1 O P E N S E S S I O N
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3 MR. MUELLER: Your Honor, for our next witness we
4 call Dr. Steve Waydo, and Ms. Garcia will do the
5 examination, Nina Garcia.
6 MS. GARCIA: Good morning, Your Honor. Nina
7 Garcia for Respondent Apple.
8 JUDGE BHATTACHARYYA: Good morning, Dr. Waydo. I
9 believe you're on mute.
10 THE WITNESS: Good morning.
11 JUDGE BHATTACHARYYA: Welcome. Do you understand
12 that you are under an obligation to tell the truth here
13 today?
14 THE WITNESS: I do.
15 STEPHEN WAYDO,
16 having been first duly sworn and/or affirmed
17 on his oath, was thereafter examined and testified as
18 follows:
19 JUDGE BHATTACHARYYA: You may proceed, counsel.
20 DIRECT EXAMINATION
21 BY MS. GARCIA:
22 Q. Good morning, sir. Would you please introduce
23 yourself? Where do you live? Where do you work?
24 A. My name is Stephen Waydo. I live in Saratoga,
25 California, and I work for Apple.

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Q. What is your current role at Apple?

A. I'm director of a group called HID Health.

Q. What is HID Health?

A. HID stands for human interface devices. The larger organization builds algorithms for sensors on a variety of Apple products. My team, in particular, is responsible for health algorithms primarily on the Apple Watch.

Q. Dr. Waydo, could you briefly describe your educational history?

A. Yes. I have a Bachelor's degree in aeronautics and astronautics from the University of Washington that I obtained in 2001, and a Ph.D. in control and dynamical systems from Caltech that I obtained in 2007.

Q. What did you do after you received your Ph.D. from Caltech?

A. Before and during graduate school I worked at NASA Jet Propulsion Laboratory in Pasadena, and I continued on there as a full-time employee for about six or eight months after I finished my Ph.D.

Q. Can you give an example of a project that you worked on at NASA Jet Propulsion Lab?

A. Yes. I worked on a variety of robotic heat space exploration missions. The biggest one was a mission called Deep Impact that flew out and took pictures of a comet in

2005.

(Clarification by reporter.)

Q. Did you work anywhere else before joining Apple?

A. Yes. After JPL I worked at a startup called C8 Medisensors for about four and a half years. At C8 we were trying to build a noninvasive glucose measuring device.

Q. When did you join Apple?

A. I joined Apple in March of 2013.

Q. What motivated you to join Apple, Dr. Waydo?

A. Well, the startup I worked at was ultimately unsuccessful, but I got very excited about the prospect of the building consumer products, and I thought Apple offered a tremendous learning opportunity to learn from the best about how to build products, and to have the opportunity to ship something at very large scale.

Q. And when you joined Apple in 2013, were you hired for a specific product?

A. I was, although I didn't know it at the time. So the interview process is very secretive. But I knew I would be working on products, and I was informed on my first day that the -- that I would be working on the first generation Apple Watch.

Q. What features did you work on for the first generation Apple Watch?

A. I worked on the algorithm supporting heart rate

sensing as well as wrist detection on the first Apple Watch.

Q. And what specifically was your role in developing the heart rate sensor for that first watch?

A. The biggest part of my role was working together with the hardware team to make sure that the hardware sensors they were building were a good fit for the algorithms we were building for particular end user applications. And by the time we shipped that first watch, I was responsible overall for the heart rate algorithm development.

Q. Can you tell us briefly about the hardware and software used for the heart rate sensing?

MS. GARCIA: Your Honor, at this point we would like to move onto the Apple confidential record.

JUDGE BHATTACHARYYA: We're moving onto the Apple confidential record.

(Whereupon, the hearing proceeded in confidential session.)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

(Whereupon, the hearing resumed in open session.)

O P E N S E S S I O N

JUDGE BHATTACHARYYA: We're moving to the public record.

THE WITNESS: Okay.

BY MS. SWAROOP:

Q. Dr. Waydo, I believe in your direct testimony you said that you wanted to join Apple because you wanted to learn from the best, correct?

A. Yes.

Q. Okay. And, Dr. Waydo, are you aware that Apple has hired individuals from Masimo?

A. Yes.

Q. You know Mike O'Reilly, correct?

A. I do.

Q. You worked with Mike O'Reilly, correct?

A. Yes.

Q. And you filed a patent application with Mike O'Reilly; isn't that correct?

A. It's possible. I don't know for sure.

Q. Okay. Let's bring up CX-1684. It's in your binder. And we'll put it up on the screen.

Dr. Waydo, this is a published patent application filed by Apple naming you and Michael O'Reilly among the inventors; isn't that right?

