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Transcript of Igor Efimov, Ph.D.

Date: July 16, 2026
Case: Samsung Electronics Co., Ltd., et al. -v- Omni MedSci, Inc. (PTAB)

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

SAMSUNG ELECTRONICS CO., LTD., et al,
Petitioners,
vs.
OMNI MEDSCI, INC.,
Patent Owner.

Case: IPR2025-01252
U.S. Patent No. 11,160,455
Case: IPR2025-01250
U.S. Patent No. 9,651,533
Case: IPR2025-01251
U.S. Patent No. 10,874,304
Case: IPR2025-01254
U.S. Patent No. 12,268,475

VIDEOTAPED DEPOSITION OF

IGOR EFIMOV, Ph.D.

Thursday, July 16, 2026

Job No.: 641422
Pages: 1 - 243
Stenographically Reported By:
Alison C. Webster, CSR, RPR, RMR, CRR, RDR

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Videotaped deposition of IGOR EFIMOV, Ph.D., produced as a witness at the instance of the Petitioner, and duly sworn, was taken in the above-styled and numbered cause on Thursday, July 16, 2026, from 10:04 a.m. to 4:37 p.m. Eastern Time, before Alison C. Webster, RPR, CRR, RMR, RDR, CSR-6266 (Michigan); License No. 14559 (California); License No. 084.004953 (Illinois); CSR-12432 (Texas), reported by stenographic method, via videoconference, pursuant to the Federal Rules of Civil Procedure and the provisions stated on the record or attached hereto.

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1 DEPOSITION OF IGOR EFIMOV, Ph.D.
2 Thursday, July 16, 2026
3
4 STENOGRAPHER: The attorneys
5 participating in this deposition and the
6 witness have verified that he is Igor Efimov,
7 Ph.D. In lieu of an oath administered in
8 person, the witness will visually affirm his
9 testimony in this matter is under penalty of
10 perjury.
11 The parties and their counsel consent
12 to this arrangement and waive any objections
13 to this manner of reporting or admissibility
14 of the transcript.
15 Would counsel please state their
16 appearance and any objections to proceeding in
17 this manner, starting with scheduling counsel.
18 MR. KIM: Sure, this is Daniel Kim
19 from Sheppard Mullin on behalf of Petitioners
20 Samsung Electronics Co Ltd and Samsung
21 Electronics America Inc.
22 MR. HOLT: Good morning. This is

8

1 Benjamin Holt from Nixon Peabody on behalf of
2 Patent Owner Omni MedSci Inc.
3 STENOGRAPHER: Thank you.
4 Hearing no objections, Dr. Efimov,
5 would you please raise your right hand.
6 Do you swear or affirm the testimony
7 you are about to give in this matter will be
8 the truth, the whole truth, and nothing but
9 the truth?
10 DR. EFIMOV: I do.
11 STENOGRAPHER: Thank you.
12 You may proceed.
13 IGOR EFIMOV, Ph.D.,
14 was thereupon called as a witness herein, and
15 after having first been duly sworn to testify
16 to the truth, the whole truth and nothing but
17 the truth, was examined and testified as
18 follows:
19 MR. KIM: Good morning, Dr. Efimov.
20 THE WITNESS: Good morning.
21 EXAMINATION
22 BY MR. KIM:

9

1 Q. Can you please state your full name for the
2 record?
3 **A. My name is Igor Efimov.**
4 Q. Thank you. And you are here to testify based
5 on your declaration submitted in
6 IPR2025-01250, IPR2025-01251, IPR2025-01252,
7 and IPR2025-01254. Correct?
8 **A. This is correct.**
9 Q. Is it okay to call those four IPRs together as
10 "IPRs" throughout this deposition?
11 **A. That's fine.**
12 Q. Okay. For these IPRs, are you retained by
13 Omni MedSci?
14 **A. Yes.**
15 Q. When were you retained for these IPRs?
16 **A. I think it was October or November of last**
17 **year.**
18 Q. October or November of 2025?
19 **A. Correct.**
20 Q. Okay. What did you do to prepare for this
21 deposition?
22 MR. HOLT: I'll just caution the

10

1 witness not to reveal any privileged
2 information.
3 **A. Yes, I read the documents again. This is an**
4 **extensive release of documents. I read also**
5 **prior art, looked at the evidence of copying,**
6 **and we had a few days of preparations with**
7 **attorneys.**
8 **BY MR. KIM:**
9 Q. Okay. When you say "a few days," how many
10 days?
11 **A. It was three days.**
12 Q. Okay. And --
13 **A. Not complete days.**
14 Q. And how many hours would that be?
15 **A. I didn't calculate. I would say maybe 24.**
16 Q. And who are the attorneys that you met with?
17 **A. They are present here, both of them, Benjamin**
18 **Holt and Angelo Christopher.**
19 Q. Okay. Outside the meeting with your counsel,
20 what did you do to prepare for this
21 deposition?
22 MR. HOLT: I'll caution the witness

11

1 not to reveal any privileged work product or
2 communications.
3 **A. Like I said, I reviewed my declarations again**
4 **and prior art documents, related patents, and**
5 **related documents.**
6 **BY MR. KIM:**
7 Q. When you say "related documents," what do you
8 mean?
9 **A. Well, for example, compiled tables with**
10 **evidence of copying by Samsung, which are**
11 **provided as exhibits.**
12 Q. When you say "compiled tables," are those
13 submitted in these IPRs?
14 **A. Yes. And they are cited extensively in my**
15 **declarations.**
16 Q. Do you recall the exhibit numbers for those
17 compiled tables?
18 **A. Oh, no, I don't.**
19 Q. Okay. What did the compiled tables look like?
20 MR. HOLT: Objection. Form.
21 **A. So these are documents of each -- one or two**
22 **or 300 pages, there are four documents, each**

12

1 **related to one of the patents, and there is a**
2 **list of specifications of claims and**
3 **corresponding evidence. It's nonconfidential**
4 **evidence from -- basically available from the**
5 **Internet or publications.**
6 **BY MR. KIM:**
7 Q. Did you prepare the compiled tables yourself?
8 **A. No, it was provided to me by the attorneys at**
9 **the time of working on the declarations.**
10 Q. Okay. Dr. Efimov, have you been deposed
11 before?
12 **A. Yes, I have.**
13 Q. Have you been deposed for IPRs before?
14 **A. Yes, I have.**
15 Q. How many times?
16 **A. I don't remember exact number, but I would**
17 **say a few. You know, one hand. Few times.**
18 Q. I will assume that you are aware of the basic
19 rules, but I will still go through them just
20 so that we're on the same page.
21 **A. Yeah, I know basic rules, but it would be**
22 **helpful here if you remind me of them.**

13

1 Q. Okay. So throughout this deposition I will
2 ask you questions that you will need to answer
3 to. Please let me know if you don't
4 understand any of my questions. I will try to
5 rephrase.
6 **A. Understood.**
7 Q. And when you answer, please answer verbally
8 and clearly so that we have a clear
9 transcript.
10 **A. Also understood.**
11 Q. And if you need a break, just let me know.
12 Unless there's a question pending, I'll try to
13 take a break. And I'll also try to take a
14 break every hour.
15 **A. Yes. Thank you.**
16 Q. Where are you sitting right now?
17 **A. I'm sitting on the 52nd floor of 70 West**
18 **Madison Street building, which is essentially**
19 **building where Nixon Peabody company is**
20 **located. I'm in Chicago.**
21 Q. Okay. So you are sitting in Nixon Peabody's
22 office in Chicago.

14

1 **A. Correct.**
2 Q. Okay. Who's there in the office with you
3 right now?
4 **A. Well, like I said, Benjamin Holt, who's**
5 **currently to my right, and Angelo Christopher**
6 **who is in the room as well.**
7 Q. Okay. If anyone else enters the office or
8 room, can you let me know that they're
9 entering?
10 **A. Will do.**
11 Q. Okay. Do you currently have any application
12 other than this Zoom open in your computer?
13 **A. I have -- let me see...**
14 **I have -- so this -- so this Zoom is**
15 **open through the Safari browser.**
16 Q. Okay.
17 **A. And I also have note-taking. I can close it.**
18 Q. Okay.
19 **A. I will close it, yes. That's it.**
20 Q. Okay. Right now, it's just the Safari
21 operating the Zoom application?
22 **A. Right. And the Zoom application. So I**

15

1 **connected through Safari -- no, I'm sorry,**
2 **I'm actually connected through Zoom**
3 **Workplace.**
4 Q. Okay. So the software is not open?
5 **A. It's open now, but let me close it. I hope**
6 **Google not shut down. No, I'm still okay.**
7 **Yeah, I closed the Safari.**
8 Q. Okay. Thank you.
9 **A. I only have Zoom application open and the**
10 **screen from Zoom Workplace.**
11 Q. Great. Thank you.
12 **A. The Google connection, yeah.**
13 Q. Okay. I would ask that you do not open any
14 applications other than Zoom throughout the
15 deposition today.
16 **A. Well, I will have to open power -- Adobe**
17 **Acrobat --**
18 Q. Correct.
19 **A. -- when you provide me with PDF.**
20 Q. Correct. That was going to be my next
21 sentence, but thank you for saying that.
22 So other than the Zoom and the PDF --

16

1 **A. Uh-huh.**
2 Q. -- I would ask that you do not open any other
3 applications.
4 **A. Understood. Unless you ask me to.**
5 Q. Great. Thank you. Do you have any questions
6 so far?
7 **A. No, everything is clear. Thank you.**
8 Q. Great. Dr. Efimov, you have a Ph.D. degree.
9 Correct?
10 **A. Correct.**
11 Q. When did you receive your Ph.D. degree?
12 **A. I received my -- my defense was in 1991 on**
13 **25th of December, and then -- and then there**
14 **was approval process. I received it in the**
15 **former Soviet Union, and so I was conferred**
16 **to -- in March, I believe, 1992.**
17 Q. Thank you. And you are currently a professor
18 of biomedical engineering and professor of
19 medicine at Northwestern University. Correct?
20 **A. Correct. In Chicago.**
21 Q. And how long have you been a professor?
22 **A. I moved to Chicago to Northwestern in 2022.**

17

1 Q. Okay. And before 2022, where were you?
2 **A. I was in Washington, D.C. I was on the**
3 **faculty of the George Washington University,**
4 **where I served as the founder and chairman of**
5 **the Department of Biomedical Engineering for**
6 **five years, and then I was also endowed chair**
7 **professor in biomedical engineering.**
8 Q. Okay. And you said "for five years," so that
9 would be between 2017 through 2022?
10 **A. No, it -- so it was from January 2015 to --**
11 **through five years, which would be December**
12 **'19, I believe, if I -- my math is correct.**
13 **And then I -- I stepped down as a chairman**
14 **after five years, which was my commitment to**
15 **five years, and I continued serving as a**
16 **regular endowed chair professor.**
17 Q. Okay.
18 **A. Two more years before moving to Northwestern.**
19 Q. Okay. And before January 2015, where were
20 you?
21 **A. I served for 11 years as a professor of**
22 **biomedical engineering at Washington**

18

1 **University in St. Louis, Missouri, but also I**
2 **was professor, secondary appointments**
3 **professor in several more departments**
4 **including radiology, medicine -- medicine,**
5 **some other -- I already forgot. Several**
6 **departments.**
7 Q. Okay. So that would be between probably two
8 thousand --
9 **A. '04, 2004 and 2015.**
10 Q. Great. And during your tenure, what has been
11 the -- what has been your field of expertise?
12 **A. So my entire research career since, I would**
13 **say, 1992, when I moved to the United States**
14 **from the Soviet Union, I was focusing on**
15 **optical methods of studying cardiovascular**
16 **function using various optical methods,**
17 **developing instrumentation, light sources,**
18 **software, and studying pathological**
19 **mechanisms of heart disease, vascular**
20 **disease, which lead to sudden cardiac death,**
21 **heart failure, coronory disease, and various**
22 **other types of cardiovascular disease.**

19

1 Q. So you are familiar with optical physiological
2 measurement devices. Correct?
3 **A. Yes, correct, and I have patents in this**
4 **space, and I -- I published over 300 papers.**
5 **Many of them are on that subject.**
6 Q. What are the common types of optical
7 physiological measurement devices?
8 MR. HOLT: Objection. Form.
9 **A. Well, it's a general question. I have**
10 **courses on that. I can speak about it for**
11 **many hours, obviously. So I have a couple of**
12 **books as well. But, basically, physiology,**
13 **cardiovascular physiology in particular, both**
14 **in the basic research laboratory as well as**
15 **in the clinical settings, is assessed using**
16 **various physical principles based on physics**
17 **including electrical principles [ph], signal**
18 **sensing, electrical signal sensors,**
19 **electrocardiogram, for example.**
20 **You sense mechanical parameters such**
21 **as contractility, pulse wave within the blood**
22 **vascular system, motion of the heart, and**

20

1 **there are sensors for mechanical sensing like**
2 **force of contraction or strain. Again, there**
3 **is a whole host of sensors on that.**
4 **And then there is also -- there are**
5 **means for chemical sensing so we can sense**
6 **various molecules using chemical sensors, for**
7 **example, or optical sensors.**
8 **And finally, there are optical means.**
9 **So in many of these parameters I mentioned,**
10 **both electrical, mechanical, as well as**
11 **chemical, all these parameters, through**
12 **intermediate principles based in -- grounded**
13 **in physics and in chemistry, can be measured**
14 **optically because electrophysiology,**
15 **electrical fields, mechanical contraction,**
16 **chemical signatures, all of that through**
17 **intermediate -- intermediary molecules like,**
18 **for example, hemoglobin, can be measured**
19 **optically.**
20 **And that's essentially what**
21 **optical -- I called it optical cardiography.**
22 **So optical cardiography deals with measuring**

21

1 physiology of cardiovascular system in this
2 case, but could also be applied to other organ
3 systems like brain, for example. It measures,
4 basically, physiology through optical means.
5 BY MR. KIM:
6 Q. Okay. Can you give me some common examples of
7 optical physiological measurement devices?
8 MR. HOLT: Objection. Form. Scope.
9 A. Well, it's a very general question. So I can
10 give you example, for instance, what I have
11 developed specifically. So, for instance,
12 there are molecules in our cells which are
13 present all the time. They are called
14 endogenous fluorophores. And I can spell it,
15 if necessary, or we can type.
16 Basically, these molecules are
17 present in our body, but they also have
18 optical properties. They change their
19 spectrum, their absorption or emission
20 spectrum based on their quantity or functional
21 state. And you can basically shine light on
22 some part of the body or isolated constituents

22

1 such as blood or isolated cells or tissue, and
2 then collect light which is being emitted by
3 tissue or scattered by tissue, and from that
4 signal, optical signal, converted of course
5 later from optical to electrical and then to
6 digital, you can derive quantitatively measure
7 of quantity of that particular substance you
8 are looking at or particular function. Like,
9 for example, electrical field in case of
10 electrocardiogram or mechanical contraction in
11 case of contractility or many other
12 physiological principles.
13 But all of them, in optical
14 cardiography, are under the same umbrella.
15 You basically deliver light and you collect
16 light back and the collected light will give
17 you this information if properly sampled and
18 analyzed.
19 BY MR. KIM:
20 Q. So the last bit about delivering light,
21 collecting light back, and generating signal
22 from the captured light, is that common across

23

1 all optical physiological measurement systems?
2 MR. HOLT: Objection. Form. Scope.
3 A. Again, it's -- most of the systems are like
4 that, but there are also variances. For
5 example, there are exponents [ph] of those
6 methods like photoacoustic tomography, for
7 instance.
8 In this case you're delivering light,
9 but light will increase temperature of sample
10 which will create pop of [ph] sound and you
11 collect back sound, not light. It still will
12 go under, essentially, optical cardiography
13 umbrella, but it will slightly deviate from
14 standards where you shine light and you
15 collect light.
16 In this case, you shine light but you
17 collect ultrasound back, so basically there
18 are differences.
19 But in general, you're correct, most
20 principles are based on shining light of
21 specific spectral characteristics and taking
22 it back basically again of whatever spectral

24

1 characteristics, depending on the parameters.
2 Q. Okay. And the same principle is used in pulse
3 oximeters. Correct?
4 A. In general, yes. But, again, like in example
5 with acoustic tomography, each specific
6 molecule in this case, oxygen,
7 deoxyhemoglobin, has very specific spectral
8 characteristics, so you have to design very
9 specifically light source color and detector
10 system, then processing of signals. In order
11 to get a decent signal, you have to basically
12 be very mindful how you design all of that.
13 Q. Okay. For physiological measurement devices,
14 LEDs were commonly used before 2012. Correct?
15 MR. HOLT: Objection. Form. Scope.
16 A. So when I started my career in 1992 as
17 a doctoral researcher at the University of
18 Pittsburgh LEDs were not used yet, so we used
19 different light sources. There is a whole
20 family of light sources such as tungsten
21 halogen lamps, lasers were available, some
22 more specialized lamps like mercury lamps,

25

1 et cetera, and then later LEDs were
2 introduced and they became, indeed, common.
3 The exact year, it depends on the
4 application, depends on what was available.
5 Not every wavelength initially was
6 available. I believe blue LEDs were not
7 immediately introduced, so it was a process,
8 but it was becoming common. And currently in
9 our -- in the middle of 2010s, I would say, it
10 was already dominant form of light sources.
11 BY MR. KIM:
12 Q. And just to be more precise, before 2012, LEDs
13 were known to be used in physiological
14 monitoring devices. Correct?
15 MR. HOLT: Objection. Form. Scope.
16 A. Generally they were used, but also still,
17 like I said, for example for microscopic
18 systems which were also optical, obviously,
19 systems using the same principles. Very
20 commonly lasers were used, tungsten halogen
21 lamps were used, mercury lamps were also
22 used, so there are several.

