UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,	)	
	)	
Petitioner,	)	
	)	Case Nos.
vs.	)	IPR2022-01291
	)	IPR2022-10465
MASIMO CORPORATION,	)	
	)	U.S. Patent
Patent Owner.	)	10,687,745
	)	

DEPOSITION OF DR. R. JAMES DUCKWORTH
August 9, 2023
10:00 a.m.

Reported by: Eileen Mulvenna, CSR/RMR/CRR

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APPLE 1080
Apple v. Masimo
IPR2024-00244

1 REMOTE VIDEOTAPED DEPOSITION of
2 DR. R. JAMES DUCKWORTH, Declarant for Patent Owner
3 in the above-titled action, held on Wednesday,
4 August 9, 2023, commencing at approximately 10:00
5 a.m., before Eileen Mulvenna, CSR/RMR/CRR, Certified
6 Shorthand Reporter, Registered Merit Reporter,
7 Certified Realtime Reporter, and Notary Public of
8 the State of New York.
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1 APPEARANCES:

2

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22 ALSO PRESENT: DANIEL HOLMSTOCK, Document Technician

1 I N D E X

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3 Dr. R. James		
4 Duckworth	MR. BINENIUS	7

5

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1 THE REPORTER: Good morning, Counsel.
2 My name is Eileen Mulvenna. I'm the court
3 reporter for today's deposition of James
4 Duckworth.
5 The attorneys participating in this
6 deposition acknowledge that I am not
7 physically present in the deposition room and
8 that I will be reporting this deposition
9 remotely. They further acknowledge that, in
10 lieu of an oath administered in person, I
11 will administer the oath remotely.
12 Do the parties and their counsel
13 consent to this arrangement and waive any
14 objections to this manner of reporting?
15 MR. KIANG: Yes.
16 MR. BINENIUS: I agree.
17
18
19
20
21
22

1 DR. R. JAMES DUCKWORTH,
2 having been duly sworn by Eileen Mulvenna,
3 a Notary Public of the State of New York,
4 was examined and testified as follows:
5 EXAMINATION
6 BY MR. BINENIUS:
7 Q. We're here today regarding IPR
8 proceeding IPR-2022-01291 and IPR proceeding
9 IPR-2022-10465. Both proceedings regarding
10 U.S. Patent No. 10,687,7745.
11 Can you please state your full name?
12 A. Reginald James Duckworth.
13 Q. Can you please state your city of
14 residence?
15 A. St. Marys, Georgia.
16 Q. Is there any reason that you cannot
17 give truthful and accurate testimony today?
18 A. Nope.
19 Q. To ensure clarity, I will define
20 several terms that will be used throughout this
21 deposition. When I use the terms "Patent Owner" or
22 "Massimo," I'm referring to Massimo Corporation, the

1 Patent Owner in this proceeding.
2 Do you understand?
3 A. Yes, I do.
4 Q. When I use the term "Apple" or
5 "Petitioner," I'm referring to Apple, Inc.
6 Do you understand?
7 A. Yes.
8 Q. When I use the term "'745 patent," I
9 am referring to U.S. Patent No. 10,687,745.
10 Do you understand?
11 A. Yes, I do.
12 Q. When I use the phrase "these IPRs" or
13 "these proceedings," I'm referring to IPR proceeding
14 No. IPR-2022-01299 and IPR proceeding
15 No. IPR-2022-01465 filed against the '745 patent.
16 Do you understand?
17 A. Yes, I do.
18 Q. When I use the acronym "POSITA," I'm
19 referring to a person of ordinary skill in the art
20 at the time of the alleged invention.
21 Do you understand?
22 A. Yes, I do.

1 Q. You have prepared two declarations for
2 these proceedings; correct?
3 A. Yes.
4 Q. When I use the term "your first
5 declaration," I'm referring to Exhibit 2002 in both
6 proceedings.
7 Do you understand?
8 A. Can you say that again, please,
9 Counselor?
10 MR. KIANG: Objection to form.
11 BY MR. BINENIUS:
12 Q. When I use the term "your first
13 declaration," I'm referring to Exhibit 2002 in both
14 proceedings.
15 Do you understand?
16 A. By "first declaration," let me -- let
17 me find that in the documents.
18 MR. KIANG: Counsel, I think there may
19 be some confusion. There are two different
20 Exhibit 2002s.
21 MR. BINENIUS: Oh, yes, there's one
22 for each proceeding, correct.

1 THE WITNESS: In the documents I
2 received, I don't see a copy of my first
3 declarations, the 2002 that you just referred
4 to.
5 BY MR. BINENIUS:
6 Q. I may end up not asking questions
7 specifically about that document, but I have
8 uploaded one of your first declarations, the
9 declaration Exhibit 2002 for IPR proceeding
10 2022-01291. If we do need to talk about it, we can
11 refer to the electronic copy that I uploaded.
12 A. Yes, I might want to work with a paper
13 copy, in which case I'd like to print that out later
14 if necessary.
15 Q. If we get to it, that's fine.
16 Moving on, when I use the term "your
17 second declaration," I'm referring to Exhibit 2070
18 in these proceedings.
19 Do you understand?
20 A. Yes, I do.
21 Q. When I use the term "your
22 declarations," I'm referring collectively to both of

1 your declarations in these proceedings.
2 Do you understand?
3 A. Well, there are a total of three
4 declarations in total.
5 Q. Ah, correct. I'm referring to all
6 three of your declarations in these proceedings.
7 A. Yes.
8 Q. Can you describe how you prepared for
9 today's deposition?
10 A. I reviewed my declaration and the
11 exhibits.
12 Q. By your declaration, you're referring
13 to Exhibit 2070?
14 A. And the file first, the previous --
15 the first two declarations, yes.
16 Q. Approximately how much time did you
17 spend preparing for today's deposition?
18 A. For the deposition, maybe in total
19 about 50 hours.
20 Q. As part of your preparation to testify
21 today, can you please identify each person you
22 communicated with either in person or via video or

1 telephone conference?
2 A. That would be Massimo counselors --
3 sorry, the Knobbe Martens counselors. So Daniel
4 that's on the call today; Carol, I forget her last
5 name; Brian, and I forget his last name; and
6 Jeremiah, I forget his last name.
7 Q. As part of your preparation for
8 today's deposition, did you conduct any independent
9 searches, such as searches on the Internet?
10 A. No.
11 Q. As part of your preparation for
12 today's deposition, did you review any documents
13 that are not currently a record in either of the
14 proceedings?
15 A. Nope.
16 Q. When were you first contacted by
17 someone on behalf of Massimo?
18 A. Regarding these proceedings?
19 Q. Have you previously worked with
20 Massimo on other proceedings?
21 A. Yes.
22 Q. When did you initially first begin

1 working with Massimo?
2 A. I believe a couple of years ago.
3 Yeah, approximately two years ago, I think.
4 Q. Do you recall when Massimo contacted
5 you regarding these specific proceedings?
6 MR. KIANG: I'll object to privilege.
7 Dr. Duckworth, you may answer to the
8 extent it doesn't reveal any communications
9 with counsel. You may answer when Massimo or
10 Massimo's attorneys contacted you about these
11 proceedings.
12 THE WITNESS: I don't remember.
13 BY MR. BINENIUS:
14 Q. Do you have a written agreement that
15 governs your work on this matter?
16 A. Yes, I do.
17 Q. Had you heard of Massimo prior to
18 being contacted by Massimo --
19 A. Yes.
20 Q. -- to conduct --
21 (Cross talk.)
22

1 BY MR. BINENIUS:
2 Q. Do you recall when you had first heard
3 of Massimo?
4 A. It would be maybe 20 years ago.
5 Something in that time frame. A long time ago.
6 Q. When did you first become aware of the
7 '745 patent?
8 A. I don't remember exactly. Probably
9 over a year ago.
10 Q. Are you aware that the '745 patent is
11 currently involved in a district court litigation
12 between Apple and Massimo?
13 MR. KIANG: Objection, scope.
14 THE WITNESS: I -- I'm not sure. I --
15 I don't know. Maybe I can clarify that that
16 I know the '745 patent was part of the --
17 some ITC proceeding. I don't know if that's
18 what you're referring to.
19 BY MR. BINENIUS:
20 Q. Without revealing privileged
21 communications, can you please describe the process
22 by which you prepared your declaration? For

1 example, did you write every word throughout the
2 entire process, did counsel for the Patent Owner
3 prepare your first drafts that you revised, or did
4 something else happen?
5 MR. KIANG: Objection to form. And,
6 also, objection, privileged.
7 Dr. Duckworth, you may answer without
8 revealing the contents of any communications
9 with counsel.
10 THE WITNESS: I produced my
11 declarations in consultation with counsel.
12 They are my opinions in the declarations.
13 BY MR. BINENIUS:
14 Q. What percentage of the arguments and
15 theories for validity addressed in your declarations
16 did you personally create as opposed to being told
17 those arguments and theories by someone else?
18 MR. KIANG: Objection to form.
19 Objection, privileged.
20 Dr. Duckworth, you may answer to the
21 extent you can answer without revealing the
22 contents of any communications with counsel.

1 THE WITNESS: I prefer not to answer.
2 BY MR. BINENIUS:
3 Q. Prior to your work on these IPR
4 proceedings, did you ever communicate in any way
5 with any of the named inventors of the '745 patent?
6 A. No.
7 Q. Did you have anyone such as an
8 assistant help you with your declarations for these
9 IPR proceedings?
10 A. No.
11 Q. Do you currently have any opinions
12 about the '745 patent that are not contained in your
13 declarations?
14 A. No.
15 Q. Are you currently aware of any errors
16 that exist in your declarations?
17 A. Nope.
18 Q. During your career, approximately how
19 many times have you been retained as an expert in
20 litigation matters or IPR matters?
21 A. Maybe ten times, also. Approximately
22 ten.

1 Q. During your career, approximately how
2 many times have you been deposed in such matters?
3 A. A couple of times.
4 (Exhibit 1001, US Patent 10,687,745.)
5 Q. All right. I'd like to turn to the
6 '745 patent, which is Exhibit 1001. Do you have
7 that in front of you?
8 A. I do, yes.
9 Q. Have you read this entire patent?
10 A. Yes.
11 Q. Is it your opinion that the
12 specification and figures of the '745 patent enable
13 a POSITA to practice the claims of the '745 patent?
14 MR. KIANG: Objection, relevance,
15 scope.
16 THE WITNESS: Can you state the
17 question again, please, Counselor?
18 BY MR. BINENIUS:
19 Q. Do you believe that the specification
20 and figures of the '745 patent enable a POSITA to
21 practice the claims of the '745 patent?
22 A. Yes.

1 MR. KIANG: Same objections.
2 BY MR. BINENIUS:
3 Q. Do you believe that a POSITA having
4 all the ordinary knowledge and skills of a POSITA in
5 this field would be able to practice the claims of
6 the '745 patent based on the specification and
7 figures of the '745 patent; or would a POSITA need
8 additional resources, skills, or knowledge to
9 practice the claims?
10 MR. KIANG: Same objections.
11 THE WITNESS: I believe I answered
12 that question already.
13 BY MR. BINENIUS:
14 Q. I want to turn to the claims of the
15 '745 patent, specifically starting with Claim 20.
16 Looking at Claim 20, after the preamble, the first
17 element reads, "a physiological monitoring device
18 comprising."
19 Do you see that?
20 A. I do, yes.
21 Q. In comparing that to Claim 1, does
22 that recitation match the preamble of Claim 1?

1 A. Claim 1 states, "a physiological
2 monitoring device comprising," and in Claim 20 says,
3 "a physiological monitoring device comprising."
4 Q. Turning to the next element of
5 Claim 20, starting, "a plurality of light-emitting
6 diodes," that element is the same as the next
7 element of Claim 1; is that correct?
8 A. I see that Claim 1 says, "a plurality
9 of light-emitting diodes configured to emit light in
10 a first shape," and I see that Claim 20 says, "a
11 plurality of light-emitting diodes configured to
12 emit light in a first shape."
13 Q. So do you agree that they have the
14 same recitations?
15 A. Yes.
16 Q. Turning to the next element of
17 Claim 20, starting, "a material configured to be
18 positioned," do you agree that this element is the
19 same as the next element of Claim 1?
20 MR. KIANG: Objection to form.
21 THE WITNESS: Yeah, I agree they are
22 the same words.

1 BY MR. BINENIUS:
2 Q. Turning to the next element of
3 Claim 20, starting, "a plurality of photodiodes," do
4 you agree that this element is the same as the next
5 element of Claim 1?
6 A. Yes, I see that they say the same
7 words.
8 Q. Turning to the next element of
9 Claim 20, starting, "a surface comprising," do you
10 agree that this element is the same as the next
11 element of Claim 1?
12 A. Yes, I agree they're the same words.
13 Q. Turning to the next element of
14 Claim 20, starting, "a light block configured," do
15 you agree that this element is the same as the next
16 element of Claim 1?
17 A. No, they don't state the same thing.
18 Q. What is the difference between this
19 element and the corresponding element in Claim 1?
20 A. Claim 1 states, "a light block
21 configured to prevent at least a portion of the
22 light emitted from the plurality of light-emitting

1 diodes from reaching the plurality of photodiodes
2 without" --
3 THE REPORTER: Excuse me -- excuse me,
4 Doctor. You need to slow down when you're
5 reading, please.
6 THE WITNESS: Oh, I'm sorry.
7 Okay. So Claim 1 says, "a light block
8 configured to prevent at least a portion of
9 the light emitted from the plurality of
10 light-emitting diodes from reaching the
11 plurality of photodiodes without first
12 reaching the tissue; and," and Claim 20
13 reads, "a light block configured to prevent
14 at least a portion of light from the
15 plurality of light-emitting diodes from
16 reaching the plurality of photodiodes without
17 first reaching the tissue; and."
18 BY MR. BINENIUS:
19 Q. Oh, is the difference that the word
20 "the" is omitted before the word "light"?
21 A. Well, there's the word "the" missing
22 and also "emitted." That's what I can see just

1 looking through there.
2 Q. Turning to the next element of
3 Claim 20, starting, "a processor configured to,"
4 other than the semicolon and the word "and" at the
5 end of this element, do you agree that this element
6 is the same as the last element of Claim 1?
7 A. Yes, I see they are the same words.
8 Q. Let's now turn to Figure 3 of the '745
9 patent. Can you please explain what this figure is
10 showing?
11 A. So the '745 patent describes Figure 3.
12 It says, "Figure 3 illustrates schematically a side
13 view of a three-dimensional pulse oximeter sensor
14 according to an embodiment of the present disclosure
15 [sic]."
16 Q. Can you please describe the components
17 of this pulse oximetry sensor shown in Figure 3?
18 A. So we have a tissue measurement site
19 102. We have an emitter 302. We have a light
20 diffuser 304. We have a light absorbing detector
21 photo 306, a light concentrator 308, and a detector
22 310.

1 Q. The emitter 302 is a light source that
2 emits light that is attenuated through tissue, such
3 as the skin of a person; is that correct?
4 A. You're referring specifically to
5 Figure 3, Counselor?
6 Q. Correct.
7 A. Can you say the question again then,
8 please?
9 Q. The emitter 302 is a light source that
10 emits light that is attenuated through tissue, such
11 as the skin of a person; is that correct?
12 A. Yes.
13 Q. And the detector 310 captures and
14 measures light that has been attenuated by the
15 tissue of the person using the device; is that
16 correct?
17 A. In Figure 3 -- Figure 3, yes.
18 Q. Continuing with Figure 3, in this
19 example, the site that the light is being emitted
20 into and captured from is the person's finger; is
21 that correct?
22 A. As shown in Figure 3, yes.

1 Q. Can you please now turn to Figure 5 --
2 sorry. I want to go to 4B first.
3 This is another example of a pulse
4 oximetry sensor; is that correct?
5 A. Figure 4P -- excuse me. "Figure 4B
6 illustrates the top view of a portion of the
7 three-dimensional pulse oximetry sensor shown in
8 Figure 4A [sic]."
9 Q. And in Figure 4B, the pulse oximetry
10 sensor is sensing light attenuated at a person's
11 finger; is that correct?
12 A. Can you ask the question again,
13 please, Counselor?
14 Q. In Figure 4B, the pulse oximetry
15 sensor senses light attenuated at a person's finger;
16 is that correct?
17 A. That's correct.
18 Q. Can you please now turn to Figure 8.
19 And can you please explain what is being shown in
20 Figure 8?
21 A. Figure 8, as described by '745 patent,
22 illustrates a block diagram of an example pulse

1 oximeter system capable of non-invasively measuring
2 one or more blood analytes in a [inaudible] patient,
3 according to an embodiment of the disclosure.
4 Q. Is the pulse oximetry system of
5 Figure 8 a different representation of the pulse
6 oximetry system of Figure 3, or does it differ in
7 some significant way?
8 MR. KIANG: Objection, form.
9 THE WITNESS: Figures 3 and Figure 8
10 are very different. I don't understand your
11 question.
12 BY MR. BINENIUS:
13 Q. I can rephrase.
14 Do you understand Figure 8 to be
15 showing different components of the pulse oximetry
16 sensor of Figure 3, or is Figure 8 a different
17 embodiment from Figure 3?
18 MR. KIANG: Objection to form.
19 THE WITNESS: I haven't considered
20 that for my declaration. So I do not have an
21 opinion on that today.
22

1 BY MR. BINENIUS:
2 Q. Figure 8 shows that light is being
3 emitted into and captured from the person's finger;
4 is that correct?
5 A. Figure 8 shows an emitter 804, a
6 finger representation 102, and a detector 806.
7 Q. I'm going to turn to Column 12 of the
8 '745 patent, and specifically starting at line 16 of
9 Column 12.
10 This paragraph of Column 12 is part of
11 the description of Figure 8 which we were just
12 discussing; is that correct?
13 A. Let me see. So we're at lines -- can
14 you repeat the lines, please -- or the column?
15 Q. Column 12, line 16.
16 A. Yes, it's part of Figure 8
17 description, yes.
18 Q. Can you please read the first sentence
19 of the paragraph, starting at line 16, out loud?
20 A. "The pulse oximetry system can measure
21 analyte concentrations at least in part by detecting
22 optical radiation attenuated by tissue at a

1 measurement site 102."
2 Q. So this sentence is saying that the
3 pulse oximetry system 800 of Figure 8 can be used to
4 detect optical radiation attenuated through tissue
5 at a measurement site; is that correct?
6 A. That's what it says, yes.
7 Q. And based on the rest of the
8 disclosures of the '745 patent, this would include
9 performing pulse oximetry to determine various
10 physiological parameters, such as blood oxygen
11 content; is that correct?
12 A. Can you repeat the question, please?
13 Q. Based on the disclosures of the '745
14 patent as a whole, the pulse oximetry described in
15 this paragraph would include determining various
16 physiological parameters, such as blood oxygen
17 content; is that correct?
18 A. That is correct.
19 Q. And as you previously mentioned,
20 Figure 8 shows the measurement site is the person's
21 finger; is that correct?
22 A. All I said was that Figure 8 shows an

1 emitter, a finger 102, and a detector.
2 Q. Based on your review of the '745
3 patent, would you consider the finger to be the
4 measurement site in Figure 8?
5 MR. KIANG: Objection, scope.
6 THE WITNESS: The next sentence that
7 we were reading says, "The measurement site
8 102 can be any location on a patient's body,
9 such as finger, foot, earlobe, wrist,
10 forehead, or the like."
11 BY MR. BINENIUS:
12 Q. Okay. So the measurement site could
13 be any location on a patient's body; is that
14 correct?
15 A. That is what the '745 patent states
16 there, yes.
17 Q. Does the '745 patent identify any
18 changes that would need to be made to the
19 physiological measurement system 800 to perform
20 pulse oximetry at the patient's wrist rather than
21 the finger?
22 A. Could you ask the question again,

1 please, Counselor?
2 Q. Does the '745 patent identify any
3 changes that would need to be made to the
4 physiological measurement system 800 to perform
5 pulse oximetry at the patient's wrist instead of the
6 finger?
7 A. I believe that the descriptions and
8 diagrams, for example, Figure 7A and 7B, describe a
9 reflective pulse oximeter sensor that would be
10 appropriate for use at the wrist.
11 Q. What are the modifications made in the
12 examples in Figure 7A and 7B to allow for
13 measurement at the wrist rather than the finger?
14 MR. KIANG: Objection to form.
15 THE WITNESS: The main difference is
16 the description of a reflective pulse
17 oximeter sensor.
18 BY MR. BINENIUS:
19 Q. What makes the pulse oximeter sensor
20 reflective?
21 A. The --
22 THE WITNESS: I'm sorry. Did someone

1 say something?
2 Sorry, could you repeat the question
3 then, please, Counselor?
4 BY MR. BINENIUS:
5 Q. Yes.
6 What makes the pulse oximeter sensor
7 shown in Figure 7A a reflective sensor?
8 A. The emitter and the detectors are on
9 the same side of the tissue.
10 Q. Turning again to Figure 8 and its
11 related description in Column 12, does the '745
12 patent describe any modifications to the components
13 shown in Figure 8 to allow for pulse oximetry at the
14 wrist rather than the finger?
15 MR. KIANG: Objection to form.
16 THE WITNESS: The description in
17 Column 12 related to Figure 8, where it says,
18 "The measurement site 102 can be any location
19 on a patient's body, such as a finger, foot,
20 earlobe, wrist, forehead, or the like," would
21 indicate to a POSITA that the embodiment
22 shown in Figure 7A and 7B might be more

1 appropriate for some of those measurement
2 site locations than others.
3 BY MR. BINENIUS:
4 Q. Do you agree that based on the
5 descriptions in the '745 patent, a POSITA would have
6 the knowledge and skill to implement this pulse
7 oximetry system 800 at a patient's wrist?
8 MR. KIANG: Objection, scope.
9 THE WITNESS: That is not something I
10 considered in my -- my opinions.
11 BY MR. BINENIUS:
12 Q. Do you believe that a POSITA would be
13 able to practice the pulse oximetry system 800 of
14 Figure 8 at a patient's wrist?
15 A. Looking at the whole of '745 patent,
16 yes, I believe a POSITA would be able to develop a
17 system 800 to work at the wrist.
18 Q. Now I'd like to turn to Column 2 of
19 the '745 patent.
20 A. Yes.
21 Q. Looking at the last two paragraphs in
22 Column 2, these are part of the "Summary" section;

1 correct?
2 A. What you highlighted is in the section
3 titled "Summary," yes.
4 Q. I'd like to look at the sentence
5 starting at line 58. This part of the '745 patent
6 recites, "The tissue measurement site can include,
7 such as, for example, a finger, a wrist, or the
8 like"; is that correct?
9 A. That's what I see there, yes.
10 Q. So this portion of the '745 patent
11 appears to be equating the finger and a wrist as
12 equivalent measurement sites on a patient; is that
13 correct?
14 MR. KIANG: Objection to form.
15 THE WITNESS: No, I don't read that
16 sentence the way you describe it, Counselor.
17 BY MR. BINENIUS:
18 Q. Other than the adjustment to put the
19 emitter and detector on the same side of the housing
20 that we previously discussed with respect to
21 Figure 7A and 7B, does this portion of the '745
22 patent describe any adjustments that would need to

1 be made to a physiological measurement system to
2 make such measurements at the wrist rather than at
3 the finger?
4 A. You're asking me, Counselor, that
5 highlighted sentence, if that describes that?
6 Q. I'm not highlighting the sentence.
7 I'm referring to the "Summary" section as a whole of
8 the '745 patent.
9 A. So can you please repeat your question
10 then?
11 Q. Yes.
12 Does this portion of the '745 patent
13 describe any adjustments that would need to be made
14 to a physiological measurement system to make such
15 measurements at the wrist rather than at the finger?
16 MR. KIANG: Objection to form.
17 THE WITNESS: I have -- I do not have
18 an opinion in my declaration on that. I
19 don't want to opine on that today.
20 BY MR. BINENIUS:
21 Q. I'd like to turn to Column 10 of the
22 '745 patent, specifically starting at line 40.

1 Could you please read the paragraph
2 that starts at line 40 of Column 10 to yourself, and
3 let me know when you're finished.
4 A. How far do you want me to read that,
5 sorry?
6 Q. Just the paragraph that starts at
7 line 40.
8 A. Okay.
9 (Document review.)
10 THE WITNESS: Yes, I've read that
11 paragraph.
12 BY MR. BINENIUS:
13 Q. This paragraph is discussing Figure 7A
14 and 7B that we previously discussed; correct?
15 A. This is discussing Figure 7A and 7B.
16 Q. And this paragraph says that any flat
17 surface of a patient is suitable for using the
18 configuration shown in Figure 7A and 7B; is that
19 correct?
20 A. It didn't say on any flat surface. It
21 reads, "The 3D sensor 700 can be placed on a portion
22 of the patient's body that has relatively flat

1 surface, such as, for example, a wrist."
2 Q. Let me go back to Column 12, line 16
3 again. You previously discussed that the paragraph
4 starting at line 16 of Column 12 identifies
5 measurement sites including the wrist and the
6 forehead.
7 Would you agree that the forehead
8 would be included in one of the relatively flat
9 surfaces that we were just discussing with respect
10 to Figure 7A and 7B?
11 A. That is not something I have
12 considered. I don't have an opinion on that.
13 Q. If a POSITA were implementing a pulse
14 oximetry sensor at the forehead, would they use a
15 reflective pulse oximetry sensor?
16 A. Yes, I used a reflectance pulse
17 oximeter sensor when we developed our
18 forehead-mounted device, yes.
19 Q. And as you previously discussed,
20 Figure 7B and 7B indicate that measurement at the
21 wrist would require a reflectance pulse oximetry
22 configuration; is that correct?

1 MR. KIANG: Objection to form.
2 THE WITNESS: Could you ask your
3 question again, please, Counselor?
4 BY MR. BINENIUS:
5 Q. Yes.
6 Do you agree that measurement at the
7 wrist requires a reflectance pulse oximeter
8 configuration, according to the '745 patent?
9 A. A reflectance pulse oximeter device
10 can be used on a wrist, yes.
11 Q. Do you believe that a reflectance
12 pulse oximeter configuration could be used to
13 measure pulse oximetry at the wrist?
14 A. That is not something I produced an
15 opinion on today in my declaration.
16 Q. But you do agree that a reflectance
17 pulse oximeter configuration could be used at both
18 the wrist and the forehead; is that correct?
19 A. So a reflectance pulse oximeter device
20 can be used at the forehead and the wrist, yes.
21 Q. Would a POSITA have expected to obtain
22 a stronger signal from the wrist or the forehead?

1 MR. KIANG: Objection to form.
2 THE WITNESS: Can you ask the question
3 again, please, Counselor?
4 BY MR. BINENIUS:
5 Q. Yes.
6 Would a POSITA have expected to obtain
7 a stronger signal from the wrist or the forehead?
8 A. From the forehead.
9 Q. Does the '745 patent describe any
10 modifications to measure the weaker signal at the
11 wrist in the reflectance sensor configuration rather
12 than the forehead?
13 MR. KIANG: Objection, scope.
14 THE WITNESS: That was not part of my
15 declaration. I don't have an opinion on
16 that.
17 BY MR. BINENIUS:
18 Q. Are you aware of any portions of the
19 '745 patent that discuss modifications to
20 accommodate the weaker signal at the wrist in the
21 reflectance sensor configuration rather than a
22 forehead?

1 MR. KIANG: Objection, scope.
2 THE WITNESS: I think a POSITA would
3 see that the design of the reflectance --
4 reflective pulse oximeter shown in Figure 7A
5 would see the light concentrator 708 that
6 would be helping to improve the level of the
7 received signals.
8 BY MR. BINENIUS:
9 Q. Is there any discussion in the '745
10 patent of the wrist having a weaker signal than the
11 forehead?
12 A. I did not consider that in my
13 declaration. I don't have an opinion.
14 Q. Are you aware of any discussion in the
15 '745 patent of the wrist having a weaker signal than
16 the forehead?
17 A. I did not provide an opinion on that
18 in my declaration.
19 MR. BINENIUS: We've been going for
20 close to an hour, and I'm about to move on to
21 a different set of questions. So now might
22 be a good time for a break.

1 THE WITNESS: Sounds good.
2 MR. BINENIUS: All right. Off the
3 record.
4 (Recess from the record.)
5 MR. BINENIUS: Back on the record.
6 BY MR. BINENIUS:
7 Q. I've got a few more questions about
8 the '745 patent before we move on.
9 We were just talking about Figures 7A
10 and 7B, and you mentioned the light concentrator 708
11 is what enables pulse oximetry at the wrist; is that
12 correct?
13 A. No, that's not --
14 MR. KIANG: Object to form.
15 THE WITNESS: No, that's not correct.
16 BY MR. BINENIUS:
17 Q. Can you please explain what in the
18 '745 patent allows for measurement of the weaker
19 signal at the wrist?
20 MR. KIANG: Objection, scope.
21 THE WITNESS: I explained that I did
22 not have an opinion about that in my

1 declaration.
2 BY MR. BINENIUS:
3 Q. Are you aware of any portion of the
4 '745 patent that describes accounting for the weaker
5 signal at the wrist?
6 MR. KIANG: Objection, scope.
7 THE WITNESS: I believe that was the
8 same question you asked earlier, and I said I
9 didn't have an opinion in my declaration on
10 that.
11 BY MR. BINENIUS:
12 Q. Are you aware of any discussion in the
13 '745 patent of correcting for artifacts due to pulse
14 oximetry at the wrist?
15 A. I did not have an opinion about that
16 in my declaration.
17 MR. KIANG: Same objection, as well.
18 BY MR. BINENIUS:
19 Q. Are you aware of any portions of the
20 '745 patent that discuss correction of noise due to
21 measurement at the wrist?
22 MR. KIANG: Objection to scope.

1 THE WITNESS: I did not have an
2 opinion about that in my declaration.
3 BY MR. BINENIUS:
4 Q. So is it fair to say that you are not
5 aware of any portions of the '745 patent that
6 discuss correcting for artifacts or noise due to
7 measurement at the wrist?
8 MR. KIANG: Objection to form and
9 scope.
10 THE WITNESS: No, that's not what I
11 said. I said that I didn't have an opinion
12 about that in my declaration.
13 BY MR. BINENIUS:
14 Q. I'm asking you here now, are you aware
15 of any portions of the '745 patent that discuss
16 correcting for artifacts or noise due to measurement
17 at the wrist?
18 A. That is -- sorry. That is not
19 something I considered for my declaration.
20 Q. Well, you're either aware of such a
21 recitation in the '745 patent, or you're not aware
22 of it.

1 So are you aware of any discussion in
2 the '745 patent of correcting for artifacts or noise
3 due to measurement at the wrist?
4 MR. KIANG: Objection, asked and
5 answered.
6 And for the record, I think the
7 last -- I also had an objection to the
8 previous question. I don't see it on the
9 realtime. So it was the same objection.
10 THE WITNESS: Can you ask the question
11 again then, please, Counselor?
12 BY MR. BINENIUS:
13 Q. Are you aware of any portions of the
14 '745 patent that discuss correcting for artifacts or
15 noise due to measurement at the wrist?
16 MR. KIANG: Objection to form and
17 scope.
18 THE WITNESS: That is not something I
19 considered for my declaration.
20 BY MR. BINENIUS:
21 Q. I understand that you did not consider
22 it in your declaration.

1 Are you refusing to answer whether or
2 not you are aware of any portions of the '745 patent
3 discussing correction for artifacts or noise due to
4 measurement at the wrist?
5 A. That is --
6 MR. KIANG: Objection, asked and
7 answered.
8 THE WITNESS: That is something I
9 would need more time to produce an opinion
10 on.
11 BY MR. BINENIUS:
12 Q. Are you aware of any portions of the
13 '745 patent that discuss correcting for interference
14 due to measurement at the wrist?
15 MR. KIANG: Objection to form and
16 scope.
17 THE WITNESS: That is not something I
18 provide an opinion on in my declaration.
19 BY MR. BINENIUS:
20 Q. I'd like to turn to Column 13 of the
21 '745 patent, starting at line 20. This sentence of
22 the '745 patent discusses making adjustments to

1 achieve desired noise reductions; is that correct?
2 A. You're at line 20 in Column 13; is
3 that correct?
4 Q. Right.
5 So I'll ask my question again. This
6 sentence is discussing configuring the system to
7 achieve desired noise reductions; is that correct?
8 MR. KIANG: Objection to form.
9 THE WITNESS: I read that that
10 sentence says, "The location of the front-end
11 interface 808 can be chosen based on various
12 factors including space desired for
13 components, desired noise reductions or
14 limits, desired heat reductions or limits,
15 and the like."
16 BY MR. BINENIUS:
17 Q. Do you agree that a POSITA would
18 understand how to achieve these desired noise
19 reductions?
20 MR. KIANG: Objection to form and
21 scope.
22 THE WITNESS: That is not something I

1 provided an opinion on in my declaration.
2 BY MR. BINENIUS:
3 Q. So you do not believe that a POSITA
4 would have been able to achieve desired noise
5 reductions?
6 MR. KIANG: Objection to form and
7 scope.
8 THE WITNESS: No, that's not what I
9 answered. I answered that I did not provide
10 an opinion on that in my declaration.
11 BY MR. BINENIUS:
12 Q. I'm aware that you didn't discuss this
13 specifically in your declaration; but I'm asking
14 now, do you believe that a POSITA would have been
15 able to achieve the desired noise reductions based
16 on the descriptions of the '745 patent?
17 A. That is --
18 MR. KIANG: Same objections, asked and
19 answered.
20 THE WITNESS: That is not something I
21 provided an opinion on in my declaration, and
22 I would need more time to analyze that.

1 BY MR. BINENIUS:
2 Q. All right. I'm going to move to your
3 second declaration, which is Exhibit 2070.
4 (Exhibit 2070, Declaration of Dr. R.
5 James Duckworth.)
6 BY MR. BINENIUS:
7 Q. Can you please turn to paragraph 20?
8 A. Yes.
9 Q. In this section of your second
10 declaration, you're discussing measurement of oxygen
11 saturation at a person's wrist; is that correct?
12 A. Well, this section is -- if you go up
13 to the line -- the heading above paragraph 20 there,
14 this is where I'm discussing, "A POSITA would not
15 have had a reasonable expectation of success in
16 measuring oxygen saturation at the wrist and
17 objective indicia confirms nonobviousness."
18 Q. In this section of your second
19 declaration, you mentioned that you reviewed
20 testimony from Apple engineers from an ITC
21 proceeding; is that correct?
22 A. That is correct.

1 Q. Turning to the next paragraph,
2 paragraph 21, here you state that based on your
3 review of the testimony from certain Apple
4 engineers, you believe that, "a POSITA would not
5 have had a reasonable expectation of success in
6 measuring oxygen saturation at the wrist as of the
7 '745 Patent's July 2, 2015 effective filing date";
8 is that correct?
9 A. That's what it says there, yes.
10 Q. Can you identify the disclosures of
11 the '745 patent that would have enabled a POSITA to
12 measure oxygen saturation at the wrist?
13 MR. KIANG: Objection to form, scope,
14 relevance.
15 THE WITNESS: I did not provide an
16 opinion about that in my declaration.
17 BY MR. BINENIUS:
18 Q. You believe that prior to July 2,
19 2015, a POSITA would not have had a reasonable
20 expectation of success in measuring oxygen
21 saturation at the wrist; is that correct?
22 A. That's what I state in my declaration

1 there, yes.
2 Q. You do also believe that a POSITA
3 would have had a reasonable expectation of success
4 in measuring oxygen saturation at the wrist based on
5 the disclosures of the '745 patent?
6 A. Can you ask the question again,
7 please, Counselor?
8 Q. Would a POSITA have had a reasonable
9 expectation of success in measuring oxygen
10 saturation at the wrist based on the disclosures of
11 the '745 patent?
12 MR. KIANG: Objection to form.
13 THE WITNESS: Sorry, ask me the
14 question again one more time, Counselor.
15 BY MR. BINENIUS:
16 Q. Sure. I can rephrase it.
17 A POSITA at the time of the invention
18 July 2, 2015, with the ordinary skills of a POSITA,
19 having the '745 patent in hand, would that POSITA be
20 able to successfully implement a pulse oximetry
21 system that measures at the wrist?
22 A. Yes, I believe so.

1 Q. Can you identify what disclosures of
2 the '745 patent would have enabled that POSITA to
3 successfully perform measurement at the wrist where
4 they would not have been able to successfully
5 perform measurement at the wrist without the '745
6 patent?
7 A. That is not something I provided an
8 opinion on in my declaration.
9 Q. Well, if you believe that the POSITA
10 could practice measurement at the wrist using the
11 '745 patent, I'm wondering what portions of the '745
12 patent led you to that belief.
13 MR. KIANG: Objection to scope.
14 THE WITNESS: That is not something I
15 provided an opinion on in my declaration.
16 BY MR. BINENIUS:
17 Q. In forming your opinion that a POSITA
18 would not have had a reasonable expectation of
19 success in measuring oxygen saturation at the wrist
20 as of the '745 patent's effective filing date, did
21 you review any materials other than the testimony of
22 the Apple engineers?

1 A. That paragraph 21 is referring
2 specifically to the Apple documents and testimony.
3 Q. In forming this opinion, did you
4 review any other documents other than the Apple
5 engineers' testimony?
6 A. Not that opinion that I'm stating
7 there, no.
8 Q. Is it your opinion that Apple
9 engineers encountered obstacles with including a
10 pulse oximetry sensor that would work within the
11 wrist-worn Apple Watch?
12 MR. KIANG: Objection to form.
13 THE WITNESS: Yes, I'm sorry, I don't
14 understand the question, Counselor. Can you
15 say that again?
16 BY MR. BINENIUS:
17 Q. Is it your opinion that Apple
18 engineers encountered obstacles with including a
19 pulse oximetry sensor that would work within the
20 wrist-worn Apple Watch?
21 A. Yes. In fact, if you can pull up
22 Exhibit 2085, the slides there, you know, show the

1 specific problems that the Apple engineers were
2 citing and their failure to produce measuring oxygen
3 saturation at the wrist.
4 Q. Can you identify what some of those
5 obstacles were?
6 A. Can you bring up the Exhibit 2085?
7 And I can point those out to you.
8 Q. You have to give me a minute. I did
9 not upload that --
10 A. Okay. Sure.
11 Q. -- to the share site.
12 I'm sorry, I don't have Exhibit 2085
13 at hand. We'll just move on.
14 MR. KIANG: I have a copy of it if I
15 can upload that to the Box, Counsel.
16 MR. BINENIUS: Yeah, if you can upload
17 it using the link that we got yesterday, that
18 would be great.
19 MR. KIANG: Yeah, I guess can we go
20 off the record for a second to figure that
21 out?
22 MR. BINENIUS: Yes.

(Pause.)

MR. KIANG: I guess we can go back on the record now.

THE WITNESS: So under the Duckworth marked exhibits, Dan, I should see that now; should I?

EXHIBIT TECHNICIAN: Yes, if you refresh the page, you should see it.

THE WITNESS: Oh, okay. Yes. Yeah. Okay. Got it. Thank you.

BY MR. BINENIUS:

Q. I'll repeat the question.

What were some of the obstacles that the Apple engineers encountered with including a pulse oximetry sensor that would work within the wrist-worn Apple Watch?

A. So starting on page 3, this describes the general requirements for measuring oxygen saturation -- sorry, not page.

So page 3 provides [redacted]

1 [redacted]

5 And then on Slide 5, you can see

6 there's [redacted]

12 On the right side, you can see [redacted]

19 And you can see the Apple engineers

20 show all the problems they were having, all --

21 excuse me -- highlighted in red there. And they

22 have a summary that [redacted]

1 [redacted]

[redacted]

3 So that table on page 5 points out [redacted]

[redacted]

[redacted]

[redacted]

7 So Slide 6 there talks about [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

14 And then on page 7, we see that --

15 and, again, this is the [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

1 next slide, Slide 8.

2 [redacted]

10 So here are the Apple engineers trying

11 to obtain oxygen saturation at the wrist with their

12 summary you can see on the right-hand side, [redacted]

16 And also above there, you can see that

17 [redacted]

21 And then on the next page, you can see

22 then [redacted]

1 [redacted]

6 On the right-hand side, you can see

7 the summary, [redacted]

10 And I think then the -- if we go

11 through a couple more slides, you can see on --

12 let's see where that is. The summary on page --

13 Slide 13, you can see -- basically, this is their

14 [redacted]

18 [redacted]

1 [redacted]

16 So I believe that Apple's own document
17 here describes why I had the opinion that the
18 produced documents and testimony confirm that a
19 POSITA would not have had a reasonable expectation
20 of success in measuring oxygen saturation at the
21 wrist as of the '745 patent's effective filing date.
22 Q. Going back to page 6 of Exhibit 2085,

1 you identified a number of challenges in the slide;
2 correct?
3 A. Let me go back Slide 6. [redacted]
[redacted]
[redacted]
6 Q. Does the '745 patent describe how to
7 overcome these challenges of performing pulse
8 oximetry at the wrist?
9 A. That is not an opinion in my
10 declaration.
11 Q. Are you aware of any disclosures in
12 the '745 patent that describe how to overcome these
13 challenges of performing pulse oximetry at the
14 wrist?
15 MR. KIANG: Objection, scope.
16 THE WITNESS: That is not an opinion I
17 provide in my declaration.
18 BY MR. BINENIUS:
19 Q. Are you aware of any portions of the
20 '745 patent that acknowledge these challenges of
21 performing pulse oximetry at the wrist?
22 MR. KIANG: Objection to scope.

1 THE WITNESS: That is not something I
2 provide an opinion on in my declaration.
3 BY MR. BINENIUS:
4 Q. But it is your opinion that the '745
5 patent enables a POSITA to conduct pulse oximetry at
6 the wrist?
7 MR. KIANG: Objection to scope.
8 THE WITNESS: That is not something I
9 provide an opinion in my declaration.
10 BY MR. BINENIUS:
11 Q. Is it your opinion that no one had
12 ever successfully measured blood oxygen saturation
13 at the wrist prior to the July 2, 2015, priority
14 date of the '745 patent?
15 A. Can you -- I'm sorry, I interrupted
16 you, Counsel.
17 Q. Is it your opinion that no one had
18 ever successfully measured blood oxygen saturation
19 at the wrist prior to the July 2, 2015, priority
20 date of the '745 patent?
21 MR. KIANG: Objection to form.
22 THE WITNESS: Yes, it is my opinion

1 that no one was able to successfully measure
2 oxygen saturation at the wrist.
3 BY MR. BINENIUS:
4 Q. I want to turn back to your second
5 declaration, Exhibit 2070, and I'd like to turn to
6 paragraph 25.
7 In paragraph 25, you discuss
8 statements made by Dr. Stephen Waydo; is that
9 correct?
10 A. I'm just looking at paragraph 25. And
11 yes, I see reference to Dr. Waydo there, yes.
12 Q. And Dr. Waydo mentions that [redacted]
[redacted]
16 A. I'm just looking for -- so, yes, I see
17 that in the answer, he says, [redacted]

1 Q. What does Dr. Waydo mean by [redacted]
2 in this statement?
3 MR. KIANG: Objection, foundation and
4 form.
5 THE WITNESS: I wouldn't like to say
6 anything different than what Dr. Waydo is
7 saying in the answer there.
8 BY MR. BINENIUS:
9 Q. In the context of pulse oximetry, what
10 do you understand the term [redacted] to mean?
11 MR. KIANG: Objection to form.
12 THE WITNESS: That is not something I
13 provide an opinion on in my declaration.
14 BY MR. BINENIUS:
15 Q. Do you know what the term [redacted]
16 refers to in the context of pulse oximetry?
17 MR. KIANG: Objection to form.
18 THE WITNESS: I would need more
19 specific information about what you mean by
20 [redacted]
21 BY MR. BINENIUS:
22 Q. Well, a practitioner in the area of

1 pulse oximetry is using the term [redacted] I'm
2 asking you if you know what the term [redacted]
3 means in that context?
4 MR. KIANG: Objection to form.
5 THE WITNESS: No, I don't know what
6 he's referring to there.
7 BY MR. BINENIUS:
8 Q. Turn to paragraph 27 of your second
9 declaration. In paragraph 27, you're discussing
10 statements made by Dr. Tao Shui; is that correct?
11 A. Yes.
12 Q. Here, Dr. Shui states that [redacted]
[redacted] is that correct?
15 A. Let's see. He says, [redacted]
[redacted]
19 Yes, I see that. Yes.
20 Q. Can you explain what the terms [redacted]
[redacted] are referring to in this context?
22 MR. KIANG: Objection, foundation.

1 THE WITNESS: No, I don't know what
2 he's specifically referring to there.
3 BY MR. BINENIUS:
4 Q. In forming the opinions in your second
5 declaration, did you consider any portions of the
6 Apple employees' testimony other than what you've
7 identified in your declaration?
8 A. I don't think I understand the
9 question. Can you please restate it again?
10 Q. Yes.
11 So you've identified a number of
12 excerpts from the testimony of Apple engineers in
13 your second declaration. I'm asking, in forming the
14 opinions included in your second declaration, did
15 you consider any other portions of the Apple
16 employees' testimony other than what you've
17 identified specifically in the declaration?
18 A. No, I believe I've captured all the
19 Apple engineers' statements there.
20 Q. In forming the opinions in your second
21 declaration, did you consider [redacted]

1 [redacted]

3 A. Yes, when I was considering my
4 opinions and looking at the Apple engineers'
5 testimony and the Apple documents, I was seeing that
6 they were stating [redacted]

9 Q. I'm going to move ahead to
10 paragraph 29 of your second declaration.
11 Here, you testify that you "worked on
12 designing a reflectance pulse oximeter for military
13 and first responder applications" from 2005 to 2008
14 and that you chose the forehead as the measurement
15 site; is that correct?
16 A. That is correct.
17 Q. Did you continue this work after 2008?
18 A. Yes.
19 Q. How long did you continue this work?
20 A. We -- Professor Mendelson and I
21 continued, I believe, until -- through the company
22 that we created, I think until like 2014. And then

1 after 2014, Professor Mendelson and I would continue
2 to discuss pulse oximeter design.
3 MR. BINENIUS: All right. I'm going
4 to have our document tech pull up a number of
5 exhibits that you've not seen yet. I'd like
6 to start with the file labeled "A
7 Neo-Reflective Wrist Pulse Oximeter."
8 This is new to the proceeding. We're
9 going to label this as Exhibit 1050.
10 (Exhibit 1050, A Neo-Reflective Wrist
11 Pulse Oximeter Article.)
12 EXHIBIT TECHNICIAN: Give me that file
13 name again, Counsel.
14 MR. BINENIUS: A Neo-Reflective Wrist
15 Pulse Oximeter.
16 EXHIBIT TECHNICIAN: Okay. There it
17 is, Neo. And you said that was going to be
18 1050?
19 MR. BINENIUS: 1050.
20 MR. KIANG: I'll object to this
21 exhibit as a new exhibit that should have
22 been presented with the petition.

1 BY MR. BINENIUS:
2 Q. In forming the opinions in your
3 declarations, have you reviewed this document?
4 A. I'm just pulling it up myself here.
5 I have not reviewed this document, no.
6 MR. BINENIUS: I'd now like to pull up
7 the file "A Wireless Reflectance Pulse
8 Oximeter with Digital Baseline Control."
9 This will be Exhibit 1051.
10 (Exhibit 1051, A Wireless Reflectance
11 Pulse Oximeter With Digital Baseline Control
12 for Unfiltered Photoplethysmograms Article,
13 received and marked.)
14 BY MR. BINENIUS:
15 Q. In forming the opinions --
16 MR. BINENIUS: Sorry, go ahead.
17 MR. KIANG: I'd like to object to this
18 exhibit as something that should have been
19 presented with the petition.
20 BY MR. BINENIUS:
21 Q. In forming the opinions in your
22 declarations, had you reviewed this document?

1 A. I'm just pulling this one up, too.
2 MR. KIANG: Counsel, I'm having some
3 connectivity issues. I can't seem to
4 download either of the new exhibits.
5 EXHIBIT TECHNICIAN: I can post it
6 into the Zoom chat for convenience. Let me
7 do that now.
8 1050 and 1051; correct?
9 MR. BINENIUS: Correct.
10 EXHIBIT TECHNICIAN: The files should
11 be in the Zoom chat.
12 MR. KIANG: Still can't seem to
13 download them.
14 EXHIBIT TECHNICIAN: If you want to do
15 it off the record, it's fine. But if you put
16 your e-mail in the chat, I can e-mail it to
17 you.
18 MR. KIANG: Yeah. Let's go off the
19 record for a minute or two. I'm not sure why
20 I can't download it. I'm almost kind of
21 seeing them offline elsewhere. But you guys
22 can still hear me; right?

1 EXHIBIT TECHNICIAN: Correct.
2 MR. KIANG: Ah, okay. Give me a sec.
3 EXHIBIT TECHNICIAN: And, Doctor, just
4 to confirm, are you able to pull those files
5 out of the chat?
6 You're muted, but I think I read your
7 lips to say yes.
8 Still muted --
9 THE WITNESS: Yeah, no, I could
10 download those okay, yep.
11 EXHIBIT TECHNICIAN: Okay.
12 MR. KIANG: Okay. This is actually
13 very odd. I can somehow still talk to you.
14 I can hear everything you're saying, but I
15 can't access any other Internet services. I
16 can't even get to Google.
17 EXHIBIT TECHNICIAN: That's strange.
18 Do you want to reboot, Counsel? Usually
19 that's the quick fix. Do you want to try
20 that?
21 MR. KIANG: Yeah, let me try that.
22 All right. Give me a second, please.

1 (Luncheon recess from the record.)

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1 A F T E R N O O N S E S S I O N
2 DR. R. JAMES DUCKWORTH,
3 having been previously sworn, resumed the
4 stand and testified further as follows:
5 EXAMINATION (Cont'd.)
6 BY MR. BISENIUS:
7 MR. BINENIUS: On the record.
8 MR. KIANG: Before we get started, I
9 would like to make an objection to these new
10 exhibits, No. 1050 and 1051. We've already
11 objected that these are improper new exhibits
12 that should have been included with the
13 petition. I'm also objecting on foundation,
14 authentication, and hearsay. I'll also make
15 a standing objection with respect to any
16 questions asked about those exhibits.
17 BY MR. BINENIUS:
18 Q. Turning to Exhibit 1051, did you
19 review this document in forming the opinions
20 contained in your declaration?
21 A. Nope.
22 Q. Prior to the year 2015, were you aware

1 of the organization IEEE?
2 A. Yes.
3 Q. Would you consider IEEE publications
4 to be a source that practitioners in the area of
5 pulse oximetry would have consulted?
6 A. Yes.
7 MR. BINENIUS: All right. The next
8 document I'd like to bring up is the file
9 that starts "Brady." I'm going to label this
10 Exhibit 1052.
11 EXHIBIT TECHNICIAN: The file that
12 starts "Brady." Oh, you said "Brady." Okay.
13 Sorry.
14 (Exhibit 1052, US Patent Application
15 No. 2006/0253010, received and marked.)
16 MR. KIANG: I will also object to this
17 as new evidence that should have been
18 presented with the petition. Also,
19 objections on foundation, authentication, and
20 hearsay. And that will also be a standing
21 objection to any questions asked about this
22 exhibit.

1 BY MR. BINENIUS:
2 Q. Dr. Duckworth, in forming the opinions
3 in your declarations, had you reviewed this patent
4 publication?
5 A. Nope.
6 MR. BINENIUS: Can you please bring up
7 the file labeled "Implementation of a
8 Wireless Pulse Oximeter Based on Wrist Band
9 Sensor," and label this Exhibit 1053.
10 (Exhibit 1053, Implementation of a
11 Wireless Pulse Oximetry Based on Wrist Band
12 Sensor Article.)
13 MR. KIANG: I will also object to
14 Exhibit 1053 as improper new evidence that
15 should have been presented with the petition.
16 Objections also to foundation,
17 authentication, and hearsay. And there will
18 also be a standing objection to any questions
19 asked about this exhibit.
20 BY MR. BINENIUS:
21 Q. Dr. Duckworth, had you reviewed this
22 document in forming the opinions included in your

1 declarations?
2 A. Nope.
3 MR. BINENIUS: Can you please bring up
4 the file that starts "Lindberg." I'm going
5 to label this Exhibit 1054.
6 (Exhibit 1054, WO 01/17421 A1.)
7 MR. KIANG: I will also object to
8 Exhibit 1054 as improper new evidence that
9 should have been presented with the petition.
10 Objections on foundation, authentication, and
11 hearsay. And that will be a standing
12 objection to any questions asked about this
13 exhibit.
14 BY MR. BINENIUS:
15 Q. Did you review this PCT publication
16 prior to forming the opinions expressed in your
17 declarations?
18 A. Nope.
19 MR. BINENIUS: Can you please open the
20 file "Optimum Place for Measuring Pulse
21 Oximeter Signal." I'm going to label this
22 Exhibit 1055.

1 (Exhibit 1055, Optimum Place for
2 Measuring Pulse Oximeter Signal in Wireless
3 Sensor-Belt Article.)
4 MR. KIANG: I'll also object to
5 Exhibit 1055 as improper new evidence that
6 should have been presented with the petition.
7 Also, objections on foundation,
8 authentication, and hearsay. And that will
9 be a standing objection to any questions
10 asked about this exhibit.
11 BY MR. BINENIUS:
12 Q. Did you review this document prior to
13 forming the opinions expressed in your declarations?
14 A. Nope.
15 MR. BINENIUS: Can you please open the
16 file "Reflectance-Based Pulse Oximeter for
17 the Chest and Wrist," and I'll label this
18 Exhibit 1056.
19 (Exhibit 1056, WPI Qualifying Project
20 Report.)
21 MR. KIANG: I will also object to
22 Exhibit 1056 as improper new evidence that

1 should have been presented with the petition.
2 I will also object on foundation,
3 authentication, and hearsay. And that will
4 be a standing objection to any questions
5 asked about this exhibit.
6 BY MR. BINENIUS:
7 Q. Had you reviewed this document prior
8 to forming the opinions expressed in your
9 declarations?
10 A. I'm just trying to pull that up on --
11 is this 10 -- what number is this, sorry?
12 Q. 1056.
13 A. I don't see that yet. Just one
14 second. Okay. Now I see it here. Just one second.
15 Can you ask the question again then,
16 please?
17 Q. Had you reviewed this document prior
18 to forming the opinions expressed in your
19 declarations?
20 A. Nope.
21 MR. BINENIUS: Would you please open
22 the file that starts with "Stein." I'm going

1 to label this as Exhibit 1057.
2 (Exhibit 1057, Stein Article.)
3 MR. KIANG: I'll object to
4 Exhibit 1057 as improper new evidence that
5 should have been presented with the petition.
6 Also, objections on foundation,
7 authentication, and hearsay. And that will
8 be a standing objection to any question asked
9 about this exhibit.
10 BY MR. BINENIUS:
11 Q. Had you reviewed this document prior
12 to forming the opinions expressed in your
13 declarations?
14 A. I'm sorry, just give me one second.
15 Nope.
16 MR. BINENIUS: Would you please open
17 the file "US7468036" and label this
18 Exhibit 1058.
19 (Exhibit 1058, U.S. Patent No.
20 7,468,036, received and marked.)
21 MR. KIANG: I will also object to
22 Exhibit 1058 as improper new evidence that

1 should have been presented with the petition.
2 Also, objections on foundation,
3 authentication, and hearsay. And that will
4 be a standing objection to any questions
5 asked about this exhibit.
6 BY MR. BINENIUS:
7 Q. Had you reviewed this patent prior to
8 forming the opinions expressed in your declarations?
9 A. I'm sorry, just -- can you just give
10 me one moment? I'm trying to bring this up here.
11 I'm not seeing the exhibit. So let me
12 go back.
13 Okay. Here we go. So this is 1058;
14 correct?
15 Q. Correct.
16 A. No, I did not use this document to
17 form my opinions in my declaration.
18 Q. To the best of your recollection, have
19 you seen this patent before?
20 A. No.
21 Q. I'd like to now turn to Sarantos.
22 This is Exhibit 1005. It's U.S. Patent

1 No. 9,392,946.
2 (Exhibit 1005, US Patent No.
3 9,392,946.)
4 BY MR. BINENIUS:
5 Q. When I say "Sarantos," you understand
6 I'm referring to Exhibit 1005; correct?
7 A. Yes, I do now. I'm just looking for
8 my paper copy of that.
9 Yes, I have that. Thank you.
10 Q. Can you please turn to Figure 2 of
11 Sarantos.
12 A. Yes.
13 Q. This figure is showing a wrist-worn
14 sensor; correct?
15 A. Figure 2 is described as a "simplified
16 representation of a wristband-type wearable fitness
17 monitor" --
18 THE REPORTER: Wait. Excuse me. Slow
19 down, please.
20 THE WITNESS: Yeah.
21 So Figure 2 depicts "a simplified
22 representation of a wristband-type wearable

1 fitness monitor."
2 BY MR. BINENIUS:
3 Q. It's looks like you're in Column 7.
4 I'm going to move to that section.
5 So we're at Column 7, line 12 of
6 Sarantos.
7 A. Okay.
8 Q. This paragraph describes that the
9 invention of Sarantos is a "wristband-type wearable
10 fitness monitor 200 that incorporates a PPG sensor";
11 is that correct?
12 A. That's what it says there in Column 7,
13 yes.
14 Q. And this paragraph goes on to describe
15 this wrist-worn monitoring device includes two light
16 sources and a photodetector; is that correct?
17 A. Can you point me to where you're
18 reading, Counselor?
19 Q. Starting at line 20, Column 7.
20 A. Oh, okay. Let me see.
21 So what was your question again,
22 please?

1 Q. This paragraph describes that the
2 wrist-worn monitoring device includes two light
3 sources and a photodetector; correct?
4 A. Yes, that's correct.
5 Q. Can you turn to Column 18 of Sarantos,
6 please? Looking at the paragraph starting at
7 line 35, can you please read that paragraph to
8 yourself, and let me know when you're finished.
9 A. The paragraph starting at line 35 in
10 Column 18?
11 Q. Correct.
12 (Document review.)
13 THE WITNESS: Yes, I've read that
14 paragraph.
15 BY MR. BINENIUS:
16 Q. This paragraph discusses different
17 wavelength ranges of light for conducting different
18 types of physiological measurements using the
19 wrist-worn sensor described by Sarantos; is that
20 correct?
21 A. Not -- not accurately, no. He doesn't
22 say that. In fact, he says the opposite there --

1 the opposite there. The end of that paragraph, he
2 says, "The aspect ratios and dimensional values
3 discussed herein are tailored based on the
4 green/yellow light spectrum and are not tailored for
5 use in other spectrums, such as the red or infrared
6 spectra."
7 Q. But the paragraph does discuss various
8 wavelengths for performing various physiological
9 measurements; is that correct?
10 A. Yes, but not in the context of the
11 Sarantos design.
12 Q. This paragraph includes a description
13 of wavelengths that would be suitable for measuring
14 blood oxygenation levels; is that correct?
15 A. It says that, "In contrast" -- then
16 "such as techniques for measuring blood oxygen
17 levels, may be most effective using light of
18 dramatically different wavelengths, such as in the
19 red wavelengths 660 nanometers, or in the infrared
20 spectrum [sic]."
21 So, yes, he makes that statement.
22 Q. I'd like to turn back to the '745

1 patent. That's Exhibit 1001.
2 Turning to Column 2, the paragraph
3 starting at line 51 --
4 A. Yes.
5 Q. -- does this portion of the '745
6 patent disclose wavelengths that are suitable for
7 measuring blood oxygen saturation specifically at
8 the wrist?
9 A. You're asking me to look at that
10 paragraph starting at line 51?
11 Q. Correct.
12 A. He says, "In an embodiment, an optical
13 physiological measurement system includes an emitter
14 configured to emit light of one or more" --
15 THE REPORTER: Excuse me -- excuse
16 me -- excuse me.
17 THE WITNESS: Okay. Sorry, sorry.
18 Okay.
19 THE REPORTER: You need to slow down.
20 THE WITNESS: I'm so sorry. Keep
21 telling me, please.
22 So the paragraph in Column 2, starting

1 at line 51, he says, "In an embodiment, an
2 optical physiological measurement system
3 includes an emitter configured to emit light
4 of one or more wavelengths..."
5 BY MR. BINENIUS:
6 Q. Doesn't this paragraph disclose the
7 specific wavelengths for measuring blood oxygen
8 saturation?
9 A. Not in that paragraph, no.
10 Q. I'd like to turn to Column 10, the
11 paragraph starting at line 40.
12 This section of the '745 patent is
13 discussing Figure 7A and 7B; correct?
14 A. Yes. It says Figure 7A and 7B, yes.
15 Q. Does this portion of the '745 patent
16 disclose wavelengths that are suitable for measuring
17 blood oxygen saturation specifically at the wrist?
18 A. This paragraph does not disclose
19 wavelengths, no.
20 Q. Are you aware of any portions of the
21 '745 patent that discuss needing to adjust the
22 wavelength used to measure blood oxygen saturation

1 specifically at the wrist?
2 MR. KIANG: Objection to scope.
3 THE WITNESS: I did not provide an
4 opinion on that in my declaration.
5 BY MR. BINENIUS:
6 Q. Can you please turn to Column 7 of the
7 '745 patent, the paragraph starting at line 30.
8 A. Yes, I'm there.
9 Q. Can you please read that paragraph to
10 yourself, and let me know when you're finished.
11 (Document review.)
12 THE WITNESS: Yes, I've read that
13 paragraph.
14 BY MR. BINENIUS:
15 Q. This paragraph discusses that red
16 wavelengths in the range of 650 nanometers to 940
17 nanometers would be suitable for use in the
18 described pulse oximetry system; correct?
19 A. In this paragraph, it's referring to,
20 yes, the wavelength 650 and 940 nanometers, yes.
21 Q. Does this paragraph of the '745 patent
22 discuss using different wavelengths for measurement

1 at the wrist versus measurement at the finger?
2 A. No, it does not.
3 Q. Do you agree that this disclosure
4 would be sufficient for a POSITA to identify the
5 correct wavelength for measuring blood oxygen
6 saturation at the wrist?
7 MR. KIANG: Objection to scope.
8 THE WITNESS: That was not an opinion
9 in my declaration.
10 BY MR. BINENIUS:
11 Q. Do you believe that the '745 patent
12 enables a POSITA to identify the correct wavelength
13 for measuring blood oxygen saturation at the wrist?
14 MR. KIANG: Objection to scope.
15 THE WITNESS: That was not an opinion
16 in my declaration.
17 BY MR. BINENIUS:
18 Q. Do you not know if the '745 patent
19 enablings a POSITA to identify the correct
20 wavelength to measure oxygen saturation at the
21 wrist?
22 MR. KIANG: Objection to scope.

1 THE WITNESS: That was not an opinion
2 I included in my declaration.
3 BY MR. BINENIUS:
4 Q. Would you agree that the
5 650-nanometers wavelength disclosed by Sarantos
6 falls within the range described in the '745 patent?
7 MR. KIANG: Objection to form.
8 THE WITNESS: Can you point me to what
9 you're comparing to, please?
10 BY MR. BINENIUS:
11 Q. Yeah. We were talking about Column 18
12 of Sarantos, the paragraph starting at line 35. We
13 previously had discussed that this paragraph
14 indicates a red wavelength of, for example,
15 660 nanometers [sic] would be suitable for measuring
16 blood oxygenation levels. And then we discussed
17 Column 7 of the '745 patent, which gives a range for
18 wavelengths for pulse oximetry.
19 I'm asking you if you agree that the
20 660-nanometer wavelength disclosed by Sarantos falls
21 within the range described in the '745 patent?
22 A. Yes, you're talking about one specific

1 wavelength required for measuring -- excuse me,
2 measuring oxygen saturation, and that's the red
3 wavelength at approximately 650 nanometers.
4 MR. BINENIUS: I'd like to now turn to
5 Iwamiya. This is Exhibit 1004 in these
6 proceedings. This is U.S. Patent No.
7 8,670,819.
8 (Exhibit 1004, US Patent No.
9 8,670,819.)
10 BY MR. BINENIUS:
11 Q. You understand that when I say
12 "Iwamiya," I am referring to Exhibit 1004; correct?
13 A. That's correct, yeah.
14 Q. Can you please turn to Column 8 of
15 Iwamiya.
16 A. Yes.
17 Q. Looking at Column 8 and then back to
18 Column 5, would you agree that the disclosures in
19 Column 8 are part of the section identified as the
20 "First Embodiment"?
21 A. I'm sorry, can you be more specific
22 where you're looking at in Iwamiya, Column 8?

1 Q. So Column 5, line 53, says "First
2 Embodiment"; correct?
3 A. Okay. Yeah, I see that.
4 Q. And would you agree that the
5 descriptions in Column 8 fall within that section
6 described as the "First Embodiment"?
7 A. Yes.
8 Q. And then turning ahead to Column 14,
9 at the bottom of Column 14 is where the "Second
10 Embodiment" starts; is that correct?
11 A. That's correct.
12 Q. All right. So turning back to
13 Column 8, can you please look at the paragraph
14 starting at line 38 and read that paragraph to
15 yourself and let me know when you're finished.
16 (Document review.)
17 THE WITNESS: Yes, I've read the
18 paragraph.
19 BY MR. BINENIUS:
20 Q. This portion of Iwamiya describes a
21 light shielding frame 18; is that correct?
22 A. Yes.

1 Q. Does this portion of Iwamiya describe
2 what material is used for the light shielding frame
3 18?
4 A. When you say "this portion," what do
5 you mean by "this portion"?
6 Q. This paragraph from lines 38 to 47 of
7 Column 8.
8 A. This paragraph -- this specific
9 paragraph just refers to a light shielding frame 18.
10 Q. Including a description of the
11 material used for the light shielding frame 18?
12 A. I missed the first part of your
13 question, please, Counselor.
14 Q. Does this paragraph include a
15 description of a material that is used for the light
16 shielding frame 18?
17 A. No, it does not.
18 Q. Can you please turn to Column 6 of
19 Iwamiya?
20 Column 6 is also part of the "First
21 Embodiment"; is that correct?
22 A. That's correct.

1 Q. Turning to the paragraph starting at
2 line 62 that continues into Column 7, can you please
3 read that to yourself, and let me know when you're
4 finished?
5 (Document review.)
6 THE WITNESS: Yes, I've read that.
7 BY MR. BINENIUS:
8 Q. There's no discussion of the light
9 shielding frame 18 in this paragraph; is that
10 correct?
11 A. That's correct.
12 Q. Continuing with Column 7 of Iwamiya,
13 can you please jump ahead to line 35 and read that
14 paragraph to yourself, and let me know when you're
15 finished?
16 (Document review.)
17 THE WITNESS: Yes, I've read that
18 paragraph.
19 BY MR. BINENIUS:
20 Q. There is no discussion of the light
21 shielding frame 18 in this paragraph; is that
22 correct?

1 A. That's correct.
2 Q. Can you please turn to Column 18 of
3 Iwamiya?
4 Do you agree that Column 18 is part of
5 Iwamiya's "Second Embodiment"?
6 A. Yes.
7 Q. Turning to line 61 of Column 18, can
8 you please read that paragraph that continues onto
9 Column 19 to yourself, and let me know when you're
10 finished?
11 (Document review.)
12 THE WITNESS: Yes.
13 BY MR. BINENIUS:
14 Q. This paragraph of Iwamiya doesn't
15 mention the light shielding frame 18; is that
16 correct?
17 A. That is correct.
18 Q. The second embodiment of Iwamiya is
19 different from the first embodiment; correct?
20 A. That is correct.
21 Q. Now, I'd like to turn to Column 28 of
22 Iwamiya.

1 Would you agree that Column 28 is part
2 of the "Third Embodiment" of Iwamiya?
3 A. Yes.
4 Q. Turning to line 64 of Column 28, can
5 you please read that paragraph that continues onto
6 Column 29 to yourself, and let me know when you're
7 finished?
8 (Document review.)
9 THE WITNESS: I've read that
10 paragraph.
11 BY MR. BINENIUS:
12 Q. This paragraph of Iwamiya doesn't
13 mention the light shielding frame 18; correct?
14 A. Yeah, that is correct.
15 Q. The third embodiment of Iwamiya is
16 different from the first embodiment; correct?
17 A. Can you say that again, please?
18 Q. The third embodiment of Iwamiya is
19 different from the first embodiment; correct?
20 A. That is correct.
21 Q. Please turn to Column 39 of Iwamiya.
22 Do you agree that Column 39 is part of

1 the "Fourth Embodiment" of Iwamiya?
2 A. Which column -- where are we looking
3 at again, I'm sorry?
4 Q. Column 39. And I'm asking if you
5 agree that that is part of the "Fourth Embodiment"
6 of Iwamiya?
7 A. Yes, I believe so.
8 Q. This paragraph of Iwamiya -- I'm
9 sorry. Can you turn to line 20 of Column 39, and
10 please read that paragraph to yourself.
11 (Document review.)
12 THE WITNESS: Yes.
13 BY MR. BINENIUS:
14 Q. This paragraph of Iwamiya does not
15 mention the light shielding frame 18; correct?
16 A. That is correct.
17 Q. The fourth embodiment is different
18 from the first embodiment of Iwamiya; correct?
19 A. Yes.
20 Q. I'd like to go back to Column 8 again
21 of -- still with Iwamiya, the paragraph starting at
22 line 38 that we previously discussed.

1 A. Which paragraph, again, please?
2 Q. Starting at line 38 of Column 8.
3 A. Yes, I've got it.
4 Q. As we previously discussed, this
5 paragraph does not disclose a specific material for
6 the light shielding frame 18; correct?
7 A. That's correct, that paragraph does
8 not.
9 Q. Do you agree that a POSITA would have
10 known that a transparent material does not block
11 light?
12 A. I'm sorry, please say the question
13 again.
14 Q. Would you agree that a POSITA would
15 have known that a transparent material does not
16 block light?
17 A. Yes.
18 Q. Would you agree that a POSITA would
19 have known that a translucent material does not
20 block all light?
21 A. When you say "does not block all
22 light," can you be more specific?

1 Q. Would you agree that a POSITA would be
2 aware that a translucent material would allow some
3 wavelengths of light to pass through?
4 A. Yes.
5 Q. Would a POSITA have understood that a
6 dark-colored opaque material blocks light?
7 A. Yes.
8 Q. Would a POSITA have understood that a
9 reflective material blocks light?
10 A. Generally, yes.
11 Q. I'd like to turn back to the '745
12 patent again, Exhibit 1001. Specifically, I'd like
13 to turn to Column 8, line 54.
14 Can you please read the paragraph
15 starting at line 54 of Column 8 that continues into
16 Column 9 to yourself, and let me know when you're
17 finished?
18 (Document review.)
19 THE WITNESS: Yes, I've read that.
20 BY MR. BINENIUS:
21 Q. This paragraph describes the effect of
22 multiple scattering and variations in pathlengths,

1 is that correct?
2 A. Yes.
3 Q. Would a POSITA have understood that
4 reflective material would have exacerbated such
5 phenomenon?
6 MR. KIANG: Objection to scope and
7 form.
8 THE WITNESS: That is not something I
9 provide an opinion on in my declaration.
10 BY MR. BINENIUS:
11 Q. Are you unaware of whether or not a
12 reflective material would cause multiple scattering
13 or variations in pathlengths?
14 MR. KIANG: Same objection.
15 THE WITNESS: Again, that is not
16 something I provide an opinion on in my
17 declaration.
18 BY MR. BINENIUS:
19 Q. All right. I'm going to turn to the
20 claims of the '745 patent, specifically Claim 15 in
21 Column 16. And I'd like to turn to the claim
22 element that starts at line 44 of Column 16, which

1 is identified as limitation 15.4 in the petition.
2 Could you please read that element out
3 loud?
4 A. Yes. "A plurality of photodiodes
5 configured to detect at least a portion of the light
6 emitted from the plurality of light-emitting diodes
7 after the light passes through the light diffusing
8 material and a portion of the tissue measurement
9 site and circled by the light block, wherein the
10 plurality of photodiodes" -- let me read it again,
11 I'm sorry -- "wherein the plurality of photodiodes
12 are arranged in an array having a spatial
13 configuration corresponding to a shape of the
14 portion of the tissue measurement site encircled by
15 the light block, wherein the plurality of
16 photodiodes are further configured to output at
17 least one signal responsive to the detected light,
18 and wherein the plurality of light-emitting diodes
19 and the plurality" -- excuse me -- "and the
20 plurality of photodiodes are arranged in a
21 reflectance measurement configuration."
22 Q. Turning to Column 9, starting at

1 line 19, can you please read that paragraph to
2 yourself, and let me know when you're finished?
3 A. Let me just get to that site.
4 Column 9 and which lines, please?
5 Q. Line 19.
6 A. 19. Okay.
7 (Document review.)
8 THE WITNESS: Yes, I've read that.
9 BY MR. BINENIUS:
10 Q. Do you believe that this portion of
11 the '745 patent specification provides support for
12 the Element 15.4 that we just discussed?
13 MR. KIANG: Objection, scope.
14 (Document review.)
15 THE WITNESS: I don't believe I
16 provided an opinion about that in my
17 declaration.
18 BY MR. BINENIUS:
19 Q. This paragraph discusses the spatial
20 configuration of the detectors; is that correct?
21 A. Sorry, which paragraph?
22 Q. That we just read starting at line 19

1 of Column 9.
2 A. So the paragraph says, "In addition, a
3 plurality of detectors can be arranged in an array
4 with a spatial configuration corresponding to the
5 irradiated surface area 206..."
6 Q. Is the arrangement of detectors
7 described in this paragraph depicted in any figures
8 of the '745 patent?
9 MR. KIANG: Objection to scope.
10 THE WITNESS: I did not provide an
11 opinion on that in my declaration.
12 BY MR. BINENIUS:
13 Q. Does the paragraph starting at line 19
14 of Column 9 reference a light block?
15 A. No, I do not see that.
16 Q. Does this paragraph identify a number
17 of detectors?
18 A. It says, "The detector 310 can be
19 implemented using one or more photodiodes,
20 phototransistors, or the like."
21 Q. Are you aware of any further
22 explanations of the spatial arrangement of detectors

1 in the '745 patent specification?
2 A. I did not provide an opinion about
3 that in my declaration.
4 Q. Turning back to Element 15.4, which is
5 at line 44 of Column 16 --
6 A. Yes.
7 Q. -- is the spatial arrangement for the
8 plurality of photodiodes recited in Element 15.4
9 depicted in any of the figures of the '745 patent?
10 A. I did not provide an opinion about
11 that in my declaration.
12 Q. Can you please turn to Column 11 of
13 the '745 patent, starting at line 31?
14 Could you please read that paragraph
15 to yourself, and let me know when you're finished?
16 A. I just want to make sure I've got
17 that. Column 11. Okay.
18 (Document review.)
19 THE WITNESS: Yes, I've read that
20 paragraph.
21 BY MR. BINENIUS:
22 Q. This paragraph, once again, discusses

1 a spatial configuration for the detectors; correct?
2 A. Yes, it says a plurality of detectors
3 can be arranged in an array.
4 Q. Do you believe that this paragraph
5 provides support for Element 15.4?
6 MR. KIANG: Objection to scope.
7 THE WITNESS: I did not provide that
8 opinion in my declaration.
9 BY MR. BINENIUS:
10 Q. Does this paragraph reference a light
11 block?
12 A. That paragraph refers to Figure 7B,
13 which includes the light -- the light block 706.
14 Q. Does the paragraph at line 31 of
15 Column 11 identify a number of detectors?
16 A. It says, "The detector can be
17 implemented using one or more photodiodes,
18 phototransistors, or the like."
19 Q. Does this paragraph of the '745 patent
20 limit the number of photodiodes that can be used in
21 the sensor?
22 A. I did not provide an opinion on that

1 in my declaration.
2 Q. I'm asking you if this specific
3 paragraph at line 31 of Column 11 limits the number
4 of photodiodes that can be used in the sensor?
5 A. The paragraph says it can be
6 implemented using one or more.
7 Q. Are you aware of any further
8 explanations of the arrangement of photodiodes in
9 the '745 patent specification?
10 A. Can you ask that question again,
11 please?
12 Q. Are you aware of any further
13 explanations of the spatial arrangement of detectors
14 in the '745 patent specification?
15 (Document review.)
16 THE WITNESS: I did not provide an
17 opinion on that in my declaration.
18 BY MR. BINENIUS:
19 Q. Does the '745 patent describe that the
20 shape of a light block, such as circle or square,
21 has any functional significance?
22 MR. KIANG: Objection to scope.

1 THE WITNESS: I did not provide an
2 opinion on that in my declaration.
3 BY MR. BINENIUS:
4 Q. Are you aware of any functional
5 significance of the shape of a light block?
6 A. I did not provide that as an opinion
7 in my declaration, and I would not want to try and
8 answer such a general question today.
9 Q. Does the '745 patent describe one or
10 more problems that are solved by the shape of the
11 light block?
12 MR. KIANG: Objection to scope.
13 THE WITNESS: That is not something I
14 provide an opinion on in my declaration
15 today.
16 BY MR. BINENIUS:
17 Q. Does the '745 patent describe that the
18 shape of the light block presents an unexpected
19 result?
20 MR. KIANG: Objection to scope.
21 THE WITNESS: That is not something I
22 provide an opinion on in my declaration.

1 MR. BINENIUS: Now might be a good
2 time for a break. I'm going to move on to a
3 different reference after this. So go off
4 the record and maybe take a ten-minute break
5 and meet at five after the hour.
6 THE WITNESS: Sounds good. Thank you.
7 (Recess from the record.)
8 MR. BINENIUS: Back on the record.
9 BY MR. BINENIUS:
10 Q. I'd now like to turn to Shie, which is
11 Exhibit 1007 in this proceeding. It's U.S. Patent
12 No. 6,483,976.
13 (Exhibit 1007, US Patent No.
14 6,483,976.)
15 BY MR. BINENIUS:
16 Q. You understand that when I say "Shie,"
17 I'm referring to Exhibit 1007; correct?
18 A. I'm just getting Shie.
19 Yes, that's correct.
20 Q. Can you please turn to Column 6 of
21 Shie? Looking at line 44 of Column 6, can you
22 please read the two paragraphs starting at line 44,

1 Column 6, with the second paragraph going onto
2 Column 7, to yourself, and let me know when you're
3 finished?
4 (Document review.)
5 THE WITNESS: Yes, I've read those.
6 BY MR. BINENIUS:
7 Q. These paragraphs of Shie describe an
8 optical element; correct? Specifically, the
9 cylindrical lens?
10 A. The first paragraph, first sentence
11 says, "Figures 2a and 2b illustrate an optical
12 element in the form of a cylindrical lens 30."
13 Q. And these paragraphs describe that the
14 curvature and contour of the cylindrical lens
15 surface define the macro-optical characteristics of
16 the lens; is that correct?
17 MR. KIANG: For the record, I have an
18 objection to the previous question to form.
19 I don't see it on the transcript yet.
20 THE REPORTER: You're going to have to
21 keep your voice up, Mr. Kiang.
22 MR. KIANG: Sorry about that, yeah.

1 MR. BINENIUS: I'll repeat the
2 question.
3 BY MR. BINENIUS:
4 Q. These paragraphs of Shie describe that
5 the curvature and contour of the cylindrical lens
6 surfaces define the macro-optical characteristics of
7 the lens; is that correct?
8 MR. KIANG: Objection to form.
9 THE WITNESS: In the second paragraph,
10 it says, "the curvature and contour of the
11 cylindrical lens surfaces 34, 40 and 44,
12 define a macro-optical characteristic of the
13 lens 30..."
14 BY MR. BINENIUS:
15 Q. And these paragraphs describe that the
16 lens provides light diffusing and shaping
17 advantages; is that correct?
18 A. Where do you see that in those
19 paragraphs? I don't see that in those paragraphs.
20 MR. KIANG: I also object to form.
21 BY MR. BINENIUS:
22 Q. This is in Column 7, at the end of the

1 second paragraph, the sentence that starts at
2 line 2. It states that "the monolithic nature of
3 the optical elements yield the highly desirable
4 light diffusing and shaping advantages..."
5 Do you see that?
6 A. I see that.
7 Q. What does the term "shaping" mean
8 here?
9 A. I don't know.
10 Q. I'm going to turn to Column 5 of Shie,
11 the paragraph starting at line 29.
12 Can you please read that paragraph to
13 yourself, and let me know when you're finished?
14 (Document review.)
15 THE WITNESS: Yes, I read that.
16 BY MR. BINENIUS:
17 Q. This paragraph describes
18 micro-structures in a substrate created in such a
19 manner so as to control the direction of light
20 output from a light source so as to shape the light
21 output into a desired distribution pattern or
22 envelope.

1 Do you see that?
2 A. Yes.
3 Q. What does Shie's discussion of "shape
4 the light output" mean here?
5 A. I do not know.
6 Q. This paragraph goes on to discuss
7 providing light homogenizing shaping and directing
8 characteristics.
9 Do you see that?
10 A. Yes, it says -- yes.
11 Q. What does the term "shaping" mean
12 here?
13 A. Again, I don't know.
14 Q. I'd like to turn to Column 7 of Shie,
15 the paragraph starting at line 8, so the next
16 paragraph after what we previously discussed.
17 Can you please read that paragraph to
18 yourself, and let me know when you're finished?
19 (Document review.)
20 THE WITNESS: Yes, I've read that.
21 BY MR. BINENIUS:
22 Q. This paragraph discusses a parabolic

1 convex lens having mico-structures at the outer
2 edges of the lens designed to shape the light into a
3 narrow distribution.
4 Do you see that?
5 A. No. Where is that, again?
6 Q. So in the second sentence which starts
7 at line 9, this talks about the parabolic convex
8 lens surface; correct?
9 A. Yes.
10 Q. And this describes that the convex
11 lens surface has a plurality of micro-structures;
12 correct?
13 A. Yes.
14 Q. Oh, sorry, I wanted you to continue
15 reading onto the next paragraph. So the next
16 paragraph discusses that the micro-structures 56
17 shape the light.
18 Can you please take a look at the
19 paragraph starting at line 21?
20 (Document review.)
21 THE WITNESS: Yes, I read that.
22

1 BY MR. BINENIUS:
2 Q. What does Shie's discussion of "shape
3 the light" mean here?
4 A. Again, I don't know.
5 Q. This paragraph discusses providing a
6 broader light distribution pattern. What does Shie
7 mean by "a broader light distribution pattern"?
8 A. Again, I don't know.
9 Q. Turning to Column 9 of Shie, starting
10 at line 36, can you please read that paragraph to
11 yourself, and let me know when you're finished?
12 (Document review.)
13 THE WITNESS: Yes, I see that.
14 BY MR. BINENIUS:
15 Q. This paragraph discusses the lightpipe
16 130 of Figure 11; correct?
17 A. Yes, it says Figure 11 represents
18 another alternative. Yes.
19 Q. And this paragraph describes that the
20 lightpipe has micro-structures integral in the top
21 surface which homogenize, shape, and direct light
22 exiting the lightpipe; correct?

1 A. Yes, slightly different I think to
2 what you said, but integral in the top surface of
3 light by 130 are micro-structures 136 which
4 homogenize, shape, and direct light exiting the
5 lightpipe.
6 Q. What does Shie's discussion here that
7 the micro-structures shape the light mean?
8 A. I don't know.
9 Q. All right. I'm going to turn back to
10 Sarantos, Exhibit 1005. Specifically, I'd like to
11 turn to Column 16 of Sarantos, the paragraph at the
12 bottom starting at line 60.
13 A. Yes.
14 Q. This paragraph discloses that
15 "Figures 22 through 24 depict cross-sections of
16 simplified representations of various PPG sensors,
17 in accordance with various example implementations";
18 correct?
19 A. That's what it says.
20 Q. Jumping ahead to Column 19 of
21 Sarantos, looking at the paragraph that starts at
22 line 33, the first few sentences of that paragraph,

1 this describes that "Figure 25 depicts an example of
2 an annular photodetector element 2512 with a light
3 source 2508 in the middle, in accordance with an
4 example implementation"; correct?
5 A. That's what it says.
6 Q. Based on those two disclosures of
7 Sarantos, would you agree that Figure 22 depicts a
8 cross-section of Figure 25?
9 MR. KIANG: Objection to form.
10 THE WITNESS: No, I don't agree with
11 that. It says Figures 22 through 24 depict
12 cross-sections of simplified representations
13 of various PPG sensors. And then Figure 25
14 is separate. It says Figure 25 depicts an
15 example of an annular photodetector element
16 with a light source in the middle.
17 I'm reading the figure descriptions on
18 Column 6.
19 BY MR. BINENIUS:
20 Q. Turning to Column 20 of Sarantos, the
21 paragraph starting at line 52, this is part of the
22 discussion of Figure 27; is that correct?

1 MR. KIANG: Counsel, can you repeat
2 the question?
3 BY MR. BINENIUS:
4 Q. Actually, I'm going to back up. I'm
5 going to go to line 34 of Column 20.
6 This describes that there are numerous
7 inventions described in Sarantos; is that correct?
8 A. The paragraph says, "There are many
9 inventions described and illustrated herein."
10 Q. So then moving down to the paragraph
11 starting at line 52, this recites, "it is to be
12 understood that any of the implementations discussed
13 above with respect to a single photodetector element
14 spaced apart from a light source may also be
15 implemented using a plurality of photodetector
16 elements arranged about the light source..."
17 So applying this disclosure at
18 Sarantos from lines 52 to 57 of Column 20, if that
19 were to apply to Figure 25, how would the
20 photodetectors be arranged?
21 MR. KIANG: Objection to scope.
22 THE WITNESS: That is not something I

1 provide an opinion on in my declaration.
2 BY MR. BINENIUS:
3 Q. You agree that based on this
4 disclosure of Sarantos, the photodetectors -- sorry,
5 scratch that.
6 Do you agree that based on the
7 disclosure of Sarantos at the paragraph starting at
8 line 52 of Column 20, the implementation shown in
9 Figure 25 could be implemented with multiple
10 photodetectors?
11 MR. KIANG: Objection to scope.
12 THE WITNESS: That is not something I
13 provide an opinion on in my declaration.
14 BY MR. BINENIUS:
15 Q. Do you understand the paragraph at
16 line 52 of Column 20 to disclose that any of the
17 descriptions of various embodiments could include
18 multiple photodetectors?
19 A. The paragraph states that "any of the
20 implementations discussed above with respect to a
21 single photodetector element spaced apart from a
22 light source may also be implemented using a

1 plurality of photodetector elements arranged about
2 the light source, as discussed with respect to
3 various other implementations discussed herein."
4 Q. Has a court ever precluded you from
5 offering an opinion?
6 A. No.
7 Q. Has a court ever criticized one of
8 your opinions?
9 A. Nope.
10 Q. Have you ever been convicted of a
11 felony?
12 A. Nope.
13 Q. Have you ever been convicted of a
14 crime related to acts of dishonesty or fraud?
15 A. Nope.
16 MR. BINENIUS: No further questions.
17 MR. KIANG: Let's take a 15-minute
18 break while I take a look at my notes.
19 (Recess from the record.)
20 MR. KIANG: I'm ready to go back on
21 the record.
22 THE REPORTER: Okay.

1 MR. KIANG: Thank you, Dr. Duckworth.
2 I don't have any redirect questions for you
3 today.
4 For the court reporter, we would like
5 to reserve the right to have the witness
6 review any errors in the transcript and to
7 sign the transcript, as well.
8 MR. BINENIUS: And we'd like to get an
9 expedited official transcript.
10 THE REPORTER: When do you need it?
11 MR. BINENIUS: Kim, thoughts? Are you
12 still on?
13 MS. LEUNG: Yeah, I'm here.
14 What's the normal time frame?
15 THE REPORTER: Ten days.
16 MS. LEUNG: Okay. And how soon can
17 you have an expedited one?
18 THE REPORTER: As soon as you want it.
19 MR. BINENIUS: Yeah, we pick the days,
20 and it just costs more the faster they go.
21 Does Monday sound reasonable to you?
22 Would that be soon enough, or do you need it

1 before then?
2 MS. LEUNG: Well, yeah, I think that
3 would be soon enough. I mean, I think maybe
4 even Wednesday would be okay, too.
5 THE REPORTER: Give me a day.
6 MR. BINENIUS: All right. Let's shoot
7 for Tuesday. Let's say Tuesday.
8 THE REPORTER: Okay. You got it.
9 Nice meeting everyone.
10 THE WITNESS: Thank you.
11 MR. BINENIUS: Thank you, everyone.
12 THE WITNESS: Thank you, Counselor.
13 THE REPORTER: Have a good night.
14 (The examination concluded. The time
15 is 2:35 p.m.)
16
17
18
19
20
21
22

1 STATE OF NEW YORK)
ss:
2 COUNTY OF WESTCHESTER)
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3 Certified Court Reporter, Registered Merit Reporter, Certified Realtime Reporter, and Notary Public in
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That I reported the taking of the
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6 hour of 10:00 a.m.
That prior to being examined, the witness
7 was duly sworn by me to testify to the truth, the whole truth, and nothing but the truth.
8 That I thereafter transcribed my said shorthand notes into typewriting and that the
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12 I further certify that I am not a relative
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16 financially interested in the action.
17 IN WITNESS WHEREOF, I have hereunto
18 set my signature this 12th day of August, 2023.
19
20
21
22

Eileen Mulvenna, CSR/RMR/CRR

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