A. Yes.

Q. Dr. Waydo, in your direct testimony you discussed the heart rate sensing feature of the Series 0 watch; isn't that right?

A. Yes.

Q. Okay. And that watch involved a heart rate measurement, correct?

A. Yes.

Q. Okay. And the measurement of oxygen saturation is a more difficult measurement than the heart rate measurement, correct?

A. It's different for sure.

Q. It's more difficult, isn't it, Dr. Waydo?

A. It's very different. It solves a different set of problems. I don't know that I would characterize it as more difficult.

Q. Okay. Let's go to your deposition, which is in your binder, and we'll take a look at pages -- page 163, line 15, to 164, line 3.

A. Can you tell me where in my binder I can find that?

Q. It should be in your binder, if there's a tab there, I believe it's CX-298C.

A. Okay. And then what pages?

Q. Page 164 -- sorry -- page 163, line 15, to 164,

line 3, and I have it up on the screen as well.

A. Okay.

Q. And the question was from your own counsel:

What was your reaction to receiving the assignment of helping develop the blood oxygen feature for the Apple Watch?

And your answer:

I was both excited and, I'd say, intimidated. It's a more difficult measurement than the heart rate measurement, and, however, embarking on a new sensing development project is always exciting and quite a ride. So I was looking forward to it.

Were you asked that question and did you give that answer at your deposition, Dr. Waydo?

A. Yes.

Q. Okay. So you would agree, then, that oxygen saturation is a more difficult measurement than heart rate measurement, correct?

A. It depends very much on the context, but in some contexts, yes.

Q. Okay. And, in fact, it was extremely challenging to develop the blood oxygen feature in the Apple Watch, correct?

A. Yes.

Q. Now you've been involved in assessing the

accuracy of the blood oxygen feature of the Apple Watch, correct?

A. Not in a hands-on way, but I reviewed the data.

Q. You understand when talking about accuracy that there's a difference between sensitivity on the one hand and specificity on the other hand, correct?

A. Yes.

Q. And let's talk first about sensitivity.

An Apple Watch that detects everyone who has a particular medical condition would be an example of a highly sensitive device, correct?

A. Yes.

Q. Okay. And that's different from specificity, correct?

A. That's correct.

Q. Okay. An Apple Watch that detects medical conditions in people who do not actually have that medical condition would be an example of a device with low specificity, correct?

A. Yes.

Q. Okay. And in your direct today you didn't present any information on false alarms, that is, people who went to seek out medical care or thought something was wrong with them based on something from the Apple Watch but had no reason to do so, correct?

A. Presented nothing to that effect, that's correct.

Q. Okay. Did you ever work with Chin San Han in 2013?

A. Yes.

Q. Are you aware that Mr. Han tore apart a Masimo reflectance sensor during that time period?

MS. GARCIA: Objection, Your Honor. This lacks foundation.

JUDGE BHATTACHARYYA: Ms. Swaroop?

MS. SWAROOP: I'm simply asking if he is aware, Your Honor.

JUDGE BHATTACHARYYA: The objection is overruled.

A. Not that I can recall.

Q. Dr. Waydo, there has been feedback in the press about the unreliability of the blood oxygen feature of the Apple Watch Series 6, correct?

A. There's been a wide variety of feedback in the press about the product, both positive and negative.

Q. Okay. Well, let's talk about some of that feedback. Let's go to CX-1606 in your book, and I'm also going to put it on the screen. It's an article from Input Mag titled, quote, The Apple Watch's blood oxygen sensor is less accurate than you think.

Do you see that?

A. I see that.

Q. Okay. And let's turn to page 2. Let's go to the "Check with your doctor" paragraph. In this article it says, quote, some day Apple's blood oxygen monitoring could be accurate enough to actually detect medical conditions, but right now it's more of a gimmick than anything else.

Is that correct, Dr. Waydo?

A. That's what this article says.

Q. Right. Let's go to CX-1608 in your book. This is an article from the Verge entitled Apple Watch Series 6 review, minute improvements.

Do you see that?

A. What page are we looking at here?

Q. Sure. We're at CX-1608, page 1.

A. Okay.

Q. Okay. And if we go to page 2, there's a heading, "bad stuff."

Do you see that?

A. I see that.

Q. And the third bullet point, "blood oxygen monitoring is unreliable."

Do you see that?

A. I see that. I think here they are referring to difficulties getting successful measurements, because we tried very hard not to produce inaccurate measurements.

MS. SWAROOP: Okay. We need to go to the Apple

CBI record at this point.

(Whereupon, the hearing proceeded in confidential session.)