26

1 It depends on the application because
2 for specific molecules you might need a very
3 specific, very narrow band wavelength. In
4 this case you would rely on laser, for
5 example, or mercury lamp which happened to
6 have this particular wavelength.
7 BY MR. KIM:
8 Q. Okay.
9 A. So you have to be specific on the -- on the
10 design.
11 Q. So the question was not whether it was common.
12 I asked whether it was known to be used in
13 physiological monitoring devices before 2012.
14 A. Yeah, it was known.
15 Q. Okay. And before 2012, detectors such as
16 photodiodes were also known to be used in
17 physiological monitoring devices. Correct?
18 MR. HOLT: Objection. Form.
19 A. Photodiodes were known, yes. I used them in
20 '92.
21 BY MR. KIM:
22 Q. Okay. And when we say "signal-to-noise

27

1 ratio," can you explain what that means?
2 MR. HOLT: Objection. Form.
3 A. So signal-to-noise ratio refers essentially
4 to quality of recording of any kind,
5 biological, physical, physiological. It
6 refers to -- essentially, if you look at the
7 signal, there is a useful part of the signal
8 and there is essentially a part which comes
9 from noise. You assess -- you measure amount
10 of noise, and there are different definitions
11 how you actually do that. Noise depends on
12 the particular path.
13 On frequency content, it could be
14 high frequency, low frequency, and essentially
15 what you do, you measure magnitude of signal,
16 you measure magnitude of noise depending on
17 definition, and you make, essentially, a ratio
18 signal divided by noise. This is in most
19 general terms.
20 BY MR. KIM:
21 Q. And before 2012, it was known in the art to
22 increase signal-to-noise ratio of an optical

28

1 signal by increasing light intensity.
2 Correct?
3 MR. HOLT: Objection. Form and
4 scope.
5 A. Well, again, it depends on application. In
6 some cases, in fact, this would be
7 detrimental. You can think of increasing
8 light intensity would lead, in some cases, to
9 saturating your sensor to essentially degrade
10 your signal-to-noise ratio. You have to be
11 very careful how you deal with it.
12 BY MR. KIM:
13 Q. Okay. But it was still known in the art to
14 increase signal-to-noise ratio of an optical
15 signal by increasing the light intensity
16 before 2012. Correct?
17 MR. HOLT: Objection. Form. And
18 scope.
19 A. I would say optimizing would be a more
20 precise definition. In some cases
21 increasing, in some cases decreasing, but
22 optimizing would be -- is best definition.

29

BY MR. KIM:
Q. Let's forget about optimization for now. I'm just asking whether it was known in the art to increase a signal-to-noise ratio by increasing the light intensity before 2012.
MR. HOLT: Same objections.
A. And again I would say the same answer, that it depends on application. In some cases increasing intensity will be helpful, in some cases it will not be helpful.
BY MR. KIM:
Q. Again, that's not the question I asked. Let me -- let me ask the question again.
Before 2012, it was known in the art to increase the signal-to-noise ratio by increasing the light intensity being used in physiological monitoring devices. Correct?
MR. HOLT: Objection to form and scope.
A. Well, like I said, again, I already answered this question. It depends. You cannot be generic about it because for a specific

30

application you have to design properly the relation between light intensity of light source and your sensitivity of your sensor. So in some cases it would be helpful, in some cases it will not be helpful.
BY MR. KIM:
Q. Again, I'm not asking whether it would be helpful in all the instances. I'm just asking whether it was known in the art to increase the signal-to-noise ratio by increasing light intensity before 2012.
MR. HOLT: Same objections.
A. Well, again, you have to give me more precise example, in what particular sensor, because I can essentially think of some in which it will not be helpful.
BY MR. KIM:
Q. Let's use pulse oximeter as an example, and let's assume that the initial light intensity is very low.
A. Uh-huh.
Q. And in that instance, was it known in the art

31

before 2012 to increase signal-to-noise ratio by increasing the light intensity of the pulse oximeter?
MR. HOLT: Objection to form and scope.
A. So, again, I can think of examples where increasing light intensity beyond certain threshold would be detrimental. It will saturate the sensor and you will not get improvement in signal-to-noise ratio.
BY MR. KIM:
Q. Again, I'm not asking for an example. I'm asking whether the concept of increasing the signal-to-noise ratio by increasing light intensity was known in the art before 2012.
MR. HOLT: Objection. Form. Scope.
A. That is one of the approaches but, like, again, it -- depending on the design.
BY MR. KIM:
Q. Again, I'm not asking for a process and I'm not asking for a design. I'm asking whether the concept of increasing signal-to-noise

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ratio by increasing the light intensity was known in the art before 2012.
MR. HOLT: Same objections.
A. Same answer. Basically, like I said, you cannot take this concept in isolation. It has to be for a specific application for specific design. And you have to understand that increasing intensity beyond certain threshold is detrimental.
BY MR. KIM:
Q. So was it known in the art before 2012 that increasing light intensity before the threshold you mentioned could increase the SNR or signal-to-noise ratio?
MR. HOLT: Objection. Form. Scope.
A. For some applications, yes. For some, no.
BY MR. KIM:
Q. What are the applications that the signal-to-noise ratio would increase?
MR. HOLT: Objection. Form. Scope.
A. Well, for example, in case of what I mentioned, electrocardiography, so you

33

1 **measure transmembrane potential using**
2 **voltage-sensitive dye where, basically,**
3 **molecule changes spectral characteristics**
4 **based on changes in transmembrane potential**
5 **in the cell, and you can sense it optically.**
6 **So within certain range if you**
7 **increase intensity it will be helpful, but if**
8 **you exceed certain threshold it will not be**
9 **helpful, so you have to be very careful.**
10 MR. KIM: I'm going to show you a
11 document that has been marked as 1008 in
12 IPR2025-01250.
13 THE WITNESS: Okay.
14 ENTERED INTO THE RECORD:
15 PREVIOUSLY MARKED IPR2025-01250
16 EXHIBIT 1008
17 10:30 a.m.
18 MR. HOLT: Counsel, can you share
19 that document in the Chat as well, please?
20 MR. KIM: I think it's already there.
21 MR. HOLT: Oh, yeah.
22 BY MR. KIM:

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1 Q. Yeah, once you download the document, please
2 let me know, Dr. Efimov.
3 **A. I will place it on desktop. Yeah, and I**
4 **opened it. It let me open it, and nothing --**
5 **I have the preview open, but I will open in**
6 **Adobe Acrobat. I opened it.**
7 Q. Okay. Have you seen this document before?
8 **A. Can you remind me the reason -- I mean, I**
9 **studied so many documents. Is it on the list**
10 **of my previously studied documents? It looks**
11 **familiar.**
12 Q. So you do not recall whether you've seen this
13 document before?
14 **A. Like I said, I studied probably 100**
15 **documents. I don't remember every single one**
16 **of them. But I do recall studying documents**
17 **for Apple case.**
18 Q. Okay. So this is the final written decision
19 issued by the Court in an IPR that involved
20 United States Patent Number 9,651,533.
21 **A. Okay.**
22 Q. Does that refresh your recollection as to what

35

1 this document is?
2 **A. Yeah.**
3 Q. Okay.
4 **A. In general terms, yes.**
5 MR. KIM: If we can go to page 26.
6 **A. Okay. 26 of the document -- it's the same as**
7 **PDF, yes.**
8 **BY MR. KIM:**
9 Q. Give me one second. My PDF just froze.
10 Okay. If you look at the sentence
11 right below the subparagraph Section C, it
12 reads, "Claim 13 further requires the light
13 source to be configured to increase
14 signal-to-noise [ratio] by increasing a light
15 intensity of at least one of the plurality of
16 semiconductor sources."
17 Do you see that?
18 **A. Yes, I do.**
19 Q. And the next sentence reads, "Petitioner
20 demonstrates how Lisogurski's LED-based light
21 source 130/316 meets this limitation."
22 Do you see that?

36

1 **A. Yes, I do.**
2 Q. So the Board found that increasing
3 signal-to-noise ratio by increasing a light
4 intensity of at least one of the light sources
5 was known in the art. Correct?
6 MR. HOLT: Objection. Form.
7 **A. So decision says, yes.**
8 **BY MR. KIM:**
9 Q. Do you disagree with this decision?
10 MR. HOLT: Objection. Form.
11 **A. Well, I take it into consideration, yes.**
12 **BY MR. KIM:**
13 Q. When you say you "take it into consideration,"
14 does that mean you agree with the Board's
15 decision or disagree with the Board's
16 decision?
17 MR. HOLT: Objection. Form.
18 **A. Can you please show me the Exhibit 101 [sic],**
19 **page 30, 56 through 58, to remind myself?**
20 **BY MR. KIM:**
21 Q. I do not have the document with me. But I'm
22 asking, looking at the Board's decision, do

37

1 you agree or disagree with the decision?
2 MR. HOLT: Objection. Form. Scope.
3 **A. Well, it -- I included it in my analysis,**
4 **this decision.**
5 **BY MR. KIM:**
6 Q. I'm asking about your opinion sitting here
7 today.
8 MR. HOLT: Same objections.
9 **A. So Lisogurski states below here it teaches**
10 **that "'the intensity of light source 130 and**
11 **the timing of when light source 130 is turned**
12 **on and off' is controlled by a light drive**
13 **signal that 'increase[s] the brightness of**
14 **the light sources in response to...noise to**
15 **improve the signal-to-noise ratio.'"**
16 **So this is Exhibit 1011. Do you have**
17 **this one? Can I look at that one?**
18 **BY MR. KIM:**
19 Q. Before we go there, I'm asking if you agree
20 with the Board's decision or not.
21 MR. HOLT: Objection. Form. Scope.
22 **A. Well, like I said, I take it into**

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1 **consideration in my analysis.**
2 **BY MR. KIM:**
3 Q. I don't think that answers my question. I'm
4 asking whether you agree or disagree with the
5 Board's decision here in Exhibit 1008.
6 **A. I do not dispute --**
7 MR. HOLT: Same objections.
8 **A. I do not dispute Board's decision.**
9 **BY MR. KIM:**
10 Q. So you agree with it.
11 MR. HOLT: Same objections.
12 **A. No, I said I do not dispute.**
13 **BY MR. KIM:**
14 Q. What's the difference between not disputing it
15 and agreeing with it?
16 **A. Well, I have to look for those references and**
17 **you unfortunately cannot provide it to me.**
18 Q. Okay. I'm going to show you a document that's
19 been marked as Exhibit 1025 in IPR2025-01250.
20 **A. Can I close this one or keep it open?**
21 Q. I would keep it open for now.
22 **A. Okay.**

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1 MR. KIM: And if we can have the
2 exhibit available on the Chat, that would be
3 great.
4 ENTERED INTO THE RECORD:
5 PREVIOUSLY MARKED IPR2025-01250
6 EXHIBIT 1025
7 10:37 a.m.
8 THE WITNESS: Not yet available,
9 right?
10 MR. HOLT: We're still waiting on it
11 in the --
12 PLANET DEPOS TECH: Counsel, would
13 you like me to prioritize the Chat over the
14 screen share? Because it takes me a second.
15 MR. KIM: Yeah.
16 PLANET DEPOS TECH: Okay. It should
17 be in the Chat now.
18 MR. KIM: Thank you.
19 **A. Yeah, I have it open.**
20 **BY MR. KIM:**
21 Q. Okay. So this is the Lisogurski reference
22 that was identified in the Board's decision

40

1 that we just looked at. Correct?
2 **A. Correct.**
3 Q. And have you reviewed this reference?
4 **A. Yes, thoroughly.**
5 Q. And you reviewed this reference in forming
6 your opinion. Correct?
7 **A. Correct.**
8 Q. So you wanted to take a look at this
9 reference. Which portion of the reference did
10 you want to take a look at?
11 **A. Let me look at the previous one.**
12 **Which one -- which exhibit number in**
13 **this decision should I refer to, 101 [sic]?**
14 Q. That should be 1011.
15 **A. Oh, 1011. Okay. I have to examine 1:19-21.**
16 Q. The Board's first cited portion is in column
17 9, lines 50 through 52.
18 **A. Which page is this? There are so many**
19 **figures.**
20 Q. Column 9, that's on page 37 of the PDF on the
21 left side of the column --
22 **A. Uh-huh.**

41

1 Q. -- lines 50 to 52.
2 **A. 50 to fifty...**
3 **Yeah, this was the citation I read**
4 **before, is, "The system may increase the**
5 **brightness of the light sources in response to**
6 **the noise or to improve the noise-to-signal**
7 **ratio." Yeah.**
8 Q. Okay. Now, having read the disclosure in
9 Lisogurski, do you agree with the Board's
10 decision?
11 MR. HOLT: Objection. Form. Scope.
12 **A. Yeah, I -- my understanding is this patent**
13 **owner does not dispute this, yes, as well. I**
14 **agree.**
15 **BY MR. KIM:**
16 Q. Okay. I wasn't asking about what the patent
17 owner does or did. I was asking about your
18 opinion.
19 **A. Yeah, I agree.**
20 Q. So let me ask you the question again. Before
21 2012, it was known in the art to increase
22 signal-to-noise ratio of an optical signal by

42

1 increasing light intensity. Correct?
2 MR. HOLT: Objection. Form. Scope.
3 **A. Again, like I said, it has to be applied to a**
4 **specific design, but it is one of the**
5 **techniques, yes. It was known.**
6 **BY MR. KIM:**
7 Q. Okay. And before 2012, it was also known in
8 the art to increase signal-to-noise ratio of
9 an optical signal by increasing pulse rate of
10 a light source. Correct?
11 MR. HOLT: Objection. Form. And
12 scope.
13 **A. Again, can you please refer me to my**
14 **declaration on that?**
15 **BY MR. KIM:**
16 Q. I'm asking about your opinion and your
17 knowledge.
18 **A. Well, like I have --**
19 MR. HOLT: Objection.
20 **A. I have to refresh my memory. I cited**
21 **foundation documents. I don't remember off**
22 **the top of my head specific dates.**

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1 **BY MR. KIM:**
2 Q. I'm not asking about what you wrote in your
3 declaration. I'm asking about your knowledge.
4 MR. HOLT: Same objections.
5 **A. Like I said, I don't remember exact dates.**
6 **It was around that time, but I don't**
7 **remember. It was '12 or before or after.**
8 **BY MR. KIM:**
9 Q. Okay. Why don't we go back to Exhibit 1008 in
10 IPR2025-01250.
11 **A. It's 108 [sic], right?**
12 Q. 1008.
13 **A. Yeah, okay. Which page?**
14 Q. Same page, 26.
15 **A. Okay.**
16 Q. Under subheader D, it reads, "Claim 13 further
17 requires the light source to be configured to
18 increase signal-to-noise ratio by increasing a
19 pulse rate of at least one of the plurality of
20 semiconductor sources."
21 Do you see that?
22 **A. Yes, I do.**

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1 Q. And then the last sentence of the paragraph,
2 it reads, "We address Petitioner's contentions
3 below, and notwithstanding Patent Owner's
4 arguments to the contrary, find Petitioner
5 demonstrates how Lisogurski alone, or in
6 combination with Carlson, teaches or suggests
7 the pulse rate limitation."
8 Do you see that?
9 **A. I do.**
10 Q. Okay. Do you disagree with the Board's
11 decision here?
12 MR. HOLT: Objection. Form. Scope.
13 **A. Again, can I please look at Lisogurski**
14 **relevant part?**
15 **BY MR. KIM:**
16 Q. Sure. You can -- you can turn to Lisogurski.
17 **A. So this is at 212 [sic]?**
18 Q. 1025. That was the exhibit that I shared with
19 you.
20 **A. Okay. I still would like to refresh my**
21 **memory by looking at my declaration, please.**
22 Q. I'm just asking about your knowledge and your

45

1 impression after reading this opinion. We'll
2 get to your declaration later.
3 MR. HOLT: Same objections.
4 **A. Why can I not look at it now?**
5 **BY MR. KIM:**
6 Q. I'm just asking about your opinion as you're
7 sitting here today.
8 **A. Well, my opinion is --**
9 MR. HOLT: Objection to scope.
10 STENOGRAPHER: Dr. Efimov, I just
11 need you to let Mr. Holt make his objections.
12 I can't hear both of you when you're talking
13 at the same time.
14 And so please repeat the objection
15 and the answer.
16 THE WITNESS: I apologize.
17 MR. HOLT: The objection was to
18 scope.
19 STENOGRAPHER: Yeah, just give a
20 little pause so that I can make sure I'm
21 getting everything, please.
22 THE WITNESS: All right.

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1 **A. Yes, I would like to look at my declaration,**
2 **please.**
3 **BY MR. KIM:**
4 Q. We'll get to that later.
5 If you can go to column 33 that's on
6 page 49 of Exhibit 1025, which is Lisogurski.
7 **A. I'm sorry, column what?**
8 Q. Column 33. That's on page 49.
9 **A. 49? And the line number?**
10 Q. Line number 56 through 58.
11 **A. Yeah, it says, "For example, in a continuous**
12 **non-invasive blood pressure measurement where**
13 **the pulse transit time is used in**
14 **calculations, increasing the sampling rate**
15 **for a portion of the cardiac cycle may result**
16 **in more accurate and reliable physiological**
17 **information."**
18 Q. Okay. Now, having read that and also having
19 seen the Board's decision, do you agree with
20 the Board's decision or not?
21 MR. HOLT: Objection. Form and
22 scope.

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1 **A. It says "more...reliable physiological**
2 **information." It doesn't say signal-to-noise**
3 **ratio.**
4 **BY MR. KIM:**
5 Q. You testified earlier that signal-to-noise
6 ratio is in relation to the accurate
7 measurement, but now you're saying that they
8 have no relevance?
9 MR. HOLT: Objection. Form.
10 **A. It's one of the measurements. Like I said**
11 **before, there is also other information**
12 **included, for example, waveform. Waveform is**
13 **not necessarily related to signal-to-noise**
14 **ratio. So in this case, "more accurate and**
15 **reliable physiological information" could be**
16 **interpreted in both ways.**
17 **BY MR. KIM:**
18 Q. Can there be a more accurate measurement with
19 lower signal-to-noise ratio, then?
20 MR. HOLT: Objection. Form.
21 **A. Depending on waveform, yes.**
22 **BY MR. KIM:**

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1 Q. Okay. So you are disagreeing with the Board's
2 decision that increasing the signal-to-noise
3 ratio by increasing pulse rate was known in
4 the art before 2012?
5 MR. HOLT: Objection. Form. Scope.
6 **A. Like I said, again, it depends on the**
7 **application, so it's not generic notion.**
8 **BY MR. KIM:**
9 Q. As the Board found, Mr. Lisogurski teaches
10 increasing signal-to-noise ratio by increasing
11 pulse rate. Do you disagree with the finding?
12 MR. HOLT: Same objections.
13 **A. It says sampling rate, not pulse rate.**
14 **BY MR. KIM:**
15 Q. That wasn't the question I asked. Do you
16 disagree with the Board's finding that
17 Lisogurski teaches increasing signal-to-noise
18 ratio by increasing pulse rate?
19 MR. HOLT: Same objections.
20 **A. Is this the only instance where the Board is**
21 **basing their opinion on? This says**
22 **increasing sampling rate, not pulse rate, and**

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1 **this could be different.**
2 **Pulse rate refers to pulses of light**
3 **and measurements during those pulses.**
4 **Sampling rate could refer to different. So**
5 **you can basically have number of regions using**
6 **the same pulse increased, so this is different**
7 **from pulse rate.**
8 **BY MR. KIM:**
9 Q. So you disagree with the Board's decision?
10 MR. HOLT: Objection. Form.
11 **A. I have different opinion.**
12 **BY MR. KIM:**
13 Q. So you disagree with the Board's decision.
14 MR. HOLT: Same objections.
15 **A. I -- again, if you point me to another**
16 **instance where it says pulse rate, I**
17 **would change my opinion. But this says**
18 **sampling rate.**
19 **BY MR. KIM:**
20 Q. So as a general matter, the Board's finding
21 doesn't have any importance to you; is that
22 your testimony today?

50

1 MR. HOLT: Objection. Form.
2 **A. No, it's not true. I rely on the Board's**
3 **decision, but in some cases I have my own**
4 **opinion.**
5 **BY MR. KIM:**
6 Q. And this is an instance where you have your
7 own opinion that increasing signal-to-noise
8 ratio by increasing pulse rate was not known
9 in the art before 2012?
10 MR. HOLT: Objection to form and
11 scope.
12 **A. No, it's not --**
13 THE WITNESS: Sorry.
14 **A. It's not my -- what I said. I said that**
15 **sampling rate and pulse rate are different**
16 **things. Based on just sample rate increase,**
17 **it doesn't necessarily mean pulse rate.**
18 **BY MR. KIM:**
19 Q. I get that sampling rate and pulse rate could
20 be different, but that's not the question I
21 asked, again.
22 Do you agree or disagree with the

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1 Board's decision that Lisogurski discloses
2 increasing signal-to-noise ratio by increasing
3 pulse rate?
4 And I'd like to remind you that you
5 testified that you viewed Lisogurski in
6 reviewing your opinion -- in forming your
7 opinion.
8 MR. HOLT: Objection to form and
9 scope.
10 And I just want to remind counsel
11 that we are limited in scope in this
12 proceeding to the declarations that Dr. Efimov
13 has submitted, and he's asked several times
14 now to be directed to relevant portions of his
15 declaration.
16 MR. KIM: I understand, and this
17 falls well within the scope of his
18 declaration.
19 **A. Do we have a question?**
20 **BY MR. KIM:**
21 Q. Yes. Do you agree or disagree with the
22 Board's decision that Lisogurski discloses

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1 increasing signal-to-noise ratio by increasing
2 pulse rate?
3 **A. I would like to review my declaration.**
4 MR. HOLT: Objection to form and
5 scope.
6 MR. KIM: Okay. Why don't we take a
7 five-minute break.
8 THE WITNESS: Okay.
9 (Off the record at 10:51 a.m.)
10 (Back on the record at 11:03 a.m.)
11 BY MR. KIM:
12 Q. Welcome back, Dr. Efimov.
13 **A. Thank you.**
14 Q. Before 2012, it was known in the art to
15 synchronize the detection system to the light
16 source of a physiological monitoring device.
17 Correct?
18 MR. HOLT: Objection. Form. Scope.
19 **A. Again, it would be helpful if I can look at**
20 **my declaration on that subject.**
21 **BY MR. KIM:**
22 Q. Okay. I'm going to show you a document that's

53

1 been marked as Exhibit 2043 in IPR2025-01250.
2 **A. Is it in the Chat? Okay.**
3 PLANET DEPOS TECH: Yeah, it takes
4 time to upload, so just going forward, expect
5 at least 20, 30 seconds. Thank you.
6 THE WITNESS: Uh-huh.
7 MR. HOLT: And since this is the
8 confidential version of Dr. Efimov's
9 declaration under the protective order and the
10 IPR, let's go ahead and designate the
11 transcript as confidential under the
12 protective order as well.
13 MR. KIM: No objections.
14 ENTERED INTO THE RECORD:
15 PREVIOUSLY MARKED IPR2025-01250
16 EXHIBIT 2043
17 11:04 a.m.
18 **A. Okay, I have it open.**
19 **BY MR. KIM:**
20 Q. Okay. Is this your declaration filed in the
21 IPR2025-01250?
22 **A. Correct.**

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1 Q. Did you prepare this declaration on your own?
2 **A. I wrote it in collaboration with attorneys,**
3 **but I stand by it. I signed it.**
4 Q. When you say "in collaboration with
5 attorneys," what kind of collaboration are you
6 talking about?
7 MR. HOLT: I'll just remind the
8 witness not to disclose the substance of any
9 privileged communications or work product.
10 **A. So I am not an attorney, as you know, so**
11 **legal issues, I need to consult from the**
12 **attorneys, so basically legal parts were**
13 **primarily written by attorneys, so with my**
14 **questions, and the other parts I wrote**
15 **drafts. So we worked together. And the**
16 **editorial work was also very helpful from the**
17 **attorneys. But like I said, I revised it, I**
18 **signed it, so I stand by this declaration.**
19 **BY MR. KIM:**
20 Q. Okay. How many hours did you spend in
21 preparing this declaration?
22 **A. Just this one or all four?**

55

1 Q. Let's start with this one first.
2 **A. It's hard to say because there are, as you**
3 **know, four declarations, and they are in many**
4 **parts quite identical. Like legal grounds,**
5 **for example, are pretty much verbatim, are**
6 **the same, so it's hard to separate.**
7 **I would say that total work on all**
8 **four would be in the -- in the range of**
9 **probably 60 hours, something like that. So if**
10 **we divide it equally, it will be 15 hours,**
11 **perhaps, per declaration. But again, many of**
12 **these parts are very similar --**
13 Q. Okay.
14 **A. -- across four declarations. Of course, for**
15 **example, my CV, my professional curriculum**
16 **vitae, is obviously cut-and-paste. It's the**
17 **same in all four.**
18 Q. Understood. Obviously you only have one job
19 at a time, so...
20 **A. No, actually, I have many jobs.**
21 Q. You're a much better person than I am, then.
22 In terms of preparing -- strike that.

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1 You mentioned about the other
2 declarations. I would assume that you're
3 referring to the declarations filed in
4 IPR2025-01251, -01252, and -01254. Correct?
5 **A. Correct. I think that was the numbers, yes.**
6 Q. Okay. And in terms of preparing the
7 declarations filed in those IPRs, were they
8 any different from your preparation of the
9 declaration that you are seeing here that's
10 Exhibit 2043 in IPR20450-01250?
11 **A. I'm sorry, your question is whether or not**
12 **the other declarations are any different?**
13 Q. Right. I'm asking whether the other
14 declarations filed in any different matter.
15 **A. I'm not sure I -- you need to clarify the**
16 **question.**
17 Q. Did you work with counsel to prepare those
18 declarations?
19 **A. Yes, it was the same work process.**
20 Q. Okay.
21 **A. And I believe on the same day.**
22 Q. So, in other words, your attorneys helped you

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1 on the legal grounds only and you were working
2 on the substantive part of your declaration --
3 or those declarations too.
4 MR. HOLT: Objection. Form.
5 **A. They also helped to reference citations and**
6 **do the editorial work, so it was a**
7 **back-and-forth.**
8 **BY MR. KIM:**
9 Q. Okay. But otherwise, everything in all your
10 declarations are your opinion and your opinion
11 only.
12 **A. Absolutely. It's my opinion and I signed it.**
13 **I stand by it.**
14 Q. Okay. Let's go to page 74 of your declaration
15 here.
16 **A. So again, when you say 74, it's the PDF 74.**
17 **Right?**
18 Q. I'm sorry, I meant 74 of your declaration, so
19 it's PDF page 77.
20 **A. 77. Yes, I see. I have the same page open.**
21 Q. Okay. And if you look at paragraph 158, it
22 reads, [redacted]

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1 [redacted] specifically
2 identified the following proprietary
3 techniques."
4 Do you see that?
5 **A. I do.**
6 Q. And by "proprietary techniques," do you mean
7 that those techniques are owned by Dr. Islam?
8 MR. HOLT: Objection to form.
9 **A. This means these are essentially covered by**
10 **the patents, yes.**
11 **BY MR. KIM:**
12 Q. And if we go to the next page, page 75 of your
13 declaration, you identify "increasing pulse
14 rate to improve SNR."
15 **A. Correct.**
16 Q. So is it your opinion that Dr. Islam invented
17 increasing pulse rate to improve SNR?
18 MR. HOLT: Objection. Form.
19 **A. My opinion is that this is covered by the**
20 **patents, the four patents.**
21 **BY MR. KIM:**
22 Q. That's not the question I asked.

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1 Do you -- you identified "increasing
2 pulse rate to improve SNR," or signal-to-noise
3 ratio, as Dr. Islam's proprietary technique.
4 So is it your opinion that Dr. Islam invented
5 increasing pulse rate to improve
6 signal-to-noise ratio?
7 MR. HOLT: Objection. Form.
8 **A. Well, I don't see a difference in my answer.**
9 **My answer is that it is covered by the**
10 **patents, by specific claims.**
11 **BY MR. KIM:**
12 Q. So is everything covered by the patent
13 proprietary technique?
14 MR. HOLT: Objection. Form.
15 **A. It's covered by the patent and should be**
16 **essentially discussed how they can be used.**
17 **BY MR. KIM:**
18 Q. That's not the question I asked. In order to
19 be a proprietary technique, do you need to
20 invent the technique?
21 MR. HOLT: Objection. Form.
22 **A. In a -- in a sense, it has to be covered by**

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1 **issued patent, yes.**
2 **BY MR. KIM:**
3 Q. So if it's covered by the issued patent,
4 everything is a proprietary technique. Is
5 that your opinion?
6 MR. HOLT: Objection to form.
7 **A. It is -- it is known because it's already**
8 **published as a published patent. But it**
9 **is -- it has to be basically utilized by any**
10 **other entity with the agreement of patent**
11 **owner.**
12 **BY MR. KIM:**
13 Q. That's not the question I asked. I'm asking,
14 before it was shown in the patent -- strike
15 that.
16 So your definition of "proprietary
17 technique" is whether it's covered by the
18 patent or not?
19 MR. HOLT: Objection. Form.
20 **A. So, basically, each of these limitations in**
21 **their combination is covered in the patents,**
22 **and therefore as a --**

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1 **BY MR. KIM:**
2 Q. Again, again, that's not the question I asked.
3 I'm asking about your definition of
4 "proprietary technique."
5 **A. Well, I said my definition already three**
6 **times. If it's covered by the patent, in**
7 **each individual -- and in combination, this**
8 **is basically owned by the patent owner.**
9 Q. Can you go back to the previous page again?
10 **A. Sure.**
11 Q. Your opinion there is that, "For example, [redacted]
12 [redacted]
13 specifically identify the following
14 proprietary techniques." Correct?
15 **A. Yeah, if you -- we can go to slide deck. I**
16 **can point you to in the specific slide.**
17 Q. We're not there yet.
18 **A. All right.**
19 Q. And you identify these individual alleged
20 techniques as proprietary techniques of
21 Dr. Islam. Correct?
22 MR. HOLT: Objection. Form.

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1 **A. Like I already answered, this individual and**
2 **in combination. Combination is also very**
3 **important.**
4 **BY MR. KIM:**
5 Q. Forgetting about the combination, can each of
6 these techniques be proprietary just because
7 they are identified in a patent?
8 MR. HOLT: Objection to form.
9 **A. It's a -- basically, I cannot forget it. So**
10 **you can have several known things, but in**
11 **combination could be very important as well.**
12 **BY MR. KIM:**
13 Q. Okay. Let me ask you again whether
14 synchronization of the detection system, the
15 light source, was known in the art before 2012
16 or not.
17 **A. Again, here it's -- I don't recall the**
18 **specific year, so you -- you're referring to**
19 **the -- Bullet Point Number 3. Right?**
20 Q. There's no number, but that's the --
21 **A. I mean, just the --**
22 Q. The third bullet in the list, yes.

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1 **A. Yeah.**
2 **Yeah, so my understanding is that**
3 **this detection system, the light source, is**
4 **covered by this patent, so --**
5 Q. That's not the question I asked again. Was it
6 known or not known in the art before 2012 to
7 synchronize the detection system to the light
8 source?
9 MR. HOLT: Objection. Form.
10 **A. For PPG system, it was not.**
11 **BY MR. KIM:**
12 Q. For pulse oximeters, was it known?
13 MR. HOLT: Objection. Form.
14 **A. So let me -- let me look again at my**
15 **declaration.**
16 **Yeah, I don't believe it was known**
17 **for PPG systems.**
18 **BY MR. KIM:**
19 Q. I didn't ask about the PPG system. I asked
20 about the pulse oximeters.
21 MR. HOLT: Objection to form.
22 **A. Pulse oximeter is a PPG system with**

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1 **additional features.**
2 **BY MR. KIM:**
3 Q. Let's go back to Exhibit 1008 in
4 IPR2025-01250.
5 **A. Okay. I'm there.**
6 Q. And let's go to page 37 of the PDF.
7 Do you see the subheader, "A
8 receiver"?
9 **A. I'm sorry, page 37. All right. Yes, I see**
10 **it.**
11 Q. So subheader F reads, "A receiver." Right?
12 **A. Yes.**
13 Q. And the first sentence of the section reads,
14 "Claim 13 further requires the wearable
15 measurement device to include a receiver
16 configured to receive and process at least a
17 portion of the analysis output beam...and
18 further configured to be synchronized to
19 pulses of the light source."
20 Do you see that?
21 **A. I do.**
22 Q. The next sentence reads, "Petitioner

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1 identifies Lisogurski's detector 140/318 and
2 front end processing circuitry 150 in monitor
3 104 as the receiver."
4 Do you see that?
5 **A. Yes.**
6 Q. And if you go to the next page.
7 **A. I'm sorry, did you say next page?**
8 Q. Yeah, page 38.
9 **A. Yes.**
10 Q. At the bottom, it reads, "Petitioner
11 demonstrates how Lisogurski's receiver" meets
12 the receiver -- sorry, "receiver and front end
13 processing circuitry meets the 'receiver'
14 limitations."
15 Do you see that?
16 **A. Yes.**
17 Q. So the Board found that Lisogurski discloses a
18 receiver limitation which includes
19 synchronizing a receiver to the light source.
20 Do you agree with that?
21 MR. HOLT: Objection. Form and
22 scope.

66

1 **A. I have to again review the actual Lisogurski**
2 **evidence. Like --**
3 **BY MR. KIM:**
4 Q. I'm asking about what you're seeing in the
5 Board's decision. Do you agree or disagree
6 that the Board found that Lisogurski discloses
7 synchronizing the detection system to the
8 light source?
9 MR. HOLT: Same objections.
10 **A. Well, like I said, I -- if you want my**
11 **opinion, I have to look --**
12 **BY MR. KIM:**
13 Q. Again, please listen to my question. I'm
14 asking what you're seeing in the Board's
15 decision. As we just read, the Board found
16 that Lisogurski discloses synchronizing the
17 detection system to the light source.
18 Correct?
19 MR. HOLT: Counsel, remind you not to
20 interrupt the witness when he's answering.
21 MR. KIM: He's not answering my
22 question.

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1 **A. So can I answer?**
2 **BY MR. KIM:**
3 Q. Yes, please.
4 MR. HOLT: Same objections.
5 **A. So I understand what you are referring to as**
6 **a decision of the Board. If you want my**
7 **opinion, I have to review the evidence. Like**
8 **in previous case, pulse rate and sampling**
9 **rate, these are different things. Based on**
10 **the evidence that pulse rate -- I'm sorry,**
11 **sampling rate is increased, it doesn't mean**
12 **pulse rate is increased, so I disagree with**
13 **that.**
14 **Here, I need to also review evidence**
15 **in order to express my opinion.**
16 MR. KIM: I move to strike everything
17 as nonresponsive.
18 BY MR. KIM:
19 Q. The question wasn't about your opinion,
20 Dr. Efimov. Right? The question was whether
21 the Board found that Lisogurski discloses
22 synchronizing the detection system to the

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1 light source.
2 MR. HOLT: Objection. Form. Scope.
3 **A. The Board found that petitioner demonstrates**
4 **how Lisogurski receiver and front end**
5 **processing circuitry meets the receiver**
6 **limitation. That's what the Board says.**
7 **Again, if you -- in this case, what**
8 **the language you said, I'm not a lawyer,**
9 **sounds about right, but, again, it's not my**
10 **opinion.**
11 **BY MR. KIM:**
12 Q. Let's say you're analyzing a physical --
13 physiological measurement device. How would
14 you confirm that the device actually has an
15 LED in it?
16 MR. HOLT: Objection. Form. Scope.
17 **A. So let me rephrase your question. So how**
18 **would I determine that it has an LED, right?**
19 **BY MR. KIM:**
20 Q. Yes.
21 **A. And I have physical device.**
22 Q. Correct.

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1 **A. Well, the best would be to do teardown, so**
2 **you will take it apart. This would be the**
3 **best. Even better if you also have**
4 **schematics.**
5 Q. Okay. And how about photodiodes? How is it
6 confirmed that a physical -- physiological
7 monitoring device includes a photodiode?
8 MR. HOLT: Objection. Form and
9 scope.
10 **A. Same answer. So basically a teardown. I**
11 **would take it apart. And even better if you,**
12 **in addition to physical device, you've got a**
13 **schematic.**
14 **BY MR. KIM:**
15 Q. And how is it confirmed that a physical --
16 physiological measurement device has a lens?
17 MR. HOLT: Objection. Form and
18 scope.
19 **A. So again, if you have physical device, I**
20 **would take it apart and look what the**
21 **components are. And even better if you have**
22 **an actual description of -- schematic of**

70

1 **device.**
2 **BY MR. KIM:**
3 Q. Is every piece of glass a lens?
4 MR. HOLT: Objection. Form. Scope.
5 **A. We already had that exchange previously. Not**
6 **every piece is a lens.**
7 **BY MR. KIM:**
8 Q. And how is it confirmed that a piece of glass
9 is a lens?
10 MR. HOLT: Objection. Scope. Form.
11 **A. So my understanding is that the -- there is**
12 **a -- I didn't do specifically a claim**
13 **construction analysis, but I do recall there**
14 **was a construction for -- with beam. I don't**
15 **remember verbatim but, basically, lens is a**
16 **device forms a beam, delivery of light to a**
17 **specific location, if I remember correctly.**
18 **So, basically, depending on the application**
19 **you have to essentially do experimentation**
20 **and see if lens forms a beam for a specific**
21 **application.**
22 **So you can think of glass object**

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1 **like, for example, a statue made of glass**
2 **serves completely different purpose. It**
3 **doesn't form a beam for a particular**
4 **application. In this case, it's not a lens.**
5 **To essentially answer to your**
6 **question if every piece of glass is a lens,**
7 **the answer is, no, not every piece of glass is**
8 **a lens. It has to form a beam for a**
9 **particular application.**
10 **BY MR. KIM:**
11 Q. Okay. And we talked about signal-to-noise
12 ratio. How would you confirm -- or how would
13 you measure the signal-to-noise ratio of a
14 signal captured by a physiological monitoring
15 device?
16 **A. Well, I --**
17 MR. HOLT: Objection to form and
18 scope.
19 **A. I already answered this question before, but**
20 **essentially, for every application, first you**
21 **start with what you're measuring, what**
22 **particular parameter you're measuring and how**

72

1 **you're measuring, what signal condition is**
2 **included at the front end before you digitize**
3 **it because there is always distributed**
4 **filtering. Analog filtering is present**
5 **through the capacitance and resistance so**
6 **which already will affect noise. And then**
7 **you define your noise, you define your**
8 **signal, and then you measure signal and you**
9 **define what is the amplitude of signal based**
10 **on your definition, based on your**
11 **application, and you define similarly what is**
12 **noise and you define amplitude of noise.**
13 **Again, it depends on many parameters.**
14 **It's very specific to specific application.**
15 **And then you'd take a ratio, signal divided**
16 **by -- signal amplitude divided by noise**
17 **amplitude. So this is your signal-to-noise**
18 **ratio.**
19 **BY MR. KIM:**
20 Q. Okay. You testified earlier that increasing
21 the light intensity of a physiological
22 monitoring device does not necessarily mean

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1 that the signal-to-noise ratio will increase.
2 Do you recall that?
3 MR. HOLT: Objection. Form.
4 **A. Yes, I did say that it depends. Basically**
5 **there is a scenario that if you increase**
6 **intensity too much you can saturate your**
7 **sensor and you will actually degrade**
8 **signal-to-noise ratio.**
9 **BY MR. KIM:**
10 Q. When you say "saturate," can you explain what
11 that means?
12 **A. So sensor has certain range of intensities of**
13 **light in this case, or any sensor, really,**
14 **whatever signal is measured in. It has**
15 **physical limitations, so it cannot sense**
16 **intensity above certain intensities, so if**
17 **light is too intense it will lead,**
18 **essentially, not to light intensity, but you**
19 **will read maximum capacity of that sensor.**
20 **So that's what's saturation means.**
21 **So you are not sensing real signal,**
22 **you are sensing the maximum to reach this**

74

1 **sensor is capable of sensing. So basically**
2 **you degrade the signal.**
3 Q. Understood. Let's say we have not -- or
4 strike that.
5 Let's say the physiological
6 monitoring device has not reached a saturation
7 point yet and you increase the signal -- light
8 intensity but there are more noise introduced.
9 In that case, would the
10 signal-to-noise ratio increase?
11 MR. HOLT: Objection. Scope. Form.
12 **A. It again depends. There is always tradeoff.**
13 **You're right, it could be the case, but it --**
14 **so basically we increase light intensity if**
15 **you are not at situation level. You**
16 **presumably increase signal. You could also**
17 **presumably increase noise. But it all**
18 **depends on which particular parameter you are**
19 **using.**
20 **And presumably, you know, the ratio**
21 **between the signal amplitude and noise**
22 **amplitude is improving, so that's essentially**

75

1 **the technique proposed in the patent of**
2 **Dr. Islam.**
3 **BY MR. KIM:**
4 Q. And does increasing the pulse rate of the
5 light source in the physiological measurement
6 device always increase the signal-to-noise
7 ratio?
8 MR. HOLT: Objection. Scope. Form.
9 **A. It's a very broad question, really. I need**
10 **to -- I didn't analyze about always. In most**
11 **cases, yes, but I could think of some**
12 **scenarios when it's not the case. But most**
13 **cases it will increase. But it will come,**
14 **again, as a tradeoff. So basically if -- for**
15 **example, if you go to extreme case when you**
16 **don't -- never turn off the light, which**
17 **means your pulse rate is essentially infinite**
18 **it probably will be the best signal possible,**
19 **but it will come at the cost of big energy**
20 **expenditures. You will deplete your**
21 **batteries very quickly, which is a problem**
22 **for a wearable device.**

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1 **So you have to mind energy**
2 **consumption, but also you could produce more**
3 **heat and which, again, will introduce more**
4 **noise, so we have to really be careful about**
5 **that. Similar to what I said about**
6 **saturating sensors, so here you can saturate**
7 **system in a different way.**
8 **But essentially, to answer your**
9 **question, you cannot answer broadly, so you**
10 **have to be very specific to specific design.**
11 **And also it has to be in combination, like I**
12 **said, of many techniques taken together to**
13 **improve signal-to-noise ratio.**
14 Q. You mentioned about saturating the system
15 again. So if a physiological measurement
16 device's pulse rate has reached a saturation
17 point, does that mean that increasing the
18 pulse rate further would not increase the
19 signal-to-noise ratio?
20 MR. HOLT: Objection. Scope. And
21 form.
22 **A. Well, again, if we go to extreme, like you**

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1 **suggested, which means you -- your pulse rate**
2 **essentially is infinite, so you're -- you**
3 **never turn off the light. Pulse rate means**
4 **you have turned it on and off, right, a**
5 **certain duration of the pulses with some**
6 **interval between pulses, but if you go to**
7 **extreme pulse rate, which means you never**
8 **turn off the light, you cannot increase it**
9 **anymore, of course, so it's already basically**
10 **highest possible pulse rate.**
11 Q. Okay.
12 **A. But, again, it will come at a cost. I**
13 **designed systems myself in which I would use**
14 **continuous light, which corresponds with**
15 **infinite pulse rate, but, again, I can only**
16 **sustain it for short period of time because**
17 **it will saturate the system.**
18 Q. How is it confirmed that increased pulse rate
19 of light source actually resulted in increased
20 signal-to-noise ratio in a physiological
21 measurement device?
22 MR. HOLT: Objection to scope and

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1 form.
2 **A. Well, it's a similar assessment like we**
3 **discussed with intensity, so basically you**
4 **measure amplitude of your signal depending on**
5 **your definition, what exactly is the**
6 **amplitude of the signal.**
7 **Like, for example, you're measuring,**
8 **I don't know, contractility in a pulse wave,**
9 **so essentially how high is the pulse, and**
10 **then you measure also noise, again depending**
11 **on your definition of noise, and then -- and**
12 **then you take a ratio. So it's a**
13 **quantitative technique which can be measured**
14 **continuously and assessed through electronic**
15 **circuitry.**
16 **And I believe every pulse oximetry**
17 **system currently on the market does that**
18 **routinely, continuously, and adjust**
19 **accordingly.**
20 **BY MR. KIM:**
21 Q. Just so that I understand, so you need to
22 measure the signal-to-noise ratio to confirm

79

1 that it's increasing or not; is that your
2 testimony?
3 MR. HOLT: Objection. Form.
4 **A. Increasing signal-to-noise ratio. Right?**
5 **BY MR. KIM:**
6 Q. Yes.
7 **A. Yes, of course, you need to measure**
8 **signal-to-noise ratio in order to determine**
9 **if you are including signal-to-noise ratio.**
10 Q. Okay. In order to synchronize a detector to a
11 light source of a physiological measurement
12 device, the detector needs to turn on and off
13 in accordance with the light source being
14 turned on -- turned on and off. Correct?
15 MR. HOLT: Objection. Form and
16 scope.
17 **A. Well, it depends on design, but, yes, it has**
18 **to be time correlated. It doesn't have to be**
19 **necessarily one to one. It could be some**
20 **delay between the two. In fact, I would**
21 **advise to have a small delay because there is**
22 **a transition -- when you turn on the light,**

80

1 **there is a process of transition from no**
2 **light to maximum light, so you don't want to**
3 **capture that. But otherwise, yes, it has to**
4 **be correlated.**
5 **BY MR. KIM:**
6 Q. Okay. If you're looking at a physiological
7 measurement device, how can you confirm that
8 the device's detector is actually synchronized
9 to a light source?
10 MR. HOLT: Objection. Scope. Form.
11 **A. So, again, it's based on what -- what's**
12 **available. Do I have physical copy or do I**
13 **have documentation or do I have general**
14 **description? So I know in all three cases, I**
15 **would use.**
16 **In general description, it probably**
17 **would say so. In the schematic, I would**
18 **infer from how things are connected, and**
19 **in -- in physical device, I would do**
20 **experimentation of it. So looking**
21 **essentially at pulses of light and measuring**
22 **signals coming out of photodiode sensor,**

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1 **whatever sensor you are using.**
2 **BY MR. KIM:**
3 Q. So for that experiment, you would be measuring
4 the timing of when the light source is turned
5 on and when the signal is generated; is that
6 right?
7 **A. Correct.**
8 MR. HOLT: Objection. Form. Scope.
9 **A. Yeah. Correct.**
10 **BY MR. KIM:**
11 Q. If a document doesn't necessarily say how it's
12 operating, would you look at the source code
13 to confirm that the detector is synchronized
14 to the light source?
15 MR. HOLT: Objection. Form and
16 scope.
17 **A. This would be one way to do it, if I had -- I**
18 **had access to it, but in this case I did not**
19 **have access to it. But -- so software would**
20 **be a good way to determine that.**
21 **BY MR. KIM:**
22 Q. Okay. Let's say we have a physiological

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1 measurement device that removes noise from the
2 signal. Would that mean that the
3 signal-to-noise ratio would go up all the
4 time?
5 MR. HOLT: Objection. Scope and
6 form.
7 **A. Well, again, like I said, it depends on your**
8 **definition of "noise" and "signal," but by**
9 **removing noise, again, it -- if you define --**
10 **reduce the amplitude of noise, that's the**
11 **goal. Removal of noise is the -- the goal is**
12 **to improve signal-to-noise ratio. But if --**
13 **again, removing signal -- noise depends on**
14 **your technique.**
15 **If it's some sort of filtering, for**
16 **example software filtering, it will also alter**
17 **content of your useful signal so it will**
18 **degrade signal itself. So, again, you have to**
19 **be very careful how you design your filter**
20 **because you can actually -- in some cases you**
21 **can degrade signal and you will actually**
22 **degrade signal-to-noise ratio.**

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1 **For each specific physiological**
2 **parameter, for each specific sensor you are**
3 **using, you have to be carefully selecting**
4 **which filter -- filtering technique you are**
5 **using, how you reduce amount of noise.**
6 **BY MR. KIM:**
7 Q. Let's say we're using the ambient light as an
8 example of a noise, and the physiological
9 measurement device is removing the ambient
10 light signal from the actual light signal.
11 Would the signal-to-noise ratio of the
12 resulting signal be higher than the one before
13 the removal of the ambient light?
14 MR. HOLT: Objection. Scope and
15 form.
16 **A. Again, it's very generic question. It**
17 **depends how you remove ambient light. For**
18 **example, if you put -- you know, if you are**
19 **using the PPG system, as an example, you can**
20 **remove ambient light by placing your device**
21 **on your finger with your hand under the**
22 **blanket. That would be one way to do it. Or**

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1 **you can do it -- use optical filtering or you**
2 **can use, for example, on and off as described**
3 **in the patent's approach.**
4 **So it really depends. But generally,**
5 **yes. So if you can directly remove ambient**
6 **light, generally you will improve**
7 **signal-to-noise ratio.**
8 **BY MR. KIM:**
9 Q. And when you are analyzing a physiological
10 measurement device, how can you confirm that
11 the device actually configure remove noise
12 from the signal?
13 MR. HOLT: Objection. Scope and
14 form.
15 **A. Again, it depends on what you have available**
16 **to you. So like -- like I answered before,**
17 **it's the same answer. You have a physical**
18 **device, you will do experimentation, but, for**
19 **example, recording -- using different type of**
20 **ambient light.**
21 **If you have schematic, you can do**
22 **essentially more inference. If you have**

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1 software, probably it's even better so you
2 can look at specific algorithm involved in
3 that. Or it could be just general
4 description of the algorithm, which could
5 also be comprehensive and quite compelling.
6 BY MR. KIM:
7 Q. Let's say the processor in the physiological
8 measurement device has multiple features, none
9 of which has been activated. In order to
10 confirm which of these features are activated,
11 what would you need to review?
12 MR. HOLT: Objection. Scope and
13 form.
14 A. It's very confusing question because, first
15 of all, we need to establish what is
16 "processor." Do we mean by "processor"
17 something which filters signal or you mean
18 like a microprocessor in a computer or some
19 filtering device? What is it exactly your
20 meaning of "processor"?
21 BY MR. KIM:
22 Q. Let's start with the -- with something that

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1 filters signal.
2 A. Uh-huh. Okay. And the question is?
3 Q. The question is, the processor has multiple
4 features that could be programmed to be used
5 in the physiological monitoring device. In
6 order to confirm whether the physiological
7 monitoring device is actually configured to
8 use those features, what would you check?
9 MR. HOLT: Objection. Scope and
10 form.
11 A. Again, it's very general question. Depends
12 on what features are -- like, for example, it
13 could be frequency content of the signal, so
14 in this case I would measure frequency
15 content before and after the system. It
16 could be waveform analysis. It could be just
17 simple as counting heart rate.
18 So it really depends. So but
19 basically if you establish what your useful
20 information is, so what you would do, you
21 would measure before and after this processor
22 or other front-end filtering system, and then

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1 you would measure, basically, content of
2 whatever parameter you are looking at like,
3 for example, frequency content before and
4 after the processor and you will establish
5 what happened with that.
6 BY MR. KIM:
7 Q. So you would be able to get the same answer by
8 reviewing the source code?
9 MR. HOLT: Objection. Scope and
10 form.
11 A. Some of the features are actually embedded in
12 analog circuitry before digital, so basically
13 you -- you probably would be better off --
14 some -- for some of the features, again,
15 better off using hardware analysis. But in
16 general, software is a good way of analyzing
17 such features indeed.
18 But, again, like I said, I did not
19 have access to software so I did not analyze
20 it.
21 BY MR. KIM:
22 Q. Okay. Let's say you have a physiological

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1 measurement device that's connected to a
2 smartphone. Processing of the signal captured
3 by the physiological measurement device can be
4 done at the measurement device itself.
5 Correct?
6 MR. HOLT: Objection. Scope and
7 form.
8 A. It depends on the design, on level of
9 integration. Because currently, as you I'm
10 sure know, the micro components which are
11 used in fabrication of these devices are so
12 tiny that you have to actually break it down
13 and get access to micron scale components in
14 order to sense those signals, so this would
15 require -- even though it's possible, but it
16 would require extremely sophisticated
17 instrumentation. But it is possible.
18 Yes, you will have to basically break
19 down, tear down device without breaking its
20 functionality. You have to connect to a
21 particular wire where you can sense signal,
22 let's say, before and after filter, and then

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1 **you can assess that, so it's possible.**
2 **BY MR. KIM:**
3 Q. Okay. And processing of the signal captured
4 by the measurement device can also be done at
5 the smartphone connected to the measurement
6 device. Correct?
7 MR. HOLT: Objection. Scope.
8 **A. Yes and no. It depends what you're**
9 **measuring. Like I said, like, for example,**
10 **most of these devices have analog filtering**
11 **front end. It's not digital. It's before**
12 **analog signal was digitized. So basically**
13 **this information is already lost by the time**
14 **it comes to the smartphone. Smartphone does**
15 **not contain this information, so you would --**
16 **will not be able to analyze that.**
17 **But, again, software, you know, if**
18 **I -- if I had choice, would be a good way to**
19 **analyze it.**
20 **BY MR. KIM:**
21 Q. Okay. So limiting the data to digital data
22 that's being converted into a digital forum by

90

1 the front-end processing circuitry in the
2 measurement device, how can you confirm that
3 the digital data is processed by the
4 measurement device or the smartphone?
5 MR. HOLT: Objection to scope and
6 form.
7 **A. Well, again, you have to basically have**
8 **access to digital data before and after,**
9 **which is not always possible without breaking**
10 **the front end. So most likely you will not**
11 **be able to do it just based on accessing the**
12 **smartphone. You will have to have access to**
13 **where your ATD converter is. ATD stands for**
14 **analog-to-digital converter.**
15 **BY MR. KIM:**
16 Q. Okay. Are you familiar with the term "cloud"?
17 **A. Yes.**
18 Q. Do you personally use a cloud?
19 MR. HOLT: Objection. Form. Scope.
20 **A. Again, it depends what you mean by that, but**
21 **I live above the cloud on the 62nd floor.**
22 **This would be one cloud. But, seriously, you**

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1 **know, cloud as a storage and computation**
2 **remotely, yes, I do use, I have my Word**
3 **documents on the cloud from my laboratory.**
4 **BY MR. KIM:**
5 Q. You mentioned the cloud is storage and
6 processing -- strike that.
7 You mentioned the cloud has both
8 storage and processing capabilities. How can
9 you confirm whether the cloud just stores data
10 or also processes data?
11 MR. HOLT: Objection to scope and
12 form.
13 **A. Well, again, it's a -- it's specific to a**
14 **task at hand. So you basically have to have**
15 **access to the data, description of the**
16 **algorithm, and you have to look at it**
17 **essentially before and after uploading it.**
18 **But generally it's described in the**
19 **capabilities of the cloud in general**
20 **description. Or even better, if you have**
21 **access to source code of the cloud.**
22 **BY MR. KIM:**

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1 Q. Okay. What is your understanding of
2 "modulation"?
3 MR. HOLT: Objection. Form.
4 **A. If I remember correctly, this term was**
5 **actually construed by the -- by the Board. I**
6 **don't remember the exact construction, but**
7 **basically changes in amplitude and frequency**
8 **and a couple other parameters. In fact, I**
9 **would extend this definition so it's not**
10 **comprehensive as it was considered.**
11 **If you can just point me to this --**
12 **to the construction, I will explain.**
13 **BY MR. KIM:**
14 Q. When you say "extend this definition," can you
15 explain what that means?
16 MR. HOLT: Objection. Form.
17 **A. I don't remember the actual definition. Can**
18 **you please point me to this definition? I**
19 **remember there are three parameters which I**
20 **included in the definition.**
21 **BY MR. KIM:**
22 Q. Did you use modulating techniques in your

93

1 research?
2 **A. Well, it's -- in physics, it's commonly used**
3 **for some data transmission, for example, so**
4 **it --**
5 Q. And what's -- I didn't mean to cut you off.
6 Go ahead.
7 **A. Yeah, yeah, go ahead.**
8 Q. Okay. What's the purpose of using modulation
9 for data transmission?
10 MR. HOLT: Objection. Form. Scope.
11 **A. So there are many different types of**
12 **modulation available. For example, frequency**
13 **modulation, amplitude modulation. Like, for**
14 **instance, if you transfer pulse sequence but**
15 **you can only transfer it in a very**
16 **high-frequency range, like megahertz range,**
17 **but your pulse sequence is in kilohertz**
18 **range, so you carry your information at very**
19 **high frequency but you modulate it by**
20 **amplitude.**
21 **So it's commonly done in electronic**
22 **equipment. So there are, again, many types**

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1 **of modulation including frequency, amplitude,**
2 **and several other types, and the, I believe,**
3 **Board construction included three of them, if**
4 **I remember correctly, but there are more**
5 **types. Sorry.**
6 **BY MR. KIM:**
7 Q. No, go ahead.
8 **A. Yeah, just, I said, there are more than three**
9 **types of modulation.**
10 Q. Okay. Does modulation improve signal-to-noise
11 ratio?
12 MR. HOLT: Objection. Form. Scope.
13 **A. Again, it depends on what you are doing**
14 **specifically in the -- in what realm,**
15 **physical, physiological, medical realm, but**
16 **basically in this particular case for PPG, it**
17 **does.**
18 **BY MR. KIM:**
19 Q. When you modulate a signal, do you need to
20 then demodulate the signal to make use of the
21 signal?
22 MR. HOLT: Objection. Form. Scope.

95

1 **A. It depends on your application because you**
2 **can, for example, carry it at a very high**
3 **frequency which is essentially not detectable**
4 **by your end-user of that information. But in**
5 **some cases you do, some cases you don't.**
6 **It's an open-ended question.**
7 **BY MR. KIM:**
8 Q. So can modulation be utilized without a
9 demodulation?
10 MR. HOLT: Objection. Form and
11 scope.
12 **A. I can think of some applications, yes.**
13 **BY MR. KIM:**
14 Q. What are those applications?
15 MR. HOLT: Same objections.
16 **A. Well, for example, I invented a pacemaker,**
17 **implantable pacemaker, which is -- it doesn't**
18 **have a battery, so to provide energy to that**
19 **pacemaker and to provide information about**
20 **duration of the signals you have to apply to**
21 **the heart muscle, so we carry this**
22 **information through RF coupled circuits at**

96

1 **very high frequency, and then it's amplitude**
2 **modulated, and then basically we don't need**
3 **to demodulate because heart doesn't see very**
4 **high frequency, only sees low frequencies.**
5 **There are -- there are basically**
6 **solutions where you don't need to get --**
7 **worry about it.**
8 **BY MR. KIM:**
9 Q. When there's a need to analyze the light
10 signal and the light signal has been
11 modulated, is there a need to demodulate the
12 light signal before analyzing it?
13 MR. HOLT: Objection. Scope and
14 form.
15 **A. Again, it really depends on the application.**
16 **You have to be more specific.**
17 **BY MR. KIM:**
18 Q. Okay. And when you're looking at a
19 physiological measurement device, how can you
20 confirm that the light source of the device is
21 modulated?
22 MR. HOLT: Objection. Scope. Form.

97

1 **A. Again, like I said, if you give me the**
2 **definition of the Board of that term,**
3 **"modulation," there are -- if I can remember**
4 **correctly, there are three different types of**
5 **modulation.**
6 **So for each type you have to look,**
7 **essentially, at that particular parameter.**
8 **So it could be -- if I remember what they**
9 **included, it was amplitude, not sure about**
10 **frequency, but basically you would look how**
11 **amplitude is changed or pulse duration has**
12 **changed. So whichever parameter is being**
13 **modulated, you can measure that.**
14 **Or you can again, like previously,**
15 **in your previous questions, if you don't have**
16 **physical device, you -- but you have**
17 **description, comprehensive description or you**
18 **have software, you can also gain this**
19 **information from those sources of**
20 **information.**
21 **BY MR. KIM:**
22 Q. You testified earlier that you did not have

98

1 access to Samsung's source code in relation to
2 these IPRs. Correct?
3 **A. Correct, I did not have access.**
4 Q. Did you have access to Samsung's confidential
5 documents in relation to these IPRs?
6 **A. No, I have not.**
7 Q. Okay.
8 MR. KIM: We've been going for a
9 little less than an hour. Do you need a break
10 or do you want to go ahead?
11 THE WITNESS: Yeah, a break would be
12 fine.
13 MR. HOLT: Let's take a -- yeah,
14 let's take a break.
15 (Off the record at 11:52 a.m.)
16 (Back on the record at 12:05 p.m.)
17 MR. KIM: Welcome back, Dr. Efimov.
18 THE WITNESS: Thank you.
19 BY MR. KIM:
20 Q. Right before the break, you testified that you
21 did not have access to Samsung's source code
22 or confidential documents in relation to these

99

1 IPRs. Correct?
2 **A. Correct.**
3 Q. Did you ever have any access to the Samsung
4 source code or confidential documents?
5 **A. You mean --**
6 MR. HOLT: Objection. Form.
7 **A. -- in relation to these proceedings? No.**
8 **BY MR. KIM:**
9 Q. Okay. Let's go to your declaration in
10 Exhibit 2043 in IPR2025-01250.
11 **A. Is it the new one or already opened?**
12 Q. It's the one I shared earlier.
13 **A. Oh, okay. Uh-huh. Lisogurski. Okay.**
14 Q. No, Exhibit 2043.
15 **A. 2043. Okay. Yes.**
16 Q. And that's your declaration. Correct?
17 **A. Correct, yeah, but -- all right, now it's the**
18 **same on the screen.**
19 Q. Okay. If we can go to paragraph 160 on
20 page 79 of the PDF.
21 **A. Okay. I'm there.**
22 MR. KIM: Just to confirm, the screen

100

1 is showing a different page. It should be
2 page 79 of the PDF and page 76 of the
3 declaration.
4 Great.
5 BY MR. KIM:
6 Q. The first sentence of paragraph 160 reads,
7 [redacted]
8
9
10
11
12
13 Do you see that?
14 **A. I do.**
15 Q. And as support, you're citing to paragraph 18
16 of Exhibit 2100, which is Dr. Islam's
17 declaration. Correct?
18 **A. Correct.**
19 Q. And there's no other citation in that
20 paragraph. Correct?
21 **A. Yes, correct. But if I recall correctly, but**
22 **I have to confirm it by looking at**

101

1 **declaration of Dr. Islam, he was also**
2
3
4 Q. We'll get to there.
5 **A. Yes.**
6 Q. And your opinion is the same for the patents
7 being challenged in all of the IPRs, as in
8 your opinion is that Samsung took Dr. Islam's
9 technologies disclosed in the '533, '304,
10 '455, and '475 patents. Correct?
11 MR. HOLT: Objection. Form.
12 **A. I believe there are some small differences in**
13 **terms of which particular limitations, but**
14 **generally, yes.**
15 **BY MR. KIM:**
16 Q. Let's go to paragraph 163 of the next page.
17 **A. Okay.**
18 Q. Under Conclusion, paragraph 163 reads, "The
19 evidence establishes a nexus between Samsung's
20 exposure to Omni MedSci's patented technology
21 and the implementation of those same
22 technologies in Samsung's products."

102

1 Do you see that?
2 **A. I do.**
3 Q. And, again, you made similar conclusions in
4 all the IPRs. Correct?
5 **A. Again, with the same stipulation that there**
6 **are slightly different references to each**
7 **particular technology depending on the**
8 **patent, but generally, yes.**
9 Q. What do you mean by "evidence establishes a
10 nexus"?
11 MR. HOLT: Objection. Form.
12 **A.**
13
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103

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2
3
4 **And then, essentially, analysis of**
5 **nonconfidential information about Samsung**
6 **accused products as presented in four**
7 **different documents of which I mentioned in**
8 **the beginning clearly show that the**
9 **technologies described in the slide deck**
10 **are -- appear to be the same technologies**
11 **which are implemented in the accused**
12 **products.**
13 **It depends again on which particular**
14 **patent, and I specifically focused on several**
15 **of these technologies for each patent. Three**
16 **or four for each patent, not all of them.**
17 **BY MR. KIM:**
18 Q. Okay. What is a "nexus"?
19 MR. HOLT: Objection. Form.
20 **A. Well, again, I'm not a lawyer, but my**
21 **understanding is that this is essentially a**
22 **relation between what was implemented versus**

104

1 **what was presented. Connection, essentially.**
2 **BY MR. KIM:**
3 Q. So "connection" is your definition of "nexus"?
4 MR. HOLT: Objection to form.
5 **A. One simplified definition.**
6 **BY MR. KIM:**
7 Q. What's the full definition of a nexus --
8 MR. HOLT: Objection.
9 BY MR. KIM:
10 Q. -- as you used in your statement in
11 paragraph 163?
12 **A.**
13
14
15
16
17 Q. That sounds like an application to me. I'm
18 asking about your definition of a nexus.
19 MR. HOLT: Objection to form. And
20 again, I'll remind counsel not to interrupt
21 the witness during his answer.
22 **A.**

105

1 [redacted]
2
3
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6
7
8 **BY MR. KIM:**
9 Q. And if a product has a feature similar in
10 concept with claim limitations, does that mean
11 that there is a nexus of copying?
12 MR. HOLT: Objection. Form.
13 **A. To me, based on my experience, it's an**
14 **evidence, yes, nexus.**
15 **BY MR. KIM:**
16 Q. And if a product has a feature similar in
17 concept but improved that concept as
18 implemented, is it still copying of the claim
19 limitation?
20 MR. HOLT: Objection to form.
21 **A. How would you define including this concept?**
22 **So you have to basically make assessment, so**

106

1 **which I don't know how exactly you would do**
2 **that without having access to all the**
3 **confidential information.**
4 **BY MR. KIM:**
5 Q. And how do you make the assessment?
6 **A. Like I said --**
7 MR. HOLT: Objection. Form.
8 **A. -- I have to have, in order to establish that**
9 **it's improvement, even if it's, you know,**
10 **evidence of -- contrary to this statement,**
11 **you still have to have access to confidential**
12 **information or hardware itself, which I also**
13 **didn't have. I only had access to publicly**
14 **available information.**
15 **BY MR. KIM:**
16 Q. And if there is enough improvement, would that
17 be still a copying of the claim limitation
18 from which the improvement was made?
19 **A. I'm sorry, I missed a word. If there was**
20 **what?**
21 Q. So if after the assessment you concluded that
22 there was an improvement to the claimed

107

1 feature, do you still consider that copying?
2 **A. If this was in the same definition of**
3 **technology, yes, it's still copying.**
4 **Technology is always improving, but**
5 **principles are the same, if it's the same**
6 **technology.**
7 Q. Okay. Dr. Efimov, have you ever heard of an
8 entity named Samsung SDS Co Ltd.?
9 **A. If I remember correctly, it's one of the**
10 **entities which has -- is part of this**
11 **proceedings.**
12 Q. Okay. And have you ever heard of an entity
13 named Samsung Semiconductor Inc?
14 **A. I have, yes.**
15 Q. Okay. Do you know what relationship
16 Samsung SDS Co Ltd. has with Samsung
17 Semiconductor Inc?
18 **A.** [redacted]
19
20
21
22

108

1 [redacted]
2
3 Q. Okay. And do you know what relationship, if
4 any, Samsung SDS Co Ltd. has with Samsung
5 Electronics Co Ltd.?
6 **A. No, I did not look into that. To me, it**
7 **would be the same, essentially, entity with**
8 **different branches.**
9 Q. So your understanding is that they are
10 different branches of the same company; is
11 that your testimony?
12 MR. HOLT: Objection to form.
13 **A. Well, again, how exactly they are linked**
14 **legally in terms of information flow, I**
15 **don't -- I have no way of knowing. This**
16 **would be part of the confidential information**
17 **which I don't have access to.**
18 **BY MR. KIM:**
19 Q. Okay. And do you know what relationship, if
20 any, Samsung SDS Co Ltd. has with Samsung
21 Electronics America Inc?
22 **A. No. Same answer. I don't -- do not know. I**

109

1 **am not a business person.**
2 Q. And do you know what relationship, if any,
3 Samsung Semiconductor Inc has with Samsung
4 Electronics Co Ltd.?
5 **A. Same answer, I don't know exactly. But,**
6 **again, to me, these are -- these are related**
7 **companies.**
8 Q. Do you know what -- sorry, I didn't mean to
9 cut you off.
10 **A. Same control, yeah.**
11 Q. So they're under the same control, all
12 these -- Samsung SDS Co Ltd., Samsung
13 Semiconductor Inc, Samsung Electronics Co
14 Ltd., Samsung Electronics America Inc. So
15 your understanding of these entities is that
16 they're under the same control. Is that your
17 testimony?
18 **A. They are subsidiaries, I believe, but, again,**
19 **I am not a business person. I did not look**
20 **at their business relationship or legal**
21 **relationship.**
22 Q. Do you know if Samsung Electronics Co Ltd.

110

1 controls Samsung SDS Co Ltd.?
2 MR. HOLT: Objection. Form.
3 **A. I don't know exact, you know, financial or**
4 **administrative relationship.**
5 **BY MR. KIM:**
6 Q. Do you know if Samsung Electronics America Inc
7 controls Samsung Semiconductor Inc?
8 MR. HOLT: Objection. Form.
9 **A. Same answer. I did not analyze how exactly**
10 **they are related.**
11 **BY MR. KIM:**
12 Q. And outside the fact that all these entities
13 have "Samsung" in their names, do you have any
14 understanding of their relationships?
15 **A.** [redacted]
16
17
18
19 Q. Have you seen any documents to confirm their
20 exact relationships?
21 **A. I did not study the business documents, no.**
22 **It would be confidential. And I did not have**

111

1 **access to confidential information.**
2 Q. So you did not know their exact relationships.
3 Correct?
4 **A. Yeah, I already answered this question.**
5 MR. KIM: I'm going to show you a
6 document that's marked as Exhibit 2100 in
7 IPR2025-01250.
8 ENTERED INTO THE RECORD:
9 PREVIOUSLY MARKED IPR2025-01250
10 EXHIBIT 2100
11 12:20 p.m.
12 **A. Okay, I have it.**
13 **BY MR. KIM:**
14 Q. Okay. Have you seen this document before?
15 **A. Yes, I have. This is a declaration of**
16 **Mohammed Islam.**
17 Q. And did you review this document in forming
18 your opinion in your declaration?
19 **A. Yes, I have.**
20 Q. And the same declarations are filed in each of
21 the IPRs. Correct?
22 MR. HOLT: Objection to form.

112

1 **A. I mean, I don't have exact recollection of,**
2 **but I will take your word for it, yes.**
3 **BY MR. KIM:**
4 Q. We can go to paragraph 8.
5 **A. Okay, I'm there.**
6 [redacted]
7
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113

1 [redacted]
2
3
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8
9 Q. Okay.
10 **A. -- no Dr. Choi,** [redacted]
11 Q. Did you think of someone by the name of
12 Dr. Choi when you were drafting that portion
13 of your declaration?
14 **A. It was a typo. It was one of our students,**
15 **who is I believe now working in Korea**
16 **somewhere, so he is Dr. Choi. He was the**
17 **first author on my papers.**
18 Q. Understood.
19 MR. KIM: I'm going to show you a
20 document that's been marked as Exhibit 2106 in
21 IPR2025-01250.
22 ENTERED INTO THE RECORD:

114

1 PREVIOUSLY MARKED IPR2025-01250
2 EXHIBIT 2106
3 12:23 p.m.
4 **A. Okay, I have it open.**
5 **BY MR. KIM:**
6 Q. Okay. So this is one of the documents
7 identified in paragraph 8 of Dr. Islam's
8 declaration. Correct?
9 **A. Correct.**
10 Q. And have you seen this document before?
11 **A. Yes. I have analyzed it, yes.**
12 [redacted]
13
14
15
16
17 **A. I don't believe so.**
18 Q. Okay.
19 **A. I never owned Samsung products and never**
20 **examined the physical version of it.**
21 [redacted]
22

115

1 [redacted]
2
3
4
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6
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8
9 Q. Okay.
10 **A.** [redacted]
11
12 Q.
13
14
15 **A. No, not too -- off the top of my head. I**
16 **don't recall.**
17 Q. Okay. Let's go to page 2 of this document.
18 **A. Okay.**
19 Q. Here, under bullet point 2, it lists a number
20 of features. Do you see that?
21 **A. I do.**
22 Q. [redacted]

116

1 [redacted]
2
3
4
5
6
7 Do you see that?
8 **A. Yes.**
9 [redacted]
10
11 MR. HOLT: Objection. Form.
12 [redacted]
13
14
15
16
17 **BY MR. KIM:**
18 Q. So as long as they are using these features,
19 does that mean that they're infringing?
20 MR. HOLT: Objection. Form.
21 **A. So I didn't do specific infringement analysis**
22 **for these particular declarations, and I am**

117

1 not a lawyer, but basically my interpretation
2 would be yes.
3 BY MR. KIM:
4 Q.
5
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11
12
13
14 MR. HOLT: Objection to form.
15 A. I don't recall one way or another. My
16 analysis here was focused on Samsung.
17 BY MR. KIM:
18 Q.
19
20
21 MR. HOLT: Objection. Form.
22

118

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5 BY MR. KIM:
6 Q.
7
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19 Q.
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119

1 MR. HOLT: Objection. Form.
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13 But, again, it's hypothetical. I
14 have to analyze each feature, each company,
15 and I haven't done it except for this
16 particular proceedings. I only looked at
17 Samsung features and only from that list.
18 Q. Okay. Let's go back to Exhibit 2100.
19 A. Okay. I opened it.
20 Q. Okay. If you can go to paragraph 18.
21 A. Okay.
22 Q.

120

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4 Do you see that?
5 A. I do.
6 Q.
7
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9 MR. HOLT: Objection to form.
10 A.
11
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16 BY MR. KIM:
17 Q.
18
19
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21
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121

1
2
3 Q.
4
5 **A. Not off the top of my head.**
6 MR. HOLT: Objection to form.
7 **A. I reviewed so many documents, I wouldn't**
8 **remember them by heart.**
9 **BY MR. KIM:**
10 Q.
11
12
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122

1 MR. HOLT: Objection.
2 **A. –** **?**
3 **BY MR. KIM:**
4 Q. Correct.
5 **A. I don't believe I've seen that.**
6 Q. Okay. Let's go back to your declaration in
7 Exhibit 2043 in IPR2025-01250.
8 **A. I am at 2043.**
9 Q. Okay. Let's go to paragraph 152.
10 **A. Okay. I'm there.**
11 Q.
12
13 **A. I do.**
14 Q.
15 MR. HOLT: Objection. Form.
16 **A.** **. By**
17 **the way, this is exactly the spot which I**
18 **referred and which I wanted to correct. You**
19 **see this reference to subheading 2? That was**
20 **Mr. Choi.**
21
22

123

1 **BY MR. KIM:**
2 Q. Okay.
3 **A. Yeah.**
4 Q. So that's your student that's in Korea?
5 **A. Yeah, I have – we have couple – they are**
6 **listed in my CV, if you look in the same**
7 **declaration above, we have two wonderful**
8 **papers with him. Very talented.**
9
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124

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5 Q. Okay. By the way, are you reading anything
6 right now?
7 **A. No, I don't. I just remember.**
8 Q. Okay. So this is based off your memory?
9 **A. Yes.**
10 Q.
11
12
13
14
15
16
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22

125

1 [redacted]
2 [redacted]
3 [redacted], I move to --
4 BY MR. KIM:
5 Q. Go ahead.
6 **A. Yeah, yeah, I'm just reading from 152,**
7 **paragraph 152 of Exhibit 2043.**
8 [redacted]
9 [redacted]
10 [redacted]
11 [redacted]
12 [redacted]
13 [redacted]
14 [redacted]
15 [redacted]
16 [redacted]
17 MR. KIM: Okay, I move to strike
18 everything after "I don't remember seeing any
19 information one way or another."
20 BY MR. KIM:
21 Q. And, Dr. Efimov, I ask that you listen to my
22 question and answer the question, please.

126

1 **A. Okay.**
2 Q. [redacted]
3 [redacted]
4 [redacted]
5 **A. I don't know organizational structure of**
6 **Samsung. I don't know one way or another.**
7 Q. [redacted]
8 [redacted]
9 [redacted]
10 [redacted]
11 **A.** [redacted]
12 [redacted]
13 [redacted]
14 [redacted]
15 [redacted]
16 [redacted]
17 [redacted]
18 [redacted]
19 [redacted]
20 **A. Again, I have no way of knowing. It's**
21 **confidential information within the structure**
22 **of Samsung.**

127

1 Q. Okay. Let's go to paragraph 154.
2 **A. Okay, I'm there.**
3 [redacted]
4 [redacted]
5 [redacted] Do you see that?
6 **A. I do.**
7 MR. KIM: I'm sorry, was there an
8 objection?
9 **A. I'm sorry? No. I do. No objection.**
10 **BY MR. KIM:**
11 Q. Okay.
12 MR. HOLT: No, there was no
13 objection. I'm not sure what you heard,
14 Counsel.
15 BY MR. KIM:
16 Q. [redacted]
17 [redacted]
18 [redacted]
19 Do you see that?
20 **A. Yeah, it says right there in paragraph 154**
21 **what you just read.**
22 Q. Okay. [redacted]

128

1 [redacted]
2 [redacted]
3 **A. I really don't know. I recall in Dr. Islam's**
4 **declaration he had some information what he**
5 **was working for, but I don't remember the**
6 **details.**
7 Q. [redacted]
8 [redacted]
9 MR. HOLT: Objection. Form.
10 **A. So also I have -- don't -- don't know the**
11 **details.**
12 **BY MR. KIM:**
13 Q. [redacted]
14 [redacted]
15 MR. HOLT: Objection. Form.
16 **A.** [redacted]
17 [redacted]
18 [redacted].
19 **BY MR. KIM:**
20 Q. And by "Samsung," which specific Samsung
21 entity were you referring to?
22 **A. If you please show me Dr. Islam's declaration**

129

1 **I will look at it, but I don't remember off**
2 **the top of my head.**
3 Q. Okay, let's go to Dr. Islam's declaration in
4 Exhibit 2100.
5 **A. Okay. So is it paragraph 19?**
6 Q.
7
8
9 **A.**
10
11
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18
19 **A. Same answer. I don't know.**
20
21
22 **A. Sorry, which -- who? Could you repeat the**

130

1 **name?**
2
3
4
5
6
7
8
9 Q. Okay. And if we go to the next paragraph,
10 paragraph 20 of Dr. Islam's declaration --
11 **A. Uh-huh.**
12
13
14
15 **A. Uh-huh, I do.**
16
17
18
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131

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6 Q. Do you use the time-of-flight sensors for
7 measuring blood oxygen level?
8 MR. HOLT: Objection. Form.
9 **A. I personally do not use time-of-flight --**
10 **time-of-flight sensors are typically used for**
11 **different purpose.**
12 **BY MR. KIM:**
13 Q. Okay.
14 **A. They are for optical interrogating**
15 **three-dimensional shapes of objects, but**
16 **could also be additional information inferred**
17 **from them.**
18
19
20
21
22 **A. I do not. Dr. Islam did not provide this**

132

1 **information.**
2
3
4 **A. Same answer, I do not know.**
5 Q. Okay.
6
7
8
9
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11
12
13
14 Q. So is it -- strike that.
15
16
17 **A. Not really. I don't even know where in Korea**
18 **Samsung is.**
19
20
21 MR. HOLT: Objection. Form.
22 **A. Again, I don't have answer to that. He just**

133

1 [redacted]
2 [redacted]
3 [redacted]
4 **BY MR. KIM:**
5 [redacted]
6 [redacted]
7 [redacted]
8 [redacted]
9 Q. Okay. Let's go back to your declaration in
10 Exhibit 2043.
11 **A. Okay.**
12 Q. Please go to paragraph 156.
13 **A. Okay. I am there.**
14 [redacted]
15 [redacted]
16 Do you see that?
17 **A. I do.**
18 [redacted]
19 [redacted]
20 [redacted]
21 [redacted]
22 [redacted]

134

1 [redacted]
2 [redacted]
3 [redacted]
4 [redacted]
5 [redacted]
6 [redacted]
7 MR. HOLT: Objection to form.
8 [redacted]
9 [redacted]
10 [redacted]
11 [redacted]
12 [redacted]
13 **BY MR. KIM:**
14 Q. Okay. If we can go to the next paragraph,
15 paragraph 157.
16 **A. Okay. I am there.**
17 [redacted]
18 [redacted]
19 [redacted]
20 **A. I do.**
21 Q. Okay. And, again, here, did you have any
22 specific Samsung entity in mind?

135

1 MR. HOLT: Objection. Form.
2 [redacted]
3 [redacted]
4 [redacted]
5 **BY MR. KIM:**
6 Q. So your understanding of Samsung is based on
7 Dr. Islam's declaration stating Samsung as a
8 general matter. Is that your testimony?
9 MR. HOLT: Objection to form.
10 [redacted]
11 [redacted]
12 [redacted]
13 [redacted]
14 [redacted]
15 [redacted]
16 **BY MR. KIM:**
17 [redacted]
18 [redacted]?
19 **A. Correct.**
20 [redacted]
21 [redacted]
22 [redacted]

136

1 [redacted]
2 [redacted]
3 [redacted]
4 [redacted]
5 [redacted].
6 Q. So when you say "Samsung" in your declaration,
7 you're referring to different entities.
8 Correct?
9 [redacted]
10 [redacted]
11 Q. If we can go to paragraph 163.
12 **A. Okay, I'm there. Conclusions.**
13 [redacted]
14 [redacted]
15 [redacted]
16 [redacted]
17 [redacted]
18 MR. HOLT: Objection. Form.
19 [redacted]
20 [redacted]
21 [redacted]
22 [redacted]

137

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5 **BY MR. KIM:**
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7 to the
8 entire Samsung group of subsidiaries?
9 MR. HOLT: Objection to form.
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15 **BY MR. KIM:**
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6 Q. So the definition of "Samsung" you used in
7 paragraph 163 defers from the definition you
8 used in 156 and 157. Correct?
9 MR. HOLT: Objection. Form.
10
11
12
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14
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17
18 **BY MR. KIM:**
19 Q. So on that paragraph 156, you also use the
20 term "Samsung." Correct?
21 **A. 156?**
22 Q. Yes.

139

1 **A. Well, it was in 157 and 156, yes.**
2
3
4
5
6
7
8 MR. KIM: This may be a good breaking
9 point. I believe you're in -- actually, let's
10 go off the record for a bit.
11 (Off the record at 12:53 p.m.)
12 (Back on the record at 12:59 p.m.)
13 MR. KIM: Welcome back, Dr. Efimov.
14 THE WITNESS: Thank you.
15 BY MR. KIM:
16 Q. If we can go to paragraph 158 of your
17 declaration in Exhibit 2043.
18 **A. Okay. I'm there.**
19 Q. And at the end of the paragraph 158 on page 76
20 of your declaration --
21 **A. Uh-huh. Yes.**
22 Q. -- you state that, "I have reviewed the claim

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1 chart in Exhibit 2116 and agree with the
2 analysis therein."
3 Do you see that?
4 **A. I do.**
5 Q. And the claim chart in Exhibit 2116 is Omni's
6 infringement contentions claim chart served in
7 the parallel Texas case. Correct?
8 MR. HOLT: Objection. Form.
9 **A. I have to look at it. I don't remember.**
10 **BY MR. KIM:**
11 Q. Okay. Let's take a look at the -- actually,
12 strike that.
13 Before we go there, you opined -- you
14 provided the same opinion in all of the
15 pending IPRs that you reviewed the claim
16 charts and agreed with the analysis therein
17 for each of the pending IPRs. Correct?
18 MR. HOLT: Objection. Form.
19 **A. But to specific limitations, which are listed**
20 **in each -- not in the entirety of the**
21 **exhibit.**
22 **BY MR. KIM:**

141

1 Q. Okay.
2 **A. I only -- I'm sorry. I just want to finish.**
3 **So these are extensive charts with hundreds**
4 **of pages. I only focused on those features**
5 **which are relevant.**
6 Q. Okay. Let's go to the beginning of
7 paragraph 158 there.
8 **A. 158?**
9 Q. Yes.
10 **A. Okay. I'm there.**
11 Q. So the first item or technique that you
12 identified here is, "Increasing light
13 intensity to improve SNR." Correct?
14 **A. Yes, correct.**
15 Q. And you reviewed the claim chart corresponding
16 to this technique. Correct?
17 **A. I have.**
18 Q. And you agreed with the analysis in the claim
19 chart; is that your testimony?
20 **A. Yes, I do, for that particular limitation.**
21 Q. Okay. And then let's go to the next one,
22 which is, "Increasing pulse rate to improve

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1 SNR."
2 **A. Okay.**
3 Q. And you reviewed the claim chart corresponding
4 to this technique. Correct?
5 **A. Right. At 19 through 33.**
6 Q. Okay. And you also agree with the analysis in
7 the claim chart. That's your testimony.
8 Correct?
9 **A. Correct.**
10 Q. Okay.
11 MR. KIM: Let's go to Exhibit 2116 in
12 IPR2025-01250.
13 THE WITNESS: Uh-huh.
14 ENTERED INTO THE RECORD:
15 PREVIOUSLY MARKED IPR2025-01250
16 EXHIBIT 2116
17 1:02 p.m.
18 THE WITNESS: Somehow it came broken.
19 Zoom download. Maybe it's not there yet.
20 MR. HOLT: Try it again.
21 **A. Okay, I have it.**
22 **BY MR. KIM:**

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1 Q. Okay. And this is the claim chart that was
2 referenced in paragraph 158 of your
3 declaration. Correct?
4 **A. This is for paragraph -- patent '533, right.**
5 **Correct.**
6 Q. Okay. We can go to page 19 of this document.
7 **A. Okay.**
8 Q. And this is the portion of the claim chart
9 that you reviewed and agreed. Correct?
10 **A. Let me look. 1933, right. This is the first**
11 **page of that --**
12 Q. Okay.
13 **A. -- extent of pages, yeah.**
14 Q. And this part of the claim chart is for claim
15 element 5[b] of the '533 patent?
16 **A. Correct.**
17 Q. And it recites [as read]: The light source
18 configured to increase signal-to-noise ratio
19 by increasing a light intensity and by
20 increasing a pulse rate.
21 Do you see that?
22 MR. HOLT: Objection. Form.

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1 **A. Well, it's -- you didn't read the whole**
2 **statement, but in general correct.**
3 **BY MR. KIM:**
4 Q. Okay. And these are the techniques that we
5 saw in paragraph 158 of your declaration.
6 Correct?
7 **A. Correct.**
8 Q. Let's go to page 20.
9 **A. Okay.**
10 Q. And it appears to show a screenshot of a
11 document with annotations. Do you see that?
12 **A. I do.**
13 Q. Do you know what document the screenshots were
14 pulled from?
15 **A. So reference to... I believe this is on the**
16 **next page, there is a --**
17 Q. We can -- we can go to the next page.
18 **A. Yeah. So if I click on it -- is it okay to**
19 **click?**
20 Q. Sure.
21 **A. So it opens. So, yeah, the link is broken,**
22 **but it was available at the time.**

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1 Q. It's a Texas Instruments AFE4510, SBASB19. Do
2 you see that?
3 **A. Correct.**
4 Q. So this document appears to be a Texas
5 Instruments document. Is that your
6 understanding?
7 **A. Yes, it is my understanding.**
8 Q. What is AFE4510?
9 MR. HOLT: Objection. Form.
10 **A. So on page 20, highlighted part, it says**
11 **that, "The AFE4510 is a versatile signal**
12 **acquisition system that supports acquiring**
13 **PPG, PDE, ECG, and Bio-impedence signals. A**
14 **PPG signal chain comprises a current driver**
15 **for LEDs and a receiver that senses the**
16 **signal from PDs."**
17 **BY MR. KIM:**
18 Q. This AFE data sheet is not identified as an
19 exhibit in IPR2025-01250. Correct?
20 MR. HOLT: Objection. Form.
21 **A. I'm not sure. Can you repeat this question?**
22 **BY MR. KIM:**

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1 Q. Let me ask a different question. Do you cite
2 to this AFE4510 data sheet in your
3 declaration?
4 **A. I have to check. I don't remember.**
5 Q. Okay. But this is not -- sorry, go ahead.
6 **A. Yeah, I cite these pages, not -- maybe not**
7 **specifically by name, but from 19 through 33,**
8 **I believe.**
9 Q. Right. So you cite to the claim chart but you
10 do not cite to the specific document in your
11 declaration. Correct?
12 **A. I have to verify, but if you represent this**
13 **to me, it probably is correct.**
14 Q. Okay. And this document is not Samsung's
15 internal document. Correct?
16 **A. This is a component which was used by**
17 **Samsung. This is my understanding.**
18 Q. Right. But that's not the question I asked.
19 I asked whether this document is Samsung's
20 internal document.
21 **A. It's a Texas Instruments document.**
22 Q. Okay. If we can go to page 21.

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1 **A. Okay.**
2 Q. There is a second document titled Optical
3 Heart Rate Monitoring (OHRM) on Wearables. Do
4 you see that?
5 **A. I do.**
6 Q. Did you review this document in forming your
7 opinion?
8 **A. I did.**
9 Q. Okay. We can go to page 24. Again, the
10 source is identified as Texas Instruments, and
11 it has a code name SBAA564. Do you know what
12 SBAA564 is?
13 MR. HOLT: Objection. Form.
14 **A. Can you point me specifically where it is?**
15 **BY MR. KIM:**
16 Q. Sure. If you can look at the -- somewhere on
17 the middle of the page under "Source," it says
18 SBAA564, second line.
19 **A. Right, I do see that. Uh-huh.**
20 Q. Do you know what that is referring to?
21 MR. HOLT: Objection. Form.
22 **A. So I clicked on the link, so it has**

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1 **description. Do you want me to read it?**
2 **BY MR. KIM:**
3 Q. I'm asking about your understanding of what
4 SBAA564 is.
5 **A. So it says Optical Heart Rate Monitoring**
6 (OHRM) uses the principle for the
7 photoplethysmography, PPG, to determine the
8 heart rate. And there's more to it, but this
9 is briefly what it is.
10 Q. And how is SBAA564 different or similar to
11 AFE4510 that we saw on page 20?
12 MR. HOLT: Objection. Form.
13 **A. So it says the PPG signal -- I'm reading**
14 **again from page 24 -- "The PPG signal chain**
15 **for optical heart rate monitoring on**
16 **wearables is supported on many other AFEs**
17 **from Texas Instruments such as," and there is**
18 **a list of those devices. So it's basically**
19 **part of the same family.**
20 **BY MR. KIM:**
21 Q. Right, but that wasn't the question.
22 The question was, do you know if

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1 there is any difference between SBAA564 and
2 AFE4510?
3 **A. I did not analyze specific differences for**
4 **this proceedings, but I can do it if you want**
5 **me to.**
6 Q. Okay. And at the top of page 24, it also
7 identifies AFE4432. Do you see that?
8 **A. Yes.**
9 Q. How is AFE4432 different from AFE4510?
10 MR. HOLT: Objection to form.
11 **A. So again, the same answer. So I don't know**
12 **the specific technical details, but as it**
13 **says below, these are all PPG essentially**
14 **signal chain for heart rate monitoring in**
15 **wearables.**
16 **BY MR. KIM:**
17 Q. But do you know what difference, if any, there
18 is between AFE4432 and AFE4510?
19 **A. I have to --**
20 MR. HOLT: Objection.
21 **A. I have to review that. I did not.**
22 **BY MR. KIM:**

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1 Q. Okay.
2 **A. But it does say, "Applications like optical**
3 **heart rate and SpO2 monitoring are based on**
4 **the principle of Photoplethysmography."**
5 Q. Okay. And, again, this is a Texas Instruments
6 document. Correct?
7 **A. Correct. But it was used by Samsung in --**
8 Q. Again, that's not the question I asked.
9 This is not Samsung's internal
10 document. Correct?
11 MR. HOLT: Objection. Form.
12 And again I'll remind counsel not to
13 interrupt the witness during his answering.
14 **A. Yeah, I mean, I have the same answer. So**
15 **this is Texas Instruments document but it is**
16 **a component used by Samsung in their**
17 **wearables.**
18 MR. KIM: Move to strike everything
19 after "so this is Texas Instruments document."
20 BY MR. KIM:
21 Q. We can go to page 26.
22 **A. Okay.**

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1 Q. Towards the end of the first paragraph, it
2 reads, "How to Design Peripheral Oxygen
3 Saturation (SpO)2 and Optical Heart Rate
4 Monitoring (OHRM) Systems Using the AFE4403."
5 Do you see that?
6 **A. I do.**
7 Q. What is AFE4403?
8 MR. HOLT: Objection to form.
9 **A. It's one in the same family of devices.**
10 **BY MR. KIM:**
11 Q. When you say "same family," what do you mean?
12 MR. HOLT: Objection. Form.
13 **A. So below it says, "AFE4403 Ultra-Small,**
14 **Integrated Analog Front-End for Heart Rate**
15 **Monitors and Low-Cost Pulse Oximeters,**
16 **SBAS650C, revised April 2021, at 9."**
17 **So this is the description.**
18 **BY MR. KIM:**
19 Q. And where are you reading this from?
20 **A. Page 26, just below the table.**
21 Q. Right. But the question was, when you say the
22 "same family," what did you mean by that?

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1 MR. HOLT: Objection. Form.
2 **A. I mean it's an integrated circuit chip which**
3 **basically does -- implements all these**
4 **functions, including heart rate monitor and**
5 **low-cost pulse oximeter.**
6 **BY MR. KIM:**
7 Q. Do you have any basis to believe that the
8 features available in AFE4403 is also
9 available in AFE4510?
10 **A. I have to look if you want me to.**
11 Q. So you testified that you already reviewed
12 this document, so I'm asking about your
13 understanding as sitting here today.
14 **A. Obviously I reviewed hundreds of other**
15 **documents. I don't remember every single one**
16 **of them by heart. I have to review it.**
17 Q. So you cannot answer the question?
18 MR. HOLT: Objection. Form.
19 **A. I can if I -- if I am provided with**
20 **sufficient time.**
21 **Could you please repeat which**
22 **numbers, AFE4403 and what?**

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1 BY MR. KIM:
2 Q. Where are you trying to go now?
3 A. No, I'm looking for -- to compare the two
4 different models.
5 Q. From where?
6 A. You mentioned two different models by number,
7 so I missed the numbers. If you could please
8 repeat -- repeat, I can do it.
9 Q. So without comparing the model numbers now,
10 you cannot answer the question as to whether
11 there is any difference between AFE4403 and
12 AFE4510. Correct?
13 MR. HOLT: Objection. Form.
14 A. 4510, right? I don't remember by heart. I
15 have to look. I did analysis, but I don't
16 remember right now.
17 BY MR. KIM:
18 Q. That's fine. And without doing any further
19 analysis, can you tell me any difference
20 between AFE4403 and AFE4432?
21 MR. HOLT: Objection. Form.
22 A. Again, if I -- if you want me to analyze it

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1 and answer your question, I have to have
2 time.
3 BY MR. KIM:
4 Q. Okay. So we have seen AFE4510, AFE4432, and
5 AFE4403 in this chart. Correct?
6 A. You read three different numbers which are
7 very long and I really have to verify that.
8 I can see 4432.
9 Q. And 4403 is shown on page --
10 A. 4403, correct, and what was the other one?
11 Q. 4510.
12 A. 4510, I'm looking for that one. Which page
13 was -- oh, yes, 4510. It's on page 21.
14 That's right.
15 Q. Correct. So we have seen three different
16 models of AFEs. Correct?
17 A. Yeah. Correct.
18 Q. Do you know which one of those three AFE chips
19 are in Samsung's accused products?
20 MR. HOLT: Objection. Form.
21 A. Again, I have to review each particular
22 product because there are so many products.

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1 BY MR. KIM:
2 Q. Did you do that review when you were reviewing
3 this claim chart?
4 A. I reviewed, yes.
5 Q. What did you review to confirm what's in
6 Samsung's accused product?
7 MR. HOLT: Objection to form.
8 A. I have to again look at the -- review 20
9 pages.
10 BY MR. KIM:
11 Q. Let me -- let me ask a different question.
12 A. Okay.
13 Q. Outside of these 20 pages for claim limitation
14 5[b] of the '533 patent, did you review any
15 Samsung internal documents?
16 A. Well, again, like I said, I don't have access
17 to confidential information. If a document
18 is cited here, I reviewed it. Otherwise,
19 not.
20 Q. Okay. And if we can go to page 30 of
21 Exhibit 2116.
22 A. Uh-huh. I'm already there.

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1 Q. Okay. Do you see the United States Patent
2 Number 11,974,838 cited there?
3 A. I do.
4 Q. Okay. Did you review the '838 patent?
5 A. I don't remember if I actually looked
6 specifically at the whole patent.
7 Q. Okay. And is it your opinion that the
8 disclosure in the '838 patent confirms what is
9 in Samsung's accused products?
10 A. Not alone, but there is -- there is also
11 technical descriptions which are in this
12 chart. Because this patent, date of patent
13 is 2024, some of the products were released
14 earlier, so maybe they -- but, again, it
15 depends on which particular product you are
16 referring to.
17 Q. So is it -- is it your opinion that Samsung
18 obtained this patent by copying Dr. Islam's
19 materials?
20 A. I did not specifically analyze your question
21 before. I have to look at both, you know,
22 this patent and the other patents and then

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1 provide you with an answer and request for
2 review, which I did not do.
3 Q. Okay, let's go to page 32 of Exhibit 2116.
4 A. Okay.
5 Q. This is a quote from Samsung's news article.
6 Correct?
7 MR. HOLT: Objection. Form.
8 A. Yeah, the website states news.samsung.com. I
9 presume this is a news article.
10 BY MR. KIM:
11 Q. Okay. Does this paragraph say anything about
12 light intensity?
13 A. Yes, it does. It says, in the description
14 before the figure, it says, "Increasing SNR
15 generally yields more accurate health
16 measurements. Samsung advertises that the
17 Accused Smartwatch provides health
18 measurements with enhanced accuracy,
19 indicating that Samsung configures the
20 Accused Smartwatch to increase SNR using
21 various techniques, including by increasing
22 light intensity and by increasing pulse rate,

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1 as shown above. For example," and there is a
2 description of how it's done.
3 So, for example, more accurate health
4 measurements, enable even more precise health
5 insights more accurately...
6 Let me follow to the next page.
7 Yeah, on the next page, it says, "The
8 SDK supports an improved health tracking
9 capability to allow your application to track
10 the user's health data accurately."
11 And then the -- it says "heart rate
12 including inter-beat interval."
13 Q. Right. So page 33 is a different article.
14 Going back to page 32, so your
15 understanding of the first paragraph is that
16 that's also part of Samsung's news article?
17 A. You're talking -- no, no, this is
18 conclusions, analysis.
19 Q. So focusing on what's disclosed in the news
20 article and quoted in this claim chart, is
21 there any mention of light intensity?
22 A. So I have to review the news piece, if I --

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1 if I may.
2 Q. No, I'm asking about what's quoted in this
3 page. Do you see the term "light intensity"
4 recited in the quoted language?
5 MR. HOLT: Objection. Form.
6 A. I have to review -- so the -- I don't see
7 "light intensity" specifically stated in this
8 quotation, but in the -- I have to review the
9 news article. Can I --
10 BY MR. KIM:
11 Q. No, I'm asking you about this particular page
12 and what's quoted here. Does the quoted
13 language say anything about pulse rate?
14 MR. HOLT: Objection. Form.
15 A. It says bio-active sensor. But I have to see
16 the news article to establish which
17 bio-active sensor it was.
18 BY MR. KIM:
19 Q. Again, the question was if you see any mention
20 of pulse rate in the quoted language.
21 A. What -- combination pulse rate is not
22 mentioned here.

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1 Q. Okay. You may click on the link.
2 A. Okay.
3 Q. Did you review this article in full in forming
4 your opinion?
5 A. I believe so, but I need to refresh my
6 memory. It was a while ago so it may take
7 some time to read through.
8 Q. Okay. Let me know when you're done.
9 A. Yes, I will.
10 Q. Just to be clear, are you reading or searching
11 something?
12 A. No, no, I'm looking now at the table, the
13 chart --
14 Q. Okay.
15 A. -- the description. Because it refers to
16 bio-active sensor and I'm trying to identify
17 features of this bio-active sensor.
18 Q. We can move on.
19 A. So do you want me to finish?
20 So bio-active sensor is mentioned 47
21 times, so I have to review that. But I do
22 recall it has these features.

161

1 Q. Again, the question was whether there is a
2 mention of light intensity.
3 **A. I already said light intensity in combination**
4 **is not mentioned, but bio-active sensor --**
5 **but bio-active sensor would reveal that.**
6 Q. Okay. We can move on. Let's go to page 33 --
7 **A. I can answer now, but okay if you want to**
8 **move on. That's fine.**
9 **Okay.**
10 Q. Okay. We can go to page 33 of the claim
11 chart.
12 **A. Okay. 33.**
13 Q. And this is the portion that you read earlier
14 which talks about the SDK. Correct?
15 **A. Correct.**
16 Q. Does it have any mention of light intensity
17 here?
18 **A. I'm looking for "light intensity."**
19 Q. You're looking for "light intensity" where?
20 **A. In the chart. In the chart.**
21 Q. Just to make sure that we're on the same page,
22 my question was whether the quoted language on

162

1 page 33 of this claim chart includes a mention
2 of light intensity.
3 **A. No, no. I understand, 33, no, but I'm**
4 **looking where it's in the adjacent pages.**
5 Q. Well, if you've confirmed that there is no
6 mention of light intensity on page 33, that's
7 all I asked for.
8 **A. Well, but it does say in page 61, for**
9 **example.**
10 Q. But that's not the portion that you reviewed
11 in forming your opinion, as you testified
12 earlier. Correct?
13 **A. I have to see the pages I referred to in this**
14 **particular instance. I reviewed the whole**
15 **document. I just cited only relevant parts.**
16 Q. So now you're saying that you -- you testified
17 earlier that you only reviewed portions of the
18 document because it's a long document, but now
19 you're saying that you reviewed everything in
20 it -- in its entirety?
21 **A. I reviewed --**
22 MR. HOLT: Objection to the --

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1 **A. -- the relevant parts.**
2 **BY MR. KIM:**
3 Q. The discussion of claim element 5[b] ends on
4 page 33. Correct?
5 **A. Page 33?**
6 Q. Page 33 of Exhibit 2116.
7 **A. [c] starts at 33 as well, yeah.**
8 Q. Okay. If we can go to page 27.
9 **A. Okay. I'm there.**
10 Q. Okay. This appears to be a posting on an
11 online forum. Do you see that?
12 **A. Yeah, it's a Texas Instruments, yeah.**
13 Q. Okay. And this looks like a post made by
14 someone named Matthew Tomback. Do you see
15 that?
16 **A. It's really hard to read, but if you**
17 **represent this to me. Matthew something,**
18 **yeah. Very hard to read, yeah, but it sounds**
19 **about right.**
20 Q. Do you know who Matthew Tomback is?
21 **A. Not personally.**
22 Q. Do you know if he's working at Samsung?

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1 **A. No, I do not.**
2 Q. So this posting talks about Optimal AFE
3 Settings for Filtering and Removing Noise and
4 Motion Artifacts in Signal. Do you see that?
5 **A. So the first one is preprocessing. The**
6 **second one is the noise, noise reduction.**
7 **And what else did you mention? I'm**
8 **sorry. Oh, yeah, and motion artifact, right.**
9 **Uh-huh.**
10 Q. Okay. Do you know if the AFE settings
11 proposed in this post is implemented in
12 Samsung's accused products?
13 **A. I did not review confidential information.**
14 MR. HOLT: Objection.
15 BY MR. KIM:
16 Q. Okay.
17 **A. But the features are there.**
18 Q. We can go to the next page. That's page 28 of
19 Exhibit 2116.
20 **A. I'm look -- 28, yes.**
21 Q. Okay. At the top, there appears to be another
22 online posting shown on the screen. Do you

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1 see that?
2 **A. I do.**
3 Q. Okay. And this particular post appears to be
4 written by someone named Praveen Aroul. Do
5 you see that?
6 **A. I do. Who is also listed as TI_Mastermind,**
7 **so basically a Texas Instruments expert**
8 **responding to Matthew's questions.**
9 Q. Do you know who Praveen Aroul is?
10 **A. I mean, I don't know him personally, but**
11 **judging that he's responding in the capacity**
12 **of a Texas Instruments representative, so**
13 **he -- he knows the product.**
14 Q. So TI_Mastermind means that he's a Texas
15 Instruments representative; is that your
16 testimony?
17 **A. That's my interpretation.**
18 MR. HOLT: Objection.
19 BY MR. KIM:
20 Q. Do you have any basis to have the belief that
21 TI_Mastermind means TI's representative?
22 **A. That's how usually Texas Instruments**

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1 **interacts with users.**
2 Q. Okay. So you've seen a similar post made by
3 TI_Mastermind; is that your testimony?
4 MR. HOLT: Objection. Form.
5 **A. We do use Texas Instruments components and**
6 **students sometimes have questions so they**
7 **answer through this forum.**
8 **BY MR. KIM:**
9 Q. Right. But the question was, does
10 TI_Mastermind confirm their affiliation with
11 Texas Instruments?
12 **A. It's a -- it's a verified expert.**
13 Q. Verified expert as in expert in TI components
14 in general, or someone that's approved by
15 Texas Instruments?
16 MR. HOLT: Objection to form.
17 **A. I'm not sure what you mean by "in general."**
18 **Usually experts answer questions which are**
19 **relevant to the area of expertise. I don't**
20 **think there is anyone, even at Texas**
21 **Instruments, who is expert in general on**
22 **everything. It's impossible. There are too**

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1 **many products.**
2 **BY MR. KIM:**
3 Q. Okay. