summary accurately depict the user interface screens that had been created for the system's mobile application by August 31, 2011. *Id.* Further, as shown

below, the application run on the prototype system's mobile computing device (iPhone) generated a graphical user interface with multiple display portions, including a variety of measured values displayed at the top and a variety of tappable buttons (or icons) at the bottom.

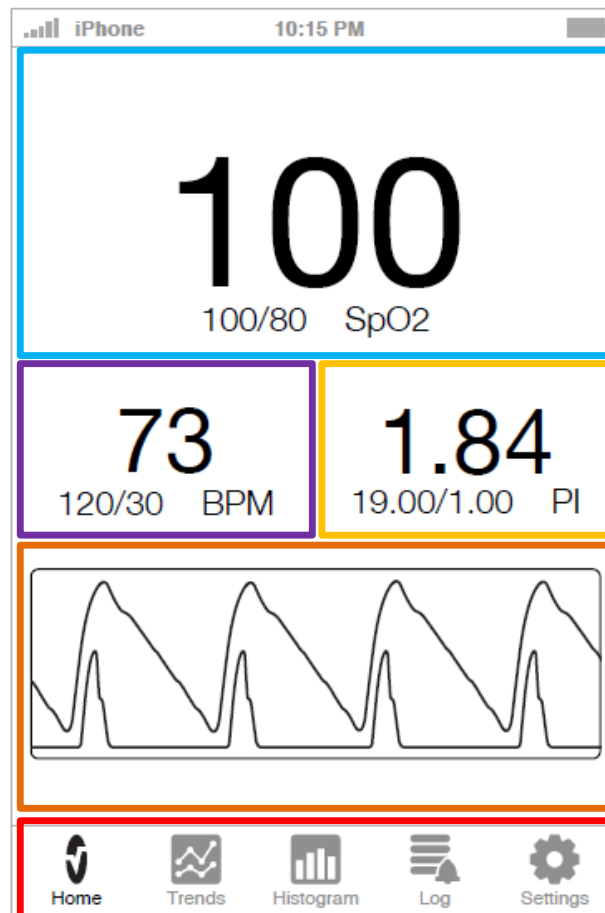


Exhibit 2040, 3.

67. Accordingly, “[via an application] ... generating a graphical user interface having a plurality of display portions” was actually reduced to practice on or before August 31, 2011.

9. **Limitation [13H] (“[via an application] ... displaying, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and”)**

68. The Prototype Video shows the system’s mobile computing device (iPhone) running an application to generate a graphical user interface that displays, in at least one display portion, a representation of a physiological parameter of a plurality of physiological parameters (e.g., SpO₂, pulse rate, perfusion index, and the PPG waveform are displayed).

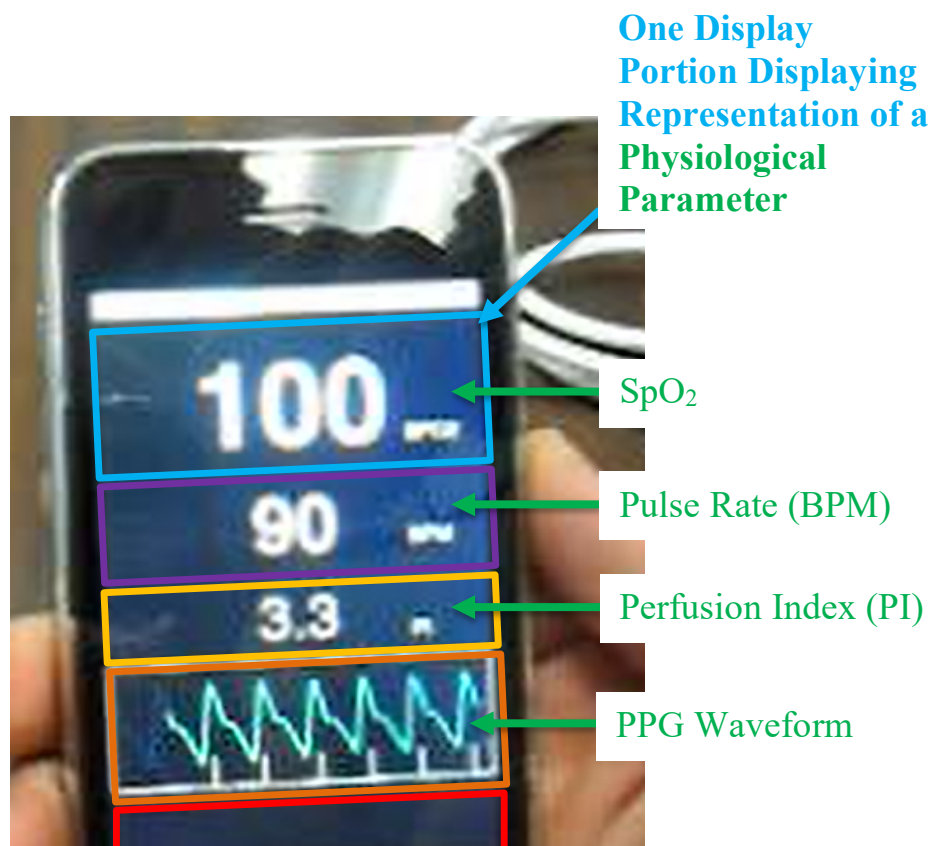


Exhibit 2039, 0:33. The User Interface Summary also shows that the prototype system's application run by the iPhone generated basically the same user interface screens apparent in the Prototype Video, including the graphical user interface shown below.

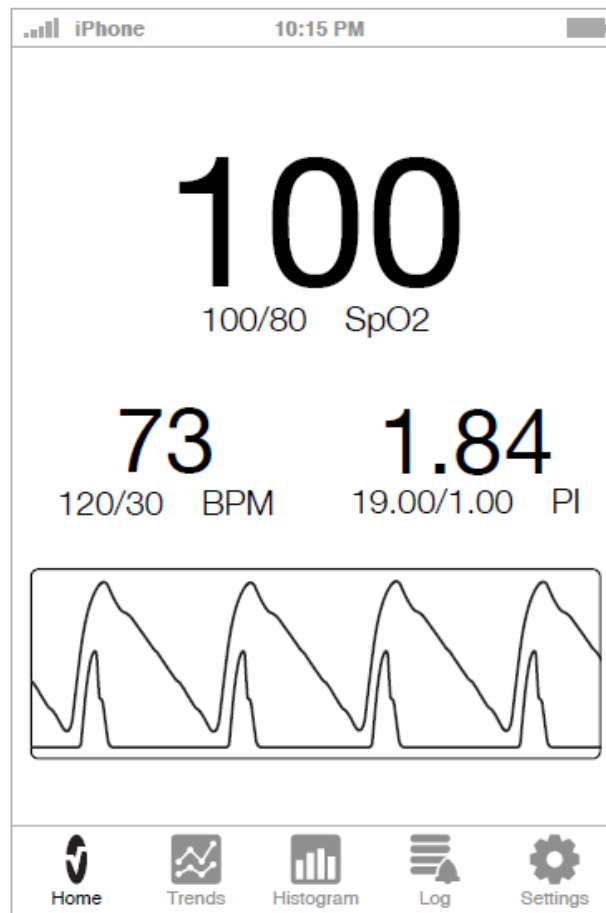


Exhibit 2040, 3. Consistent with the above evidence, Mr. Muhsin confirms that the graphical user interface screens shown in the User Interface Summary accurately depict the user interface screens that had been created for the system's mobile application by August 31, 2011. Exhibit 2038 ¶20.

69. Accordingly, “[via an application] ... displaying, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO₂ measurement values” was actually reduced to practice on or before August 31, 2011.

10. **Limitation [13I] (“[via an application] ... displaying, in a different portion of the plurality of portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application.”)**

70. I understand that the User Interface Summary shows how Masimo’s mobile application operated on the mobile computing device (iPhone) to display various user interface screens on the mobile computing device. Exhibit 2040; Exhibit 2038 ¶21. The User Interface Summary shows the application run on the iPhone that generated a user interface including: (1) one display portion that displays a representation of a physiological parameter (e.g., SpO₂) as shown above for the prior limitation; and (2) a different display portion (e.g., the bottom of the user interface) that displays a plurality of user inputs (tappable buttons or icons, including “Home,” “Trends,” “Histogram,” “Log,” and “Settings”) that were configured to allow the user to interact with the mobile application, as shown below.

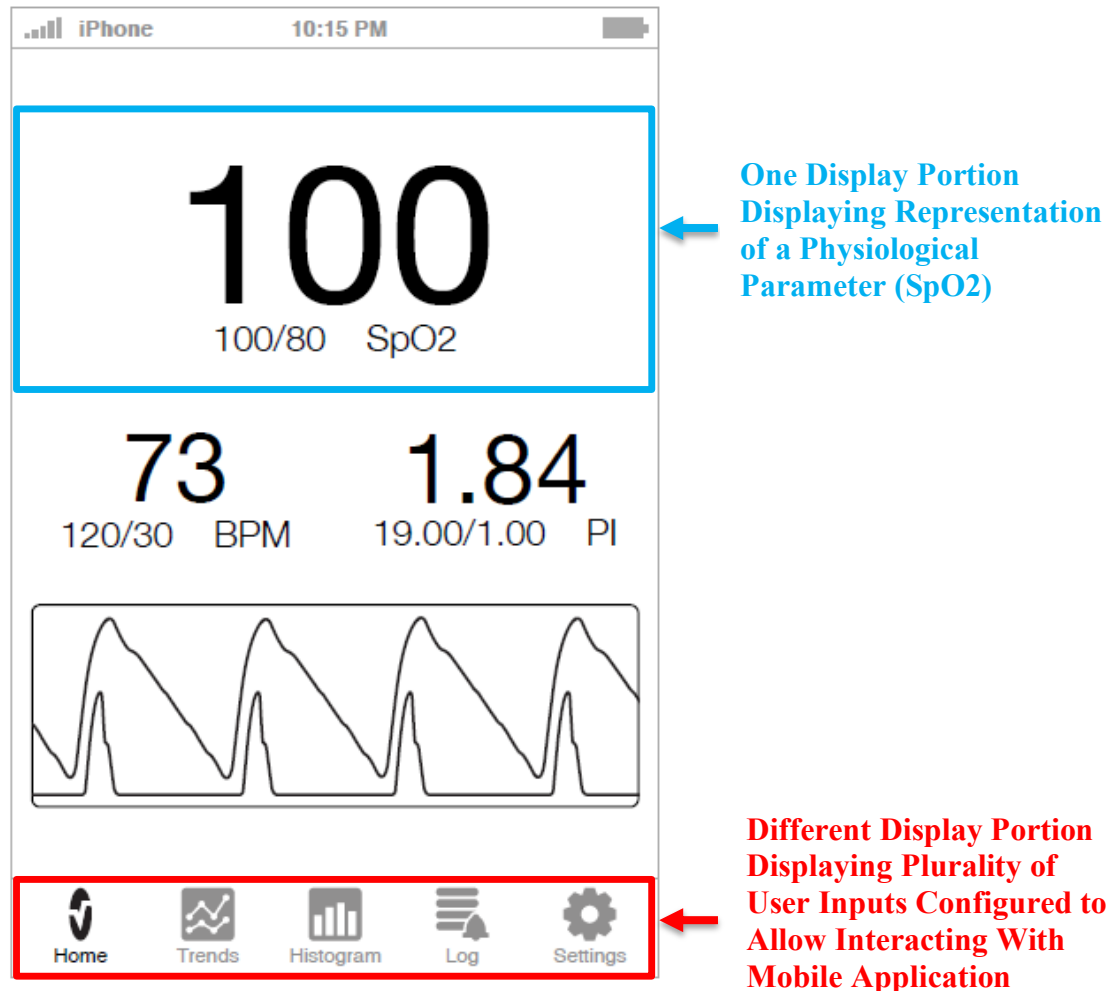


Exhibit 2040, 3. Consistent with the above evidence, Mr. Muhsin confirms that the graphical user interface screens shown in the User Interface Summary accurately depict the user interface screens that had been created for the system's mobile application by August 31, 2011, and that the bottom of the application's graphical user interface was designed to be tappable buttons/icons that could be (and were used) to interact with the system's application. Exhibit 2038 ¶21.

71. Accordingly, "[via an application] ... displaying, in a different portion of the plurality of portions, a plurality of user inputs configured to allow the user to

interact with at least one of the plurality of display portions or the application” was actually reduced to practice on or before August 31, 2011.

72. Therefore, every limitation of Claim 13 of the ’507 Patent was actually reduced to practice on or before August 31, 2011. The priority date of Claim 13 is, therefore, August 31, 2011 at the latest.

B. Claim 1 Was Actually Reduced To Practice By August 31, 2011

73. As explained in detail below, every limitation of Claim 1 of the ’507 Patent was actually reduced to practice on or before August 31, 2011.

1. Limitation [1PRE] (“A mobile pulse oximetry system for informing a user of mobile measurement of oxygen saturation (“SpO2”), the mobile pulse oximetry system comprising:”)

74. I understand from counsel that the preamble of Claim 1 is not limiting and that neither Masimo nor Apple contends it is limiting. However, for the reasons discussed above with respect to the preamble of Claim 13 (Section VI.A.1), even under Apple’s proposed construction of “mobile measurement” in the Delaware Litigation, the preamble of Claim 1 was actually reduced to practice on or before August 31, 2011.

2. **Limitation [1A] (“an SpO2 measurement system including:”);
Limitation [1B] (“an optical sensor configured to output one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and”)**

75. For the reasons discussed above (Section VI.A.2), this claim limitation was actually reduced to practice on or before August 31, 2011.

3. **Limitation [1C] (“a processing board in data communication with the optical sensor and a mobile computing device including a display and cellular communication, wherein the processing board is configured to:”)**

76. For the reasons discussed above (Section VI.A.3), this claim limitation was actually reduced to practice on or before August 31, 2011.

4. **Limitation [1D] (“[a processing board ... configured to] ... receive said one or more signals from the optical sensor;”)**

77. For the reasons discussed above (Section VI.A.4), this claim limitation was actually reduced to practice on or before August 31, 2011.

5. **Limitation [1E] (“[a processing board ... configured to] ... process said one or more signals to generate SpO2 measurement values; and”)**

78. For the reasons discussed above (Section VI.A.5), the claim limitation was actually reduced to practice on or before August 31, 2011.

6. **Limitation [1F] (“[a processing board ... configured to] ... output the SpO2 measurement values to the mobile computing device; and”)**

79. For the reasons discussed above (Section VI.A.6), this claim limitation was actually reduced to practice on or before August 31, 2011.

7. **Limitation [1G] (“one or more hardware processors of the mobile computing device configured to execute an application, the application configured to execute commands to:”)**

80. For the reasons discussed above (Section VI.A.7), this claim limitation was actually reduced to practice on or before August 31, 2011.

8. **Limitation [1H] (“generate a graphical user interface having a plurality of display portions;”)**

81. For the reasons discussed above (Section VI.A.8), this claim limitation was actually reduced to practice on or before August 31, 2011.

9. **Limitation [1I] (“display, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and”)**

82. For the reasons discussed above (Section VI.A.9), this claim limitation was actually reduced to practice on or before August 31, 2011.

10. **Limitation [1J] (“display, in a different portion of the plurality of display portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application;”)**

83. For the reasons discussed above (Section VI.A.10), this claim limitation was actually reduced to practice on or before August 31, 2011.

11. **Limitation [1K] (“wherein the processing of the one or more signals to generate SpO2 measurement values is performed only on the processing board, thereby freeing up memory available to the mobile computing device; and”)**

84. Mr. Muhsin confirms that the processing of signals output by the prototype system’s finger-clip optical sensor to generate SpO₂ measurement values (as well as pulse rate, perfusion index, and the PPG waveform measurement values) was performed only on the processing board in the processing module. Exhibit 2038 ¶22. Mr. Muhsin also confirms that, because only the processing board of the prototype system processed the optical sensor signals and calculated measurements, memory on the mobile computing device (iPhone) that otherwise have would been used to store and process the signals was freed up for other uses. *Id.* He concludes that performing all of the signal processing with the processing board was a main purpose of the inventions in the ’507 Patent, and that the prototype system shown in the Prototype Video operated in this way. *Id.* Consistent with Mr. Muhsin’s testimony, the Prototype Video shows that the iPhone application opens quickly and operates smoothly, which is partly because processing the optical sensor signals to compute measurement values was done by the processing module, such that the iPhone application could simply display the already computed values. Exhibit 2039; Exhibit 2038 ¶22.

85. Accordingly, “wherein the processing of the one or more signals to generate SpO₂ measurement values is performed only on the processing board,

thereby freeing up memory available to the mobile computing device;” was actually reduced to practice on or before August 31, 2011.

12. **Limitation [1L] (“wherein the processing board is configured to draw power for operation from the mobile computing device.”)**

86. As shown in the Prototype Video, the finger-clip optical sensor was directly connected to the processing board (which is inside the processing module), and the processing board was directly connected to the mobile computer device (iPhone) through a 30-pin connector. Exhibit 2039. The 30-pin connector used to connect the iPhone to the rest of the system is shown below.

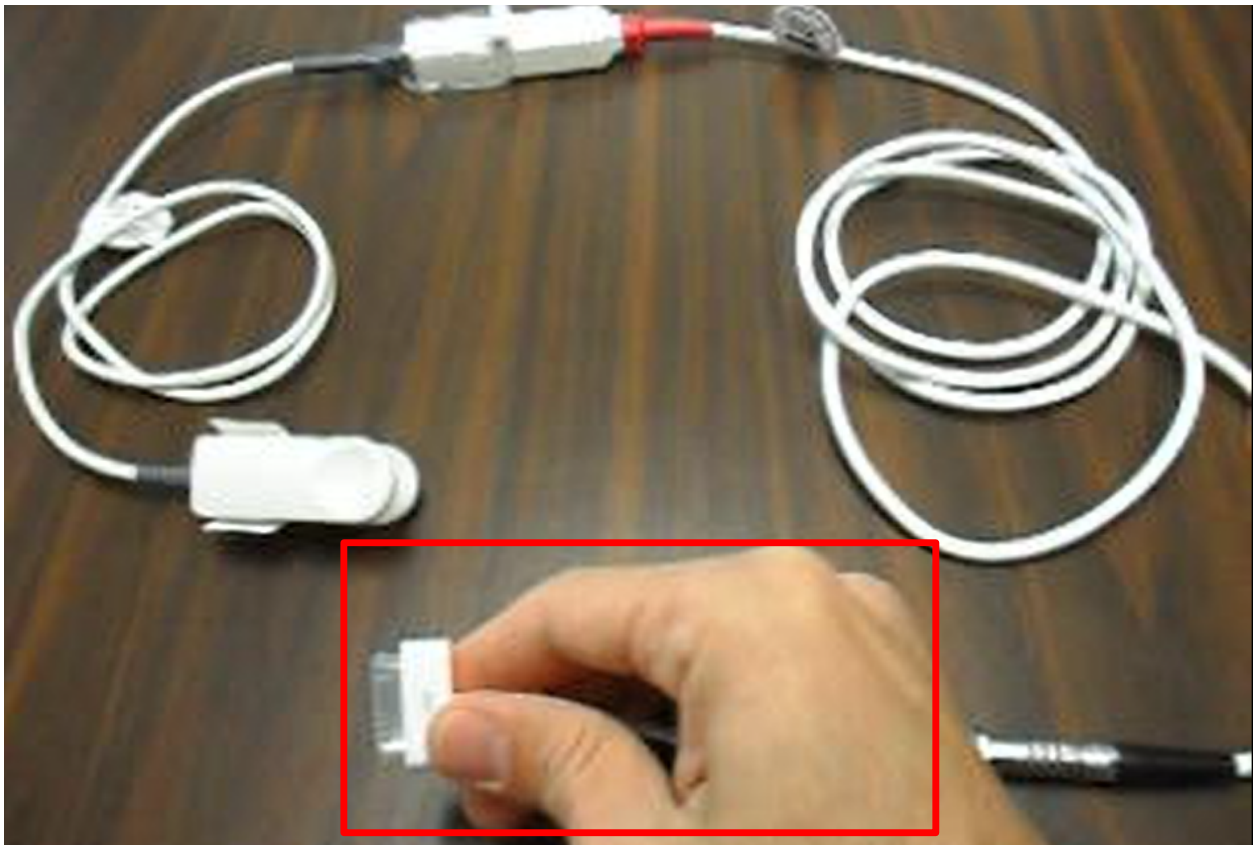


Exhibit 2039, 0:10. The 30-pin connector shown above connected the processing module to the mobile computing device (iPhone), as shown below.



Id., 0:12. As shown in the Prototype Video, once the processing module was connected to the iPhone using the 30-pin connector, the system's finger-clip optical sensor illuminated for the first time because the iPhone powered both the optical sensor and the processing module (and the processing board it contains).



Id., 0:18. Consistent with the Prototype Video, Mr. Muhsin confirms that the prototype system only became operational once the 30-pin connector was connected to the iPhone. He explains that the finger-clip optical sensor and processing module had to, and did, draw power for operation from the iPhone because the optical sensor and processing module did not have their own power source. Exhibit 2038 ¶23. Therefore, as shown in the Prototype Video, both the optical sensor and processing module drew power for their operation from the iPhone—the iPhone powered the whole system. *Id.*; Exhibit 2039.

87. Accordingly, “wherein the processing board is configured to draw power for operation from the mobile computing device” was actually reduced to practice on or before August 31, 2011.

88. Therefore, every limitation of Claim 1 of the ’507 Patent was actually reduced to practice on or before August 31, 2011. The priority date of Claim 1 is, therefore, August 31, 2011 at the latest.

VII. CLAIM CONSTRUCTION

89. For purposes of this Declaration, I apply the plain and ordinary meaning of the terms of the '507 Patent. I understand that Masimo's position in this proceeding is that the claim terms of the '507 Patent need no construction and should be given their plain and ordinary meaning, and that Masimo took the same position in the Delaware Litigation. I understand that Apple's position in this proceeding is that "no claim terms need be construed to resolve issues of controversy in the present Petition." Pet., 2-3. However, I understand that Apple took a contrary position in the Delaware Litigation, where it proposed express claim constructions for five terms in the '507 Patent. The parties' claim construction positions in the Delaware Litigation are provided below.

90. I understand that the following table includes the parties' proposed constructions in the Delaware Litigation for the phrase "mobile measurement":

Masimo's Delaware Construction	Apple's Delaware Construction
Preamble is not limiting; No construction needed	Preamble is limiting; "measurement during motion"

Exhibit 2029, 27-33.

91. I understand that the following table includes the parties' proposed constructions in the Delaware Litigation for the phrase "one or more signals":

Masimo’s Delaware Construction	Apple’s Delaware Construction
No construction needed	raw detected signal(s)

Id., 34-39.

92. I understand that the following table includes the parties’ proposed constructions in the Delaware Litigation for the phrase “via a processing board ... receiving ... processing ... outputting”:

Masimo’s Delaware Construction	Apple’s Delaware Construction
No construction needed	The same processing board performs the receiving, processing, and outputting steps

Id., 46-52.

93. I understand that the following table includes the parties’ proposed constructions in the Delaware Litigation for the phrase “via an application ... generating ... displaying ... displaying”:

Masimo’s Delaware Construction	Apple’s Delaware Construction
No construction needed.	the same application performs the generating, displaying, and displaying steps

Id., 53-57.

94. I understand that the following table includes the parties’ proposed constructions in the Delaware Litigation for the phrase “the processing board in data

communication with the optical sensor and a mobile computing device including a display”:

Masimo’s Delaware Construction	Apple’s Delaware Construction
No construction needed.	the processing board communicates data with—rather than is a part of—the optical sensor and a mobile computing device including a display

Id., 40-45. In sum, I understand that Masimo proposes applying the plain and ordinary meaning of the ’507 Patent’s claim language (i.e., no constructions needed) in both the Delaware Litigation and this proceeding. However, I understand that Apple has taken inconsistent positions in these parallel matters by arguing in the Delaware Litigation that various claim terms have the express constructions noted above but arguing in this proceeding that no constructions are needed.

95. As explained below, it is my opinion that Apple fails to show that any claims are anticipated or rendered obvious under the plain and ordinary meaning of the claim language. It is also my opinion that Apple fails to show that any claims are anticipated or rendered obvious under Apple’s proposed construction of “one or more signals” in the Delaware Litigation.

VIII. SUMMARY OF OPINIONS

96. I have conducted analyses leading to the opinions expressed in this Declaration. To summarize my opinions, it is my conclusion, from a technical point of view, that Claims 1-20 of the ’507 Patent are not anticipated and would not have

been obvious to a POSITA based on the grounds asserted by Apple in its Petition.

Specifically, it is my opinion that:

- (Grounds 1A1-1I) Claims 1-20 of the '507 Patent would not have been anticipated by, or obvious to a POSITA based on, Mendelson alone or in combination with D'Angelo, Ording, Tran, Kianl, and/or Goldsmith; and
- (Grounds 2A-2I) Claims 1-20 would not have been obvious to a POSITA based on Mendelson alone or in combination with D'Angelo, Moon, Ording, Tran, Kianl, and/or Goldsmith.

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

IX. BACKGROUND OF THE TECHNOLOGY

A. Pulse Oximetry

98. Pulse oximetry is a noninvasive method of measuring the arterial oxygen saturation of a patient's blood. Pulse oximeters typically emit light at two wavelengths, often red (approximately 600-700 nm) and infrared (approximately 800-950 nm). Red and infrared wavelengths are chosen because deoxyhemoglobin absorbs more light (i.e., has a higher optical extinction coefficient) than oxyhemoglobin in the red region of the spectrum, whereas oxyhemoglobin absorbs more light than deoxyhemoglobin in the infrared region of the spectrum.

99. The emitted red and infrared light enters into the user's tissue, where some of the light is absorbed by the blood or other tissue and some is not absorbed.

The light that is not absorbed either passes through the tissue to a light detector on the opposite side of the tissue from where the light entered (“transmittance” pulse oximetry) or is reflected back to a light detector on the same side of the tissue from where the light entered (“reflectance” pulse oximetry). The light detector outputs an electrical signal corresponding to the intensity of the detected light of all wavelengths it is capable of detecting. A processor separates that detector signal into what are called photoplethysmography (PPG) signals—one PPG signal for the detected intensity of red light, one PPG signal for the detected intensity of infrared light. The amount of blood in the user’s arteries changes as the heart beats (systole) and relaxes (diastole). The beating of the heart permits each PPG signal to be separated into (1) a pulsatile (or “AC”) signal component that is caused by arterial blood and (2) a non-pulsatile (or “DC”) signal component that is primarily caused by bloodless tissue and residual blood when the heart is in diastole (i.e., venous blood). Complicated algorithms can then be used to calculate the ratio of AC/DC components for the red PPG signal divided by the ratio of AC/DC components for the infrared PPG signal—i.e., a ratio of ratios. This ratio of ratios can then be empirically mapped to an oxygen saturation value.

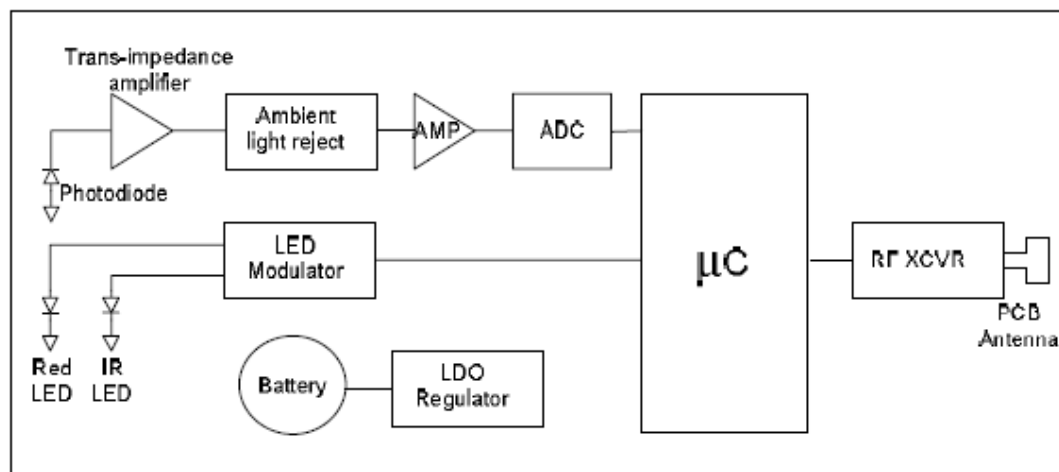
100. I understand the level of skill in the art at the relevant time very well, based on my work on pulse oximetry sensor design. From 2005 through 2008, I

worked extensively with my colleague at WPI, Professor Yitzhak Mendelson, Ph.D., to research, publish papers about, design, and make, wearable pulse oximetry devices.

101. Around 2005-2006, I worked with Professor Mendelson to develop a prototype forehead-worn pulse oximeter and publish the findings from our work. One publication stemming from this work is titled “A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring,” and is Apple’s Exhibit 1011. As shown below, our prototype sensor design was a sensor with one photodiode, one red LED, and one infrared LED.



102.



103. *Id.*, 2. The sensor also includes a microcontroller and RF transceiver for transmitting packets to a receiving module. *Id.*, 2. We recognized at the time that, to become effective, a wearable pulse oximeter must be comfortable to wear. *Id.*, 1. At the ATA conference in 2006, we presented the results of our prototype sensor work.

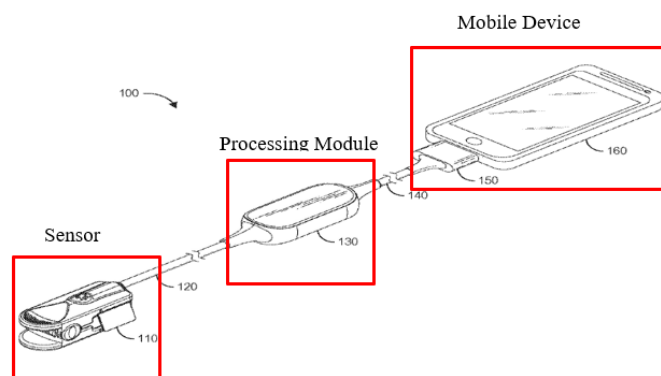
104. Subsequently, in July 2007, Professor Mendelson and I formed a company together called Advanced Body Sensing to design, develop, and build a new, wireless, battery powered, forehead-mounted reflectance pulse oximetry device. Together, Professor Mendelson and I (along with a few other engineers we hired) developed a new housing, optical sensor, and associated electronics, including the design and programming of microprocessor and wireless transmission components. Our design and development process led us to the final forehead-mounted pulse oximetry device shown below.



105. Our device included one red LED and one infrared LED (above, right), and a single photodetector (above, left). Over the course of 2007 and 2008, Advanced Body Sensing received approximately \$1,000,000 to develop and build the above pulse oximetry devices for the United States Air Force.

B. Overview of the '507 Patent (Exhibit 1001)

106. The '507 Patent is directed to a patient monitor that connects to mobile devices. Exhibit 1001, 1:20-25. In some embodiments, the patient monitor includes a sensor that connects to a processing module which then connects to a mobile device. *Id.*, FIG. 1A, 3:57-62, 4:65-5:14. The processing module receives signals from the sensor, processes the signals, calculates measurement values, and then sends them to the mobile device. *Id.*, 4:65-5:14. The mobile device contains “software applications for managing the data and sensor.” *Id.*, 10:43-46. These applications display the measurement value on the mobile device and provide a user interface for the application. *Id.*, 10:35-46. Figure 1A shows this configuration:



Id., FIG. 1A. The '507 Patent explains that the processing module can comprise one or more processing boards within the module, such as an analog processing board and a digital processing board. *Id.*, FIG. 1C, 9:1-6, 9:62-65.

107. In my opinion, the claims of the '507 Patent provide distinct advantages over the prior art. As described in the '507 Patent, “[m]obility and ease of use are key factors in the health care industry because they correlate to efficient, rapid patient care as well as enable patients to participate in their own care.” Exhibit 1001 2:14-16. The claimed inventions allow for accurate measurements of SpO2 values outside of a hospital environment using a mobile device, in part by using a separate processing board. As the specification explains, a processing board can provide more accurate SpO2 measurement values to the mobile computing device, particularly when compared to using the mobile computing device itself to compute the values. For example, the specification explains “the board or card can include one or more signal processors and associated memory, I/O, and the like to provide monitored physiological data to applications executing on traditional smartphone processing environments, such that board or card handles advanced signal processing and the smartphone displays parameter data.” *Id.*, 2:29-38; see also *id.*, 9:47-65. Using a dedicated processing board also improves power savings and decreases measurement latency when compared to using a processor on a mobile device. *Id.*, 6:38-7:2. This innovative system allows for more comprehensive patient care than was previously

available, for example by allowing a patient's blood oxygenation values to be continuously monitored to identify a risk of hypoxemia prior to a surgery. Exhibit 1001, 2:58-3:5.

C. Apple's Cited References

1. Mendelson (Exhibit 1011)

108. The "Mendelson" publication relied on by Apple is titled "A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring" and was authored by myself, Dr. Mendelson, and Comtois (who was then our student). Dr. Mendelson and I were professors and colleagues at WPI for several years. I worked extensively with Dr. Mendelson to research, publish papers about, design, and make wearable pulse oximetry devices, including the pulse oximeter described in the Mendelson reference. Exhibit 1011.

109. Mendelson describes a "pulse oximeter for *remote physiological monitoring*." Exhibit 1011, 1. That the pulse oximeter must be able to complete remote monitoring was a fundamental requirement of the system described in Mendelson. We specifically designed our pulse oximetry system to provide "remote" monitoring because it was intended to be used by a medic assessing injuries in a dangerous combat and/or first responder scenarios. *Id.*, 1-4. As our publication expressly states, the Mendelson system was designed "for use in combat casualty care, such as for remote triage, and by first responders, such as firefighters." *Id.*, 1.

Therefore, the Mendelson system includes three wirelessly connected components: (1) a “Sensor Module” worn by each injured person (on their forehead); (2) a “Receiver Module” also worn by each injured person (on their body); and (3) one PDA carried by a medic to monitor the injured persons in the field. *Id.*, 1-4. The Sensor Module generates sensor data and then wirelessly transmits packets of sensor data to the Receiver Module. *Id.*, 2. The Receiver Module processes the sensor data and computes the user’s oxygen saturation, heart rate, and PPG waveform and then wirelessly transmits that information to a PDA, which displays the measurements to the medic. *Id.*, 2-3. To ensure the system provided remote monitoring, we deliberately designed the portions worn by the injured person to be separate from, and only ever wirelessly connected to, the PDA used by the medic to remotely monitor any injured persons in the field. Dr. Mendelson and I even designed our “PDA-based” system so that Receiver Modules could be connected via an ad-hoc network to allow “the PDA to communicate with a remote unit that is beyond the PDA’s wireless range.” *Id.*, 3. This ad-hoc functionality allowed the medic performing the remote monitoring with their PDA to be as far as possible from injured persons and dangerous environments.

2. D’Angelo (Exhibit 1007)

110. D’Angelo is an IEEE conference paper allegedly published in “September 2011. As I explain above in Section VI, at least independent Claims 1

and 13 of the '507 Patent have a priority date of August 31, 2011 at the latest because they recite inventions that were actually reduced to practice by the inventors by that date. *Supra* Section VI. Therefore, as I explain below in Section XI.C.1, D'Angelo is not prior art to at least independent Claims 1 and 13 of the '507 Patent.

111. D'Angelo discusses a data-logging “management device” that continuously collects sensor data and stores it in a storage module on the management device. Exhibit 1007, 1-3. The management device includes “modules for data reception, processing, and storage,” and uses “a microSD card” for storing sensor data. *Id.*, 2-3. The management device only sends the sensor data stored on its microSD card to the iPhone when the management device is physically connected to the iPhone’s serial interface. *Id.*, 3. Specifically, D'Angelo states an “iPhone application enables transferring the data stored on the microSD card inside the management device to the iPhone via [the iPhone’s] serial interface.” *Id.* D'Angelo also states that the management device’s “charging pin” can be connected to the “power output pin” of the iPhone so that the iPhone can “read out [the stored data from] the management device ... even when its battery is empty.” *Id.*

3. Additional References

112. Apple’s Petition has grounds that rely on various additional combinations of references in order to allege the claims of the '507 Patent would have been obvious, including: Goldsmith (Exhibit 1009), Moon (Exhibit 1010), Ording

(Exhibit 1008), Kianl (Exhibit 1006), and Tran (Exhibit 1005). In my opinion, Apple and its expert fail to show obviousness of any claim for the reasons explained herein.

X. INDEPENDENT CLAIMS

113. Below I have included the independent claims of the '507 Patent, along with the limitation labels used in Apple's Petition. Claim 1 of the '507 Patent recites:

[1pre]	A mobile pulse oximetry system for informing a user of mobile measurement of oxygen saturation ("SpO2"), the computer-implemented method comprising:
[1a]	an SpO2 measurement system including:
[1b]	an optical sensor configured to output one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and
[1c]	a processing board in data communication with the optical sensor and a mobile computing device including a display and cellular communication, wherein the processing board is configured to:
[1d]	receive said one or more signals from the optical sensor;
[1e]	process said one or more signals to generate SpO2 measurement values; and
[1f]	output the SpO2 measurement values to the mobile computing device; and
[1g]	one or more hardware processors of the mobile computing device configured to execute commands to:
[1h]	Generate a graphical user interface having a plurality of display portions;
[1i]	display, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and
[1j]	display, in a different portion of the plurality of display portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application;

[1k]	wherein the processing of the one or more signals to generate SpO2 measurement values is performed only on the processing board, thereby freeing up memory available to the mobile computing device; and
[1l]	wherein the processing board is configured to draw power for operation from the mobile computing device.

Exhibit 1001, Claim 1. Claim 13 of the '507 Patent recites:

[13pre]	A computer-implemented method of informing a user of mobile measurement of oxygen saturation ("SpO2"), the computer-implemented method comprising:
[13a]	outputting, from an optical sensor of an SpO2 measurement system, one or more signals responsive to light from a light source attenuated by tissue of the user at a measurement site, said one or more signals responsive to an oxygen saturation of said tissue; and
[13b]	via a processing board of the SpO2 measurement system, the processing board in data communication with the optical sensor and a mobile computing device including a display:
[13c]	receiving said one or more signals from the optical sensor;
[13d]	processing said one or more signals to generate the SpO2 measurement values; and
[13e]	outputting the SpO2 measurement values to the mobile computing device; and
[13f]	via an application configured to execute commands on the mobile computing device:
[13g]	generating a graphical user interface having a plurality of display portions;
[13h]	displaying, in at least one portion of the plurality of display portions, a representation of a physiological parameter of a plurality of physiological parameters comprising at least the SpO2 measurement values; and
[13i]	displaying, in a different portion of the plurality of portions, a plurality of user inputs configured to allow the user to interact with at least one of the plurality of display portions or the application.

Id., Claim 13.

XI. ANALYSIS

114. Apple asserts the following 19 grounds in its Petition.

Ground	Claims	§102
1A1	13-15, 19	Mendelson
Ground	Claims	§103
1A2	13-15, 19	Mendelson
1B	16, 18, 20	Mendelson, Tran
1C	14, 17	Mendelson, Kianl
1D	1, 2, 5, 7, 9, 12-15, 17, 19	Mendelson, D'Angelo
1E	3	Mendelson, D'Angelo, Ording
1F	4-6, 8, 16, 18, 20	Mendelson, D'Angelo, Tran
1G	2, 7, 14, 17	Mendelson, D'Angelo, Kianl
1H	3	Mendelson, D'Angelo, Kianl, Ording
1I	10, 11	Mendelson, D'Angelo, Goldsmith
2A	13-15, 19	Mendelson, Moon
2B	16, 18, 20	Mendelson, Moon, Tran
2C	14, 17	Mendelson, Moon, Kianl
2D	1, 2, 5, 7, 9, 12-15, 17, 19	Mendelson, Moon, D'Angelo
2E	3	Mendelson, Moon, D'Angelo, Ording
2F	4-6, 8, 16, 18, 20	Mendelson, Moon, D'Angelo, Tran
2G	2, 7, 14, 17	Mendelson, Moon, D'Angelo, Kianl
2H	3	Mendelson, Moon, D'Angelo, Kianl, Ording
2I	10, 11	Mendelson, Moon, D'Angelo, Goldsmith

Pet., 1-2. However, in my opinion, Apple's grounds fail to show anticipation or obviousness of any claim of the '507 Patent, for many responses.

115. First, as explained in this section, Mendelson does not disclose an optical sensor outputting “one or more signals responsive to light” or a processing board receiving those light “signals,” under the plain meaning of “one or more signals responsive to light” or under Apple’s construction of “one or more signals” from the Delaware Litigation. Because every independent claim (Claims 1 and 13) requires these limitations and Apple relies solely on Mendelson for these limitations, all of Apple’s grounds fail for this reason.

116. Second, D’Angelo is not prior art, and thus all of Apple’s grounds based on D’Angelo fail. Additionally, Apple’s grounds 1D and 2D, which rely on D’Angelo to challenge independent Claim 1, fail because a POSITA would not have been motivated in view of D’Angelo to modify Mendelson’s Receiver Module to draw backup power (or power for any purpose or amount of time) from Mendelson’s PDA. For at least the same reasons, Apple’s grounds that rely on D’Angelo to challenge the dependent claims of Claim 1 (grounds 1E-1I, 2E-2I) fail to show obviousness of any claim.

117. Third, Apple fails to show unpatentability for any dependent claim for at least the reasons that Apple’s grounds fail to show unpatentability of any independent claim.

118. Fourth, Apple’s grounds 1I and 2I fail because a POSITA would not have been motivated in view of Goldsmith to modify the Mendelson-D’Angelo combination by making Mendelson’s PDA into a wearable wristwatch.

119. Accordingly, it is my opinion that for the reasons explained in this section, Apple’s grounds fail to show that any claim is anticipated or would have been obvious to a POSITA based on the asserted references, alone or in combination.

A. Apple Has Not Shown That Mendelson Discloses An Optical Sensor Outputting “One Or More Signals Responsive To Light” Or A Processing Board Receiving Those Light “Signals”

120. Independent Claim 1 of the ’507 Patent recites “an optical sensor” that is “configured to output one or more signals responsive to light” and a “processing board” that is “configured to: receive said one or more signals from the optical sensor.” The only other independent claim, Claim 13, recites “outputting, from an optical sensor ... one or more signals responsive to light” and “via a processing board ... receiving said one or more signals from the optical sensor.” Therefore, every independent claim of the ’507 Patent recites that the “one or more signals” that are “output” from the optical sensor and received by the processing board must be “responsive to light.”

121. In the Petition, Apple relies on only Mendelson to teach these limitations. However, in my opinion, Mendelson does not disclose a processing board receiving one or more signals from an optical sensor (1) under the plain and

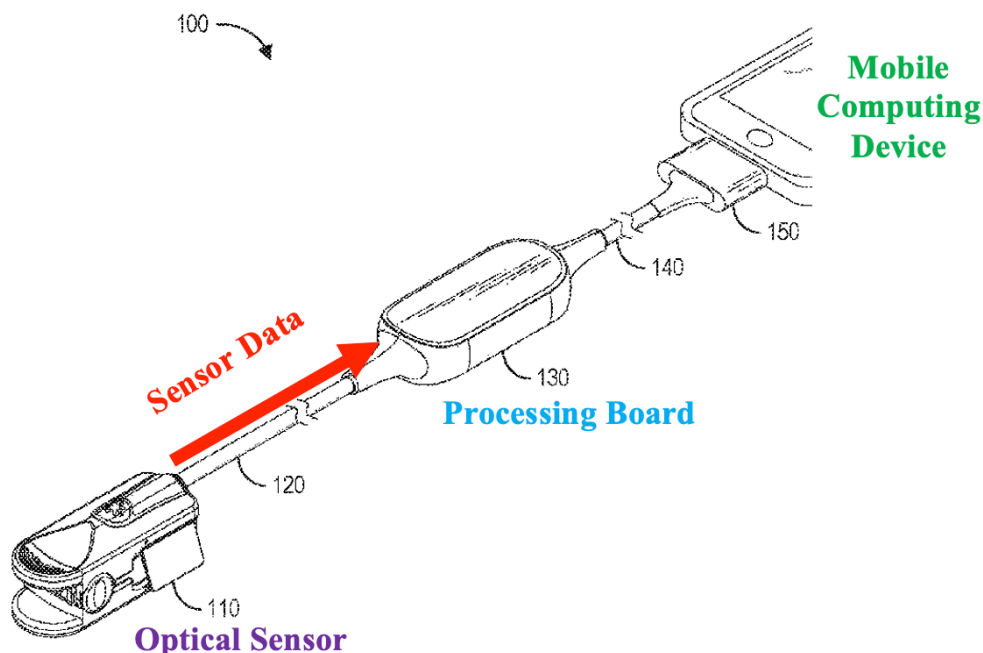
ordinary meaning of “one or more signals responsive to light” or (2) under Apple’s construction of “one or more signals” in the Delaware Litigation.

1. **Mendelson Does Not Disclose An Optical Sensor Outputting “One Or More Signals Responsive To Light” Or A Processing Board Receiving Those Light “Signals” Under The Plain Meaning Of “One Or More Signals Responsive to Light” (All Grounds)**

122. In its Petition, Apple argues that Mendelson’s “Sensor Module” discloses the claimed “optical sensor” (Pet. 10-11, 44) and that Mendelson’s “Receiver Module” discloses the claimed “processing board” (*id.*, 12-13, 44-45). Further, Apple argues that Mendelson discloses outputting and receiving “one or more signals responsive to light” because Mendelson states that “[t]he information acquired by the Sensor Module is transmitted wirelessly to [the] body-worn Receiver Module” and that the Receiver Module subsequently calculates oxygen saturation. *Id.*, 10-11, 44; Exhibit 1003 ¶¶53-56. In my opinion, however, Apple is incorrect because the information transmitted by Mendelson’s Sensor Module and received by its Receiver Module does not satisfy the plain and ordinary meaning of the phrase “one or more signals responsive to light” output from the optical sensor.

123. In my opinion, a POSITA would have understood that the plain and ordinary meaning of “one or more signals responsive to light” output by the optical sensor refers to data that is actually acquired with the optical sensor. This understanding is consistent with, and supported by, the specification of the ’507

Patent. The specification describes an embodiment of the claimed oxygen saturation measurement system with respect to FIGS. 1A-1C. For example, in FIG. 1A (shown below), the system includes “a sensor 110” (i.e., an optical sensor) connected to “a processing module 130” (i.e., a processing board) that is in turn connected to “a mobile computing device, illustrated [in FIG. 1A] as smartphone 160.” Exhibit 1001, 3:57-62, FIG. 1A.



Id., FIG. 1A.

124. The specification explains that “the sensor has light emitting diodes (LEDs) that transmit optical radiation into a tissue site and a detector” that measures light received from the tissue of the measurement site (e.g., a finger). *Id.*, 1:28-34. It also explains that the “sensor 110 provides data in the form of an output signal indicative of ... light” that is measured from “body tissues....” *Id.*, 4:46-51. The

“output signal” from the sensor 110 is indicative of measured light because that data is light intensity data that is actually acquired with the detector of the sensor. *Id.*, 1:28-34, 4:46-51. The sensor’s detector “responds to the intensity” of light by outputting data (specifically, an electrical signal) corresponding to the intensity of the light measured by the detector. *Id.* The specification further explains that that “sensor data is transmitted from sensor 110 along the first cable 120 to the processing module 130, which can apply noise filtering and signal processing techniques described below....” *Id.* Accordingly, in my opinion, a POSITA would have understood that the plain and ordinary meaning of “one or more signals responsive to light” output by the optical sensor and received by the processing board refers to data that is actually acquired with the optical sensor. Based on my review of the specification, the ’507 Patent never explains or suggests that the optical sensor outputs data that it did not actually acquire (such as means (averages), medians, or modes of data, which are computed, not acquired) to the processing board.

125. Applying the plain and ordinary meaning of “one or more signals responsive to light,” it is my opinion that Mendelson fails to disclose this limitation. Mendelson’s Sensor Module (which Apple relies on as the alleged “optical sensor”) is shown in the following diagram. As shown, the diagram depicts the process between the Sensor Module’s photodiode detecting light outputting a signal (left) and the Sensor Module transmitting information to the Receiver Module (right).

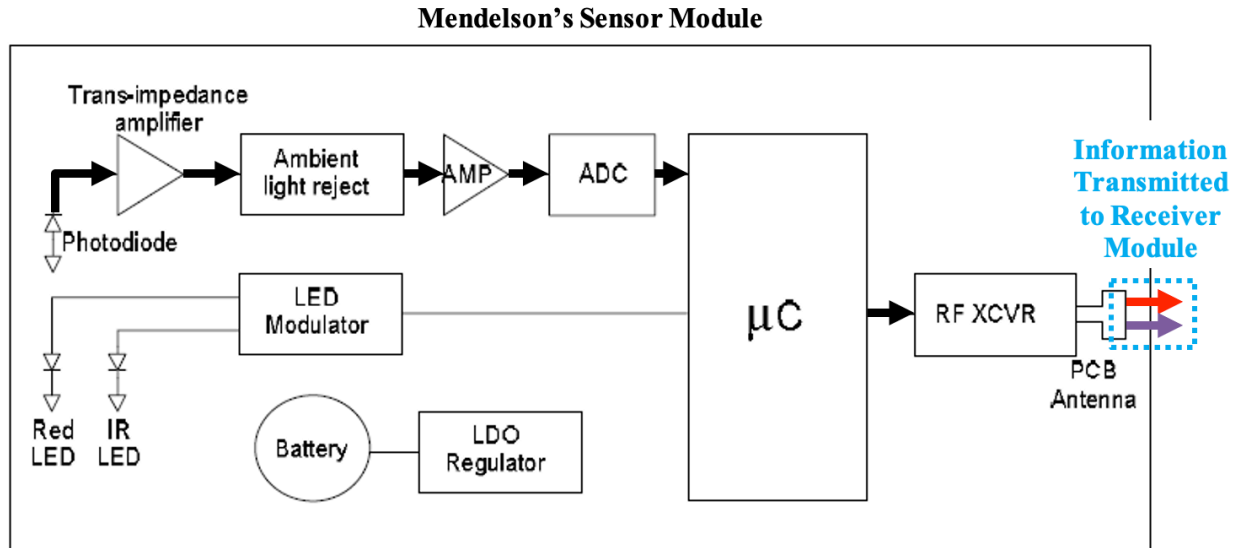
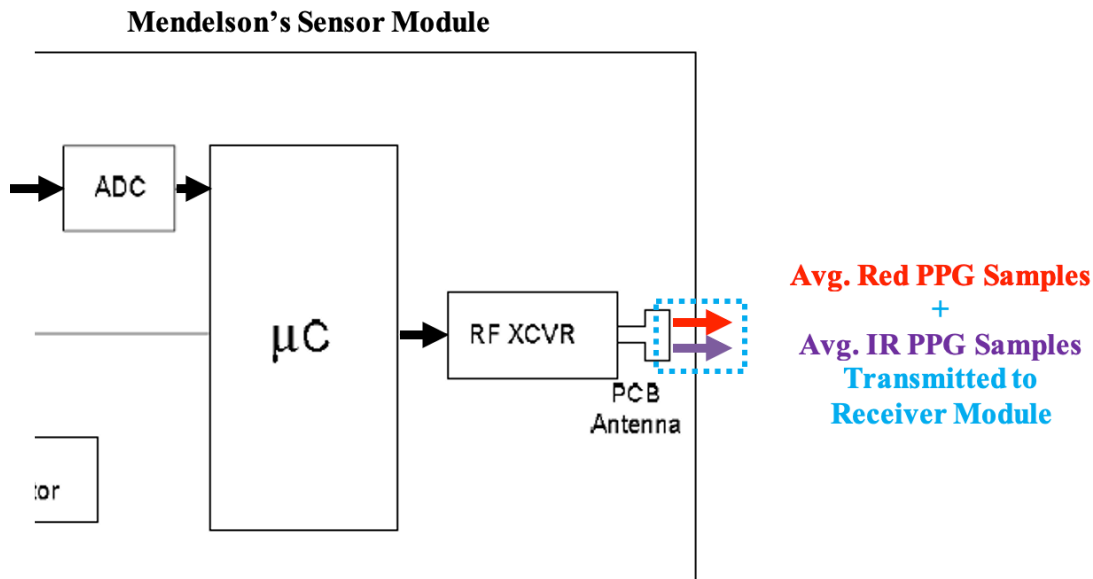


Exhibit 1011, 2. The Sensor Module has a “photodiode” that outputs a signal corresponding to the detected light. *Id.* That photodiode signal is: (1) subjected to a “Trans-impedance amplifier”; (2) filtered to remove ambient light using “ambient light reject” signal conditioning; (3) amplified again (“AMP”); (4) converted from an analog signal to a digital signal with an analog-to-digital converter (“ADC”); and (5) received by a microcontroller (“μC”). *Id.* The microcontroller then processes the signal and outputs the resulting information to the radio frequency (“RF”) transceiver (“RF XCVR”). *Id.* The RF transceiver then performs more processing to generate the packetized information that is transmitted to, and received by, Mendelson’s Receiver Module. *Id.* As an author of the Mendelson paper and someone who was integral to the development of the system it describes, I confirm that the Mendelson device operated in this way.

126. In my opinion, a POSITA would have understood that the Sensor Module of the Mendelson system does not output data actually acquired with the Sensor Module because it only outputs only *average* red and infrared PPG samples to the Receiver Module. Specifically, when in operation, the Sensor Module of Mendelson first turns on the red LED for a short period. Exhibit 1011, 2-3. While the red LED is on, the microcontroller of the Sensor Module takes five consecutive samples of red light intensity using the module's photodiode. *Id.* Those five red light intensity samples are amplified, filtered, amplified, and converted by the Sensor Module's ADC converter into five red PPG samples. Once converted, those five red PPG samples are summed by the Sensor Module's microcontroller and temporarily stored by the Sensor Module's microcontroller. *Id.* After the red LED turns off, the Sensor Module immediately turns on the infrared LED for the same short period of time and follows the same process to generate five infrared PPG samples that are then summed by the microcontroller and temporarily stored by the Sensor Module's microcontroller. *Id.* Once the five infrared PPG samples have been obtained, the infrared LED turns off and that is the conclusion of a measurement cycle. *Id.* As discussed further below, this cycle repeats very quickly, many times per second. *Id.*

127. At the conclusion of each measurement cycle, the set of summed PPG samples is divided by five (the number of samples), resulting in one average red PPG sample (which is temporarily stored in volatile memory of the microcontroller) and

one average infrared PPG sample (which is temporarily stored in volatile memory of the microcontroller). *Id.* Finally, only the average red PPG sample and average infrared PPG sample computed by the microcontroller are processed into packets and transmitted to the Receiver Module, as shown below.



Id. This light measurement cycle (taking five red PPG samples, summing them, taking five infrared PPG samples, summing them, computing the average red PPG sample and average infrared PPG sample, and processing those two average samples into packets) repeats every 12.5ms (i.e., at 80 Hz) while the system is in use. *Id.*

128. The Sensor Module transmits the average PPG samples to the Receiver Module every 0.5s (i.e., at 2 Hz) as a continuous data stream (in RF packets). *Id.* The Receiver Module uses the stream of average red and infrared PPG samples, which Mendelson describes as the “information acquired by the Sensor Module,” to construct the red and infrared “PPG signals” that it uses to “compute SpO₂ and HR.”

Id. By the time of the '507 Patent, which is approximately five or six years after Mendelson, a POSITA would have understood the above-described details and operation of Mendelson's system.

129. As discussed, Mendelson describes a system where average red and infrared PPG samples are the only information that Mendelson's Sensor Module outputs to its Receiver Module. However, average PPG samples are values that are computed, *not* data that is actually acquired with the optical sensor. Therefore, in my opinion a POSITA would have understood that Mendelson does not disclose an optical sensor outputting, or processing board receiving, the "one or more signals responsive to light" recited in Claims 1 and 13 under the plain and ordinary meaning of that phrase (a plain and ordinary meaning that I have explained above).

130. Apple argues that Mendelson discloses the claimed "one or more signals responsive to light" because Mendelson mentions that "information" is transmitted from Mendelson's Sensor Module to its Receiver Module. Pet. 10-11, 44. However, Apple and its expert never address all that happens to the Sensor Module's photodiode signal before any "information" is transmitted to the Receiver Module. Pet.; Exhibit 1003. For example, while Apple admits that Mendelson's Sensor Module has "signal processing circuitry" (Pet. 6), Apple ignores that that circuitry includes a microcontroller. Pet. 10-11, 44. As I have explained above, a POSITA would have understood that the microcontroller of Mendelson's Sensor

Module causes the Sensor Module to only output average PPG samples to the Receiver Module, not data actually acquired with the Sensor Module (i.e., by its light-sensitive detector). Apple presumes that the “information” transmitted by Mendelson’s Sensor Module must be the claimed “one or more signals responsive to light” because the Receiver Module uses that “information” to calculate oxygen saturation. Pet. 10-11, 44. However, Apple’s presumption ignores Sensor Module’s microcontroller and how it outputs only average samples, not data actually acquired with the Sensor Module (i.e., by its detector). Therefore, in my opinion, Apple fails to show that Mendelson discloses an optical sensor outputting, or processing board receiving, the “one or more signals responsive to light” recited in Claims 1 and 13. Further, in my opinion, Apple’s conclusion to the contrary is based on impermissible hindsight because it ignores and does not attempt to consider the actual operation of the system described in Mendelson.

131. Moreover, Apple ignores the major inconsistency between the testimony of Dr. Kenny here and the testimony of its expert on the same patent in the Delaware Litigation. Specifically, I understand that Apple’s expert in the Delaware Litigation opines that the signal from a photodiode is no longer the claimed signal once it is “converted, amplified, filtered, or otherwise processed.” Exhibit 2031 ¶340; *see id.* ¶344 (Apple’s expert arguing that the claims require “the signals output from the optical sensor to the processing board ... must be unprocessed”). However, in

this proceeding, Apple’s expert Dr. Kenny testified that he did not apply Apple’s construction of “one or more signals” from the Delaware Litigation because he did not ask or know about that construction prior to submitting his declaration. Exhibit 2044, 32:8-18. Dr. Kenny also confirmed he had no opinion on whether Mendelson satisfies Apple’s Delaware construction that “one or more signals” in the claims means “raw detected signals.” *Id.*, 32:22-33:13. Instead, Dr. Kenny opines in this IPR proceeding (Exhibit 1003 ¶¶ 53-56) that Mendelson discloses the claimed “one or more signals” even though he admits that the Sensor Module converts, amplifies, filters, and processes the photodiode signal (e.g., computing average red and infrared PPG samples) before outputting any information, as I have detailed above. Exhibit 2044, 70:6-19; Exhibit 1011, 2-3. Regardless, it is my opinion that Apple fails to show that Mendelson discloses an optical sensor that outputs, or a processing board that receives, “one or more signals responsive to light.”

2. Mendelson Does Not Disclose An Optical Sensor Outputting “One Or More Signals Responsive To Light” Or A Processing Board Receiving Those Light “Signals” Under Apple’s Construction Of “One Or More Signals” in the Delaware Litigation (All Grounds)

132. I understand that in the Delaware Litigation, Apple argues: (1) that “one or more signals” means “raw detected signal(s)” from the optical sensor (Exhibit 2029, 34-40); (2) that a POSITA would have understood “one or more signals” does not refer to “signals that had been converted, amplified, filtered, or otherwise

processed” before being received by the processing board (Exhibit 2031 ¶¶340-341); and (3) that Apple’s accused products (Apple Watches) do not infringe because the signals received by their processing board are not the “raw” and “unprocessed” signals that are “‘detected’ by the photodetectors.” *Id.* ¶344. While I take no position on whether Apple’s construction of “one or more signals” in the Delaware Litigation is correct, I now apply Apple’s construction of “one or more signals” in the Delaware Litigation to Apple’s arguments in this proceeding. As I have detailed below, it is my opinion that Mendelson does not disclose the claimed “one or more signals” under Apple’s construction of that phrase in the Delaware Litigation.

133. Here, in its Petition, Apple argues that Mendelson satisfies the “one or more signals” limitations of Claims 1 and 13. Pet. 10-11, 44. However, as I have detailed above in Section XI.A.1, Mendelson’s Sensor Module converts, amplifies, filters, and processes the photodiode signal to compute average PPG samples, and those average PPG samples are the only information that the Sensor Module transmits to the Receiver Module. Each of these steps (conversion, amplification, filtration, computing averages) means the information output by Mendelson’s Sensor Module is not “raw detected signal(s).” Therefore, in my opinion, Mendelson does not disclose the “one or more signals” of Claims 1 and 13 under Apple’s construction of that phrase in the Delaware Litigation. Further, every claim of the ’507 Patent requires the “one or more signals” limitations, either directly (in independent Claims

1 and 13) or by dependency from Claim 1 or 13. Accordingly, it is my opinion that Apple fails to show unpatentability for any claim under its construction of “one or more signals” in the Delaware Litigation.

B. Apple’s Grounds Based On D’Angelo Fail To Show Obviousness (Grounds 1D-1I, 2D-2I)

134. Independent Claim 1 of the ’507 Patent recites, in part, that the “processing board” of the system “is configured to draw power for operation from the mobile computing device.” In the Petition, Apple does not argue that Mendelson discloses this limitation of Claim 1. Pet. 37-43. Rather, in grounds 1D and 2D, Apple argues that D’Angelo teaches this limitation and that a POSITA would have modified Mendelson based on D’Angelo to arrive at this limitation. *Id.* However, for at least two main reasons, it is my opinion that Apple fails to show that grounds 1D and 2D render obvious Claim 1 or any other claim: (1) D’Angelo is not prior art; and (2) even if D’Angelo was prior art, a POSITA would not have been motivated to modify Mendelson based on D’Angelo to make Mendelson’s Receiver Module draw power from the PDA, as Apple proposes.

1. D’Angelo Is Not Prior Art

135. Apple argues that D’Angelo is prior art under pre-AIA 35 U.S.C. § 102(b). Pet. 2-3. I understand that for D’Angelo to constitute § 102(b) prior art, it would have to be a printed publication dated more than one year before the effective filing date of the ’507 Patent (which is September 20, 2012). As such, I understand

that for D'Angelo to be § 102(b) prior art, it would have to be a printed publication dated before September 20, 2011.

136. In my opinion, nothing shows that D'Angelo was published before September 20, 2011. Apple's expert, Dr. Kenny, merely states that D'Angelo "is a paper that was presented at the 33rd IEEE EMBS Annual International Conference in Boston, MA and published in the collected proceedings of the conference," and that "the conference took place from August 30th to September 3, 2011." Exhibit 1003 ¶114. I note that Dr. Kenny has no proof D'Angelo was presented at that conference, much less the specific day the paper was supposedly presented. Dr. Kenny also does not state that the D'Angelo publication, the document on which Apple relies here, was made available to public at the conference. *Id.* Dr. Kenny confirmed that he did not attend the IEEE conference in question, so in my opinion, he has no basis on which to opine about the conference or what was done there. *Id.*; Exhibit 2044, 38:8-18. Dr. Kenny also talked about IEEE conferences generally, in his declaration and at his deposition. Exhibit 1003 ¶114; Exhibit 2044, 38:19-45:18. Dr. Kenny also stated his general understanding that IEEE proceedings are made available to the public some unspecified amount of time "after the event of the conference itself." Exhibit 2044, 45:19-47:10. Therefore, in my opinion, Dr. Kenny fails to show when D'Angelo was made publicly available, and as such, fails to show D'Angelo is § 102(b) prior art.

137. I understand that Apple’s librarian declarant, June Munford, states she obtained copies of D’Angelo from various university libraries. Exhibit 1012 ¶¶22, 7-10, 12-13, 16-20. However, Ms. Munford also never states that she attended the IEEE conference in question, so in my opinion, she also has no basis on which to opine about the conference or what was done there. Ms. Munford’s declaration states that various university libraries obtained copies of IEEE proceedings “in perpetuity,” but never states the *specific date when* any of those libraries obtained the proceedings of the IEEE conference in question and made them available to members of the public. Therefore, in my opinion, Ms. Munford, also fails to show when D’Angelo was made publicly, and as such, fails to show D’Angelo is § 102(b) prior art.

138. Further, I was a member of the IEEE during the relevant time frame, and I still am an IEEE member. I have had numerous papers presented at IEEE conferences, and served as a reviewer for various IEEE conferences. Exhibit 2001, 4-11. It is well-known to POSITAs like myself that IEEE publishes its conference proceedings and papers to the public through a portion of its website called “IEEE Xplore.” Moreover, the IEEE Xplore webpage for the D’Angelo paper shows that it was not “added to IEEE Xplore” until **December 1, 2011**. Exhibit 2043. Therefore, in my opinion, Apple fails to show that the D’Angelo paper became a printed publication before September 20, 2011. As such, it is my opinion that Apple fails to show that D’Angelo is § 102(b) prior art.

139. Because D’Angelo is not § 102(b) prior art, I understand that it could at most qualify as prior art under pre-AIA 35 U.S.C. § 102(a). I also understand that § 102(a) art can be “sworn behind” to the extent that any of the claimed inventions were actually reduced to practice before the date of the reference.

140. As explained above in Section VI, at least Claims 1 and 13 of the ’507 Patent were actually reduced to practice by August 31, 2011 at the latest, which is before the December 1, 2011 date of D’Angelo. Therefore, it is my opinion that D’Angelo is not prior art to at least independent Claims 1 and 13. As a result, it is my opinion that Apple’s grounds relying on D’Angelo for these claims, grounds 1D and 2D, fail to show obviousness of either claim. Further, because D’Angelo is not prior art for the processing board “configured to draw power for operation from the mobile computing device” limitation of Claim 1, it is my opinion that all of Apple’s others grounds that rely on D’Angelo for this limitation (grounds 1E-1I and 2E-2I) likewise fail to show obviousness of any claim.

2. **A POSITA Would Not Have Been Motivated To Modify Mendelson In View of D’Angelo To Make Mendelson’s Receiver Module Draw Power From The PDA**

141. Apple does not argue that Mendelson’s Receiver Module draws power from its PDA. Pet. 37-43. Rather, Apple argues a POSITA would “apply D’Angelo to Mendelson ... to configure Mendelson’s Receiver Module to draw power from the PDA/smartphone.” *Id.*, 40-43. The single motivation that Apple alleges for its

proposed modification is that modifying Mendelson's Receiver Module to draw power from the PDA "would have allowed the PDA/smartphone *'to read out the' measured physiological data 'even when its battery is empty.'*" Pet. 42 (quoting Exhibit 1007, 1530). I understand that Apple's expert, Dr. Kenny, explained at his deposition that in his opinion, a POSITA "would consider modifying Mendelson so that the power connection from the PDA to the Receiver Module could allow download of physiological data" including both (1) "the current flow of data" and (2) "data that's been stored." Exhibit 2044, 55:12-20. However, even if D'Angelo were prior art (which it is not), it is my opinion for the following reasons that a POSITA would not have been motivated to modify Mendelson as Apple proposes.

142. As a first reason, a POSITA would have understood that modifying Mendelson's Receiver Module to draw power from the PDA to read out "the current flow of data" (i.e., ongoing or new measurements) after the Receiver Module's battery had died, which Apple calls "crucial backup functionality," would defeat Mendelson's intended purpose. Mendelson repeatedly and expressly describes that the intended purpose of its system is keeping the medic using it out of harm's way by allowing them to remotely monitor injured people. For example, Mendelson explains that its system is intended "for use in combat casualty care, such as for *remote triage*, and by first responders, such as firefighters." Exhibit 1011, 1. Because those scenarios are dangerous, Mendelson explains that a "primary goal" of its system is to

“readily allow[] the *telemetry of physiological information to medical providers*” who are remotely located, including “*far-forward medics.*” *Id.* To keep emergency responders safe in dangerous scenarios, Mendelson expressly states that its system was designed “to determine a casualty’s condition *remotely without exposing the first responders to increased risks.*” *Id.* Moreover, this critical intended purpose of remote monitoring is even reflected in Mendelson’s title, which is “A Wearable Reflectance Pulse Oximeter *for Remote* Physiological Monitoring.” *Id.* As a co-author of Mendelson and co-creator of the system it describes, my colleagues and I designed Mendelson’s system to achieve a primary and fundamental purpose, namely, allowing the medic to *remotely monitor injured people from a safe distance.* Even Apple’s expert Dr. Kenny admitted at his deposition that “*remote monitoring*” is a “priority” and “important” purpose of Mendelson. Exhibit 2044, 64:10-22. Dr. Kenny also speculated that he did not think remote monitoring was “intended as [the] exclusive” purpose of Mendelson’s system. *Id.*, 64:10-14. However, Dr. Kenny is wrong. As someone who designed Mendelson’s system, I know that remote monitoring is the whole purpose that my colleagues and I intended Mendelson’s system to achieve, which is why we even specified that the system was “for Remote Physiological Monitoring” in the title of our paper describing our system.

143. For the system to achieve its intended purpose, Mendelson explains that a key aspect of the system’s design is that the “body-worn Receiver Module,” which

is worn by injured persons in the field, transmits physiological measurements “wirelessly to a PDA” that is “carried by medics or first responders.” Exhibit 1011, 2-4. Mendelson explains that the system’s “PDA-based wireless system architecture ... allows the PDA to communicate with a [Receiver Module] that is beyond the PDA’s wireless range” because multiple Receiver Modules in the field can be interconnected in an “ad-hoc network.” *Id.*, 3. Further, Mendelson explains that due to this wireless connectivity of the Receiver Modules and PDA, the system is able keep “far-forward medics” out of danger by allowing them to remotely monitor injured persons in the field with their PDA. *Id.*, 1, 3. Moreover, to ensure that Mendelson’s system achieved its intended purpose of allowing the medic to remotely monitor injured people from a safe distance, my colleagues and I specifically designed its Receiver Module(s) to be a battery-powered device that *wirelessly* connects to the PDA carried by the medic.

144. A POSITA would have understood that the Mendelson modification Apple proposes (i.e., using the PDA to provide backup (or any) power to the Receiver Module) would require the medic carrying the PDA to enter the dangerous scenario and be right next to (i.e., co-located with) the injured person (casualty) in order to power their Receiver Module with the PDA. Exhibit 2044, 66:1-7. Therefore, in my opinion, a POSITA would have understood that Apple’s proposed modification defeated Mendelson expressly intended purpose of “determin[ing] a casualty’s

condition remotely without exposing the first responders to increased risks.” *Id.*, 1. Specifically, a POSITA would have understood that the modification Apple proposes would defeat the intended remote monitoring purpose of Mendelson’s system whenever the medic had to stop remote monitoring, enter the dangerous scenario, and use their PDA to provide backup power to the Receiver Module worn by an injured person in the field.

145. Therefore, because Apple’s proposed modification would defeat Mendelson’s intended remote monitoring purpose, it is my opinion that a POSITA would not have been motivated to modify Mendelson as Apple proposes. Additionally, because Apple insists on a proposed modification that would defeat the intended remote monitoring purpose of Mendelson’s system, it is my opinion that impermissible hindsight is the basis of Apple’s proposed modification.

146. Also, the modification proposed by Apple assumes that a medic would use the PDA to power the Receiver Module attached to an injured person after reaching that injured person in the field. Pet. 42. However, in my opinion, Apple’s assumption is incorrect. Specifically, a POSITA would have understood that if the medic physically went to an injured person in the field, the medic would not have used Mendelson’s PDA to power that injured person’s Receiver Module because remotely monitoring that injured person with the PDA (via measurements sent from the Receiver Module to the PDA) was no longer necessary. Rather than unnecessarily

power the injured person's Receiver Module, a POSITA would have understood as a matter of common sense that the medic would directly monitor the person right before them using ordinary medical equipment (e.g., a finger-clip pulse oximeter, stethoscope, etc.) and applied the emergency medical care that was warranted. A POSITA would have further understood (again, as a matter of common sense) that if the person's injuries warranted continued monitoring, the medic would not have provided that continued monitoring by staying with the person to power their Receiver Module using the medic's PDA. Rather, the medic would have just replaced the Receiver Module's AA batteries (as I have explained below) in order to return as quickly as possible to remotely monitoring injured persons in the field.

147. As a second reason, a POSITA would have understood that modifying Mendelson's Receiver Module to draw power from the PDA would not have allowed the PDA to read out "data that's been stored" (i.e., previously measured physiological data) even after the Receiver Module's battery had died. Pet. 42. Mendelson does not disclose or suggest that its Receiver Module stores measurements, or that the Receiver Module included a storage device that could be "read out" by the PDA after the Receiver Module's battery had died (i.e., a non-volatile storage device). Exhibit 1011, 2-3. Apple and Dr. Kenny do not even argue that Mendelson's Receiver Module stores measurements or has a non-volatile storage device (e.g., flash memory such as an SD card) from which stored measurements could be "read out" after the

Receiver Module's battery had died. Pet. 42; Exhibit 1003 ¶124. Moreover, as an author of Mendelson and co-creator of the system that it describes, I confirm that the Receiver Module does not store measurements that could be read out after its battery died. Exhibit 1011, 2-3. Therefore, a POSITA would have understood there would be no measured physiological data to "read out" from the Receiver Module after its battery died, even if the Receiver Module was later powered by the PDA or another source. *Id.* Thus, in my opinion, "reading out the measured physiological data" after the Receiver Module's battery died would not have motivated a POSITA to modify the Receiver Module to draw backup power from the PDA. Rather, a POSITA would have understood that there simply would be no "measured physiological data" that could be "read out" from Mendelson's Receiver Module after its battery died.

148. Mendelson's Receiver Module does not have a storage device that stores information from the Sensor Module because the PDA provided the only data storage in Mendelson's system. *Id.* Instead of storing data on the Receiver Module, the Receiver Module "synchronously" uses the information from the Sensor Module to generate PPG signals that the Receiver Module uses to "compute SpO2 and HR values." Exhibit 1011, 2. Further, the Receiver Module does not store the PPG signals and SpO2 and HR values that it computes. *Id.* Instead, the Receiver Module outputs those signals and values as a continuous "stream of data" to the "PDA carried by medics or first responders" to enable the real-time remote monitoring that

Mendelson's system was intended to provide. *Id.*, 3-4. In Mendelson's system, the Sensor Module and Receiver Module did not store information themselves because the system used the PDA for storage. *Id.* Specifically, Mendelson explains that its system used the PDA to "store vital medical information received from the wearable unit [which is the Receiver Module]." *Id.*, 3. Mendelson further explains that to offload information from the PDA, information could be "downloaded or streamed" from the PDA's storage "to a remote base station." *Id.* Therefore, as the PDA was the part of Mendelson's system used for data storage, in my opinion a POSITA would have understood that there was no "measured physiological data" to read out from the Receiver Module after its battery had died.

149. In its Petition, Apple relies on D'Angelo as supplying the motivation to use a PDA/smartphone to power a separate device so that measured data can be "read out" from the separate device after its battery died. Pet. 42. In D'Angelo's system, the smartphone could only "read out" already measured data from the management device after the management device's battery died because measured data was **"stored on the microSD card inside the management device."** Exhibit 1007, 2-3; Exhibit 2044, 57:3-18. However, Mendelson's Receiver Module had no non-volatile storage device (e.g., a micro SD card) from which measured data could be "read out" after its battery died, as I have explained above. Exhibit 1011; Exhibit 2044, 58:8-11, 59:14-18. Therefore, in my opinion, a POSITA would have

understood that D'Angelo's approach to "reading out" stored data was inapplicable to, and would not work in, Mendelson's system. Further, Apple and its expert propose no modification to address this difference between D'Angelo's management device and Mendelson's Receiver Module.

150. Therefore, for the foregoing reasons, it is my opinion that a POSITA would not have been motivated to modify Mendelson as Apple proposes because a POSITA would have understood that modifying Mendelson's Receiver Module to draw power from the PDA would not allow the PDA to "read out" previously "measured physiological data" after the Receiver Module's battery died. As explained, a POSITA would have understood that after the Receiver Module's battery died, there is no "measured physiological data" for the PDA to "read out." For the same reason, it is my opinion that a POSITA would not have reasonably expected Apple's proposed modification to succeed. Further, in my opinion, Apple's obviousness argument appears to be based on impermissible hindsight because the only modification Apple proposes, "read[ing] out the measured physiological data" from the Receiver Module after its battery dies, is impossible. As I have discussed above, Mendelson's Receiver Module does not store measured data and has no measured data to "read out" after its battery dies.

151. As a third reason, in my opinion, Apple's proposal to use Mendelson's PDA to read out measured data from a single Receiver Module would have

eliminated functionality that Mendelson's system was intended to include. Mendelson expressly describes that its system used a fully wireless design to allow the medic carrying the PDA to monitor multiple injured people remotely at the same time. Exhibit 1011, 2. Specifically, Mendelson explains that the fully wireless design of its system (e.g., Sensor Module(s) wirelessly connected to Receiver Module(s) wirelessly connected to PDA) ensures that "[t]he PDA can monitor multiple wearable pulse oximeters simultaneously and allows medics to [remotely] collect vital physiological information" from each injured person in the field. *Id.* Apple's proposed modification would eliminate that functionality. Apple proposes modifying the Receiver Module so that PDA could "read out the measured physiological data [from the connected Receiver Module] even when [the Receiver Module's] battery is empty." Apple's expert, Dr. Kenny, likewise proposes "modifying Mendelson so that the power connection from the PDA to the Receiver Module could allow download of physiological data" to the PDA. Exhibit 2044, 55:12-20. However, a POSITA would have understood that connecting the PDA to read out *one* injured person's Receiver Module as Apple proposes was not using the PDA as intended (i.e., to monitor "*multiple*" injured persons "simultaneously"). Therefore, in my opinion, a POSITA would not have been motivated to modify Mendelson as proposed by Apple because doing so would have eliminated intended functionality of Mendelson's system.

152. As a fourth reason, in my opinion, providing battery “backup functionality” would not have motivated a POSITA to modify the Receiver Module of Mendelson. As I have explained above, Mendelson’s system was specifically designed for remote monitoring of emergency-type events, such as combat casualty care and triage, which are relatively discrete and short duration events. Further, as Mendelson describes, its Sensor Module and Receiver Module utilize batteries that supply plenty of power to ensure the devices remain operational throughout their intended use. Mendelson explains that its Sensor Module is powered by a “CR2032 type coin cell battery ... providing at least 5 days of operation.” Exhibit 1011, 2. Additionally, as a co-author of Mendelson and co-creator of the system it describes, I confirm that Mendelson’s Receiver Module uses two AA batteries, resulting in the Receiver Module providing a similar number of days of operation. *Id.* Therefore, in my opinion, a POSITA would not have been motivated to modify Mendelson’s Receiver Module to draw backup power from the PDA because a POSITA would have understood that the Receiver Module already had plenty of power to keep the device operational throughout any of the emergency-type events that it was used to monitor. A POSITA would have understood that using the PDA to provide backup power to the Receiver Module would be redundant of the more than adequate power supply (two AA barriers) already within the Receiver Module.

153. Additionally, a POSITA would not have been motivated to go to the difficulty and expense of modifying Mendelson's Receiver Module to draw backup power from the PDA because a POSITA would have recognized that it was much easier, cheaper, faster, and more logical to simply replace the Receiver Module's AA batteries with new ones whenever the batteries died or were running low. In my opinion, because the solution to the Receiver Module's batteries dying was as easy, cheap, and fast as replacing AA batteries, a POSITA would not have been motivated to modify Mendelson as Apple proposes just to have the possibility of using the PDA to provide backup power to the Receiver Module. Also, in my opinion, a POSITA would have understood that replacing the Receiver Module's AA batteries would allow the medic to get out of the dangerous environment as quickly as possible and resume the remote monitoring functionality that Mendelson's system was expressly designed to provide. In contrast, a POSITA would not have been motivated to stay in the dangerous environment to power the Receiver Module of a single injured person, which is what Apple proposes, because doing so contradicts the intended remote monitoring purpose of Mendelson's system, as I have explained above.

154. As a fifth reason, modifying the PDA to power Mendelson's Receiver Module as Apple proposes because would drain the PDA's battery more quickly, to the detriment of the entire system. A POSITA would have avoided using the PDA to power other devices because the PDA is the only part of Mendelson's system that

enables monitoring by displaying measured values on its display (i.e., the PDA is the central node of the system). Exhibit 1011, 2-3. As Mendelson explains, the Mendelson system is a “**PDA-based** wireless system,” and a POSITA would have understood that Mendelson’s PDA displays nothing and therefore provides no monitoring functionality at all if the PDA’s battery is dead. *Id.* Therefore, in my opinion, a POSITA would not have risked draining the PDA’s battery to power one Receiver Module in a system that could include (and was intended to be used with) multiple Receiver Modules, because the system would be unusable if the PDA’s battery died. Rather, a POSITA would have solved the issue of dead Receiver Module batteries in the easier, cheaper, faster, and more logical way that I have discussed above, namely, replacing the Receiver Module’s AA batteries with new ones if and when needed.

155. As a sixth reason, a POSITA would have understood that to implement Apple’s proposed modification, components such as a voltage converter and an external power connector would have to be added to Mendelson’s Receiver Module so that it could be powered by the PDA. A POSITA would have understood that Mendelson’s Receiver Module does not include such components because it already has a sufficient power source and was intentionally designed as a “compact, low-power, small-size, light- weight, and unobtrusive” system that is also “cost-effective.” Exhibit 1011, 1-2. Therefore, in my opinion, a POSITA would have

understood that Apple’s proposed modification is inconsistent with the design of Mendelson because the modification would require adding components that make the Receiver Module larger, heavier, and more expensive to manufacture. Further, in a typical implementation of Mendelson’s system, the impact of Apple’s proposed modification (making the Receiver Module larger, heavier, and more expensive) would be quite significant because Mendelson’s system was designed to use multiple Receiver Modules (one for each injured person), not just a single Receiver Module. *Id.*, 1, 4. Therefore, it is my opinion that Apple’s proposed modification would have necessitated making each Receiver Module larger, heavier, and more expensive, which would have deterred a POSITA from modifying Mendelson’s Receiver Module as Apple proposes.

156. As a seventh reason, when asked about his opinion that it would have been obvious to modify Mendelson’s Receiver Module to draw backup power from the PDA, Apple’s expert Dr. Kenny only spoke about what a POSITA “would consider” doing, what “might be,” or what “could be useful.” Dr. Kenny repeatedly stated that his obviousness opinion for this combination is that “a person of ordinary skill in the art *would consider*” modifying Mendelson’s Receiver Module to draw power from the PDA. Exhibit 2044, 49:4-14; *see id.*, 49:15-50:4 (“one person of ordinary skill *would consider* modifying Mendelson’s system to be able to rely on the PDA for power”), 50:5-51:1 (“a person of ordinary skill in the art *would consider*

modifying Mendelson to achieve the benefits described by D’Angelo), 55:12-20 (“I think a person of ordinary skill in the art **would consider** modifying Mendelson so that the power connection from the PDA to the Receiver Module **could** allow download of physiological data[.]”). Dr. Kenny also testified that his opinion is that “[i]t could be useful to read out previously captured and stored data, as well as whatever the current measurements are[.]” *Id.*, 55:5-11. Dr. Kenny further testified that a POSITA “**might consider** some of the choice Mendelson made in 2006, and **perhaps** substitute a microcontroller for a slightly more modern microcontroller.” *Id.*, 61:5-17. However, I understand that the obviousness inquiry considers only what a POSITA **would have** been motivated to do, not merely what a POSITA “would consider,” “could,” or “might” do. Therefore, because Dr. Kenny’s opinion is not based in what a POSITA would have been motivated to do (which I understand is the correct inquiry) and instead is based in what a POSITA supposedly “would consider” or “might” do, it is my opinion that he, and Apple, fail to show obviousness.

157. Therefore, it is my opinion that Apple’s only alleged reason to modify Mendelson’s Receiver Module as proposed (providing backup power) would not have motivated a POSITA to modify Mendelson’s Receiver Module to draw power from Mendelson’s PDA. Moreover, for at least the reasons I have explained above, it is my opinion that a POSITA would not have been motivated to modify Mendelson’s Receiver Module to draw backup power, or any power, from the PDA.

C. Apple Has Not Shown Unpatentability For Any Dependent Claims (Grounds 1B-1C, 1E-1I, 2B-2C, 2E-2I)

158. All of Apple's grounds include unpatentability arguments for dependent claims, and grounds 1B-1C, 1E-1I, 2B-2C, and 2E-2I argue obviousness for dependent claims only. Pet. 1-2. But as I have explained above in Sections XI.A-B, it is my opinion that Apple fails to show that the cited references, alone or in combination, disclose or render obvious independent Claims 1 and 13. Therefore, for at least the reasons that I have explained in Sections XI.A-B, it is my opinion that Apple fails to show to show that any dependent claim of the '507 Patent is unpatentable.

D. A POSITA Would Not Have Been Motivated To Modify The Mendelson-D'Angelo Combination Based On Goldsmith To Implement The Display Function Of Mendelson's PDA As A Wristwatch (Grounds 1I, 2I)

159. Claim 1 recites that "the processing board is configured to draw power for operation from the mobile computing device." Claims 10 and 11 depend from Claim 1 and add that "the mobile computing device comprises a wearable computing device" (Claim 10) and "the mobile computing device comprises a wristwatch."

160. Apple argues that a POSITA would have been motivated to modify the Mendelson-D'Angelo combination by applying Goldsmith to implement the alleged "display device," Mendelson's PDA, as a wristwatch. Pet. 62-64; Exhibit 2044, 75:7-76:1 ("[T]he proposed combination contemplates replacing the PDA with a

wristwatch. It might have all the same functions of a PDA and [you] might even still call it a PDA, but it would have the form, shape of a wristwatch.”). I disagree. Apple argues that the following four motivations support making its proposed modification: (1) “increas[ing] the portability of the display device”; (2) “free[ing] up the user’s hands for other tasks”; (3) “increas[ing] the ease of user” by not having “to retrieve the display device from a pocket, backpack, or bag”; and (4) “provid[ing] additional functionality to devices already owned by users.” *Id.* However, in my opinion, Apple fails to show obviousness of Claims 10-11 at least because they depend from Claim 1, which Apple fails to show is anticipated or would have been obvious as explained above in Sections XI.A-B. Further, it is my opinion that Apple fails to show that Claims 10-11 would have been obvious because a POSITA would not have been motivated to make Mendelson’s PDA into a wearable “wristwatch” as Apple proposes.

161. Apple’s proposed modification ignores the expressly and repeatedly described purpose of the PDA in Mendelson’s system. As I explained above in Section XI.B.2, Mendelson expressly and unequivocally states that its system is for “remote monitoring” of injured persons in dangerous environments, such as “combat casualty” and “first responder” emergency settings. Exhibit 1011, 1. Further, to accomplish its remote monitoring purpose, Mendelson explains that it is a “PDA-based” system that utilizes its “wireless communication capabilities to transfer SpO₂,

HR, body acceleration, and posture information” from the Receiver Module that is “body-worn” by injured persons “to a PDA carried by medics or first responders.” Exhibit 1011, 3-4.

162. As discussed above in Section XI.B.2, Apple’s argument for Claim 1 (on which Claims 10-11 depend) is that a POSITA would have modified Mendelson’s Receiver Module to draw backup power from the PDA. Pet., 40-43. Therefore, the resulting modification that Apple proposes for Claims 10-11 is making Mendelson’s PDA into a wristwatch, and using that PDA-turned-wristwatch to provide backup power to the Receiver Module, which is worn by the injured person. Pet. 62-64; Exhibit 2044, 75:7-76:21 (opining that a “POSITA would use this PDA turned into a wristwatch to provide power to Mendelson’s Receiver Module”).

163. In either case, whether backup power was provided to Mendelson’s Receiver Module by the PDA (as Apple argues for Claim 1) or the PDA-turned-wristwatch (as Apple argues for Claims 10-11), Apple’s proposed modification would require the medic carrying the PDA (or wearing the PDA-turned-wristwatch) to enter the dangerous scenario and co-locate with the injured person. Therefore, in my opinion, Apple’s proposed modification for Claims 10-11 (using Mendelson’s PDA-turned-wristwatch to power the Receiver Module) suffers the same deficiencies as its proposed modification for Claim 1 (using Mendelson’s PDA to power the Receiver Module). Each proposed modification would defeat Mendelson’s intended

purpose of “determin[ing] a casualty’s condition remotely without exposing the first responders to increased risks” for the reasons I have explained above in Section XI.B.2. Specifically, as explained in that prior section, it is my opinion that a POSITA would have understood that the modification Apple proposes would defeat the intended remote monitoring purpose of Mendelson’s system during any time the medic had to use their PDA (or PDA-turned-wristwatch) to provide backup power to the Receiver Module, which is worn by an injured person in the field. Also, in my opinion, if the PDA-turned-wristwatch was used to power and read out measured data from the Receiver Module attached to one injured person, as Apple proposes, the medic would not be using the PDA-turned-wristwatch to monitor “multiple” injured people at the same time, which is functionality that Mendelson’s PDA was specifically intended and designed to provide.

164. For these reasons, it is my opinion that the modification Apple proposes for Claims 10-11 would defeat Mendelson’s intended purpose of remote monitoring and therefore a POSITA would not have been motivated to modify Mendelson as Apple proposes. Additionally, in my opinion, Apple’s argument that a POSITA would have pursued a modification that defeats Mendelson’s remote monitoring purpose shows that impermissible hindsight is the basis of Apple’s proposed modification.

165. Additionally, in my opinion, if the PDA was turned into a wristwatch as Apple proposes, a POSITA would have been deterred from using the PDA-turned-wristwatch to power a Receiver Module. Specifically, as discussed as part of my fifth reason above in Section XI.B, Mendelson's system would provide no monitoring functionality at all without the PDA (or here, the PDA-turned-wristwatch). A POSITA would have understood that the PDA-turned-wristwatch was a small device with a very limited battery capacity, which a POSITA would have understood was not suitable for powering the Receiver Module or other devices. Accordingly, a POSITA would not have been motivated to use the PDA-turned-wristwatch to power one Receiver Module because doing so would have posed tremendous risk of fully draining the PDA-turned-wristwatch's small battery, which would render the entire system unusable.

XII. CONCLUSION

166. For the reasons explained herein, it is my opinion that Apple fails to show that any of the challenged claims of the '507 Patent are anticipated or rendered obvious by the identified references. None of the claims of the '507 Patent is anticipated by, or would have been obvious to a POSITA based on, the references asserted by Apple in its Petition, alone or in the combinations proposed.