[redacted]

[redacted]

(Whereupon, the hearing resumed in open session.)

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O P E N S E S S I O N

BY MS. SWAROOP:

Q. Dr. Waydo, you've been aware of Masimo since 2010, correct?

A. I think so.

Q. Okay. And you're aware of Masimo's products, correct?

A. Not by model number, but generally speaking, yes.

Q. Okay. And in the specific area of clinical and in-hospital monitoring, you consider Masimo to be an important player and a leader; isn't that right, Dr. Waydo?

A. I believe they are an important player.

Q. And a leader, correct?

A. I don't know. I'm not deeply familiar with the clinical market.

Q. Okay. Well, let's go to your deposition. It's in your binder, CX-298C, page 127, line 25, to 128, line 6.

A. Can you repeat the page number again, please?

Q. Sure. Page 127, line 25 to 128, line 6.

A. Okay.

Q. And you were asked:

And do you consider Masimo to be a leader in that field as well?

And you answered:

I consider Masimo to be an important player and a leader just specifically in the area of clinical and in-hospital monitoring.

Do you see that?

A. Yes. Masimo is certainly a market leader. I don't know the extent to which they are a technology leader.

Q. So you were asked that question and you gave that answer at your deposition, right, Dr. Waydo?

A. Yes.

Q. Thank you.

MS. SWAROOP: I have no further questions.

MS. GARCIA: Brief redirect, Your Honor.

REDIRECT EXAMINATION

JUDGE BHATTACHARYYA: Yes, go ahead. We're on the public record. Do you want to stay on the public record?

MS. GARCIA: No, Your Honor. We'll briefly go on the confidential record please.

(Whereupon, the hearing proceeded in confidential session.)

[redacted]

[redacted]

(Whereupon, the hearing resumed in open session.)

O P E N S E S S I O N

JUDGE BHATTACHARYYA: We're moving to the public record.

BY MS. GARCIA:

Q. Dr. Waydo, you were also shown some articles that purported to describe the accuracy of Apple Watch.

Do you recall that?

A. Yes.

Q. Now as a factual matter, based on your work developing the blood oxygen feature, how accurate are the measurements that are presented to users?

A. We've tested the watch to the same standards that are used to assess clinical grade devices, and we meet the general accepted standards for accuracy of blood oxygen devices.

Q. Dr. Waydo, you were asked some questions about Dr. O'Reilly.

Do you recall that?

A. Yes.

Q. Did Dr. O'Reilly contribute any ideas to the software or hardware of the Apple Watch blood oxygen sensors?

MS. SWAROOP: Objection, foundation.

MS. GARCIA: I can restate it.

Q. Dr. Waydo, what role, if any, did Dr. O'Reilly have on your health sensing algorithm team with respect to the development of the blood oxygen feature?

A. Dr. O'Reilly is an anesthesiologist. He has extensive knowledge around the physiological, that's in general, and physiological of PPG signals in particular, but he has no engineering expertise and had no contributions to the hardware or software.

Q. Who did come up with the ideas for the software and hardware of Apple Watch and the blood oxygen feature?

A. The majority of the work happened between the health sensing hardware team, I believe we have heard from a few of them in this hearing, as well as my team.

Q. Did any of those ideas come from Masimo?

A. No.

Q. Thank you, Dr. Waydo.

MS. GARCIA: I have no further questions at this time.

RECROSS-EXAMINATION

BY MS. SWAROOP:

Q. Ms. Garcia asked you about your familiarity of accuracy with the Apple Watch health sensing features.

Do you recall that?

A. Yes.

Q. Okay. Are you aware of a published study from

the Mayo Clinic indicating that the Apple Watch triggers a number of false alarms causing people to go to the hospital and resulting in unnecessary utilization of hospital resources?

A. We have a number of problems with that particular study and the methodology there in general, but I'm aware of the paper you're talking about.

Q. Thank you.

MS. SWAROOP: No further questions.

MS. GARCIA: Nothing further, Your Honor.

Thank you, Dr. Waydo.

JUDGE BHATTACHARYYA: Thank you for your time, Dr. Waydo.

THE WITNESS: Thank you.

MR. MUELLER: We certainly defer to Your Honor, but this might be a good time for the morning break before our next witness.

JUDGE BHATTACHARYYA: It sounds like a good idea. Let's take a morning break now. We're in recess for 15 minutes.

(Whereupon the proceedings recessed at 11:07 a.m.)s.

(In session at 11:23 a.m.)

JUDGE BHATTACHARYYA: We're back on the record.

MR. MUELLER: Thank you, Your Honor. Apple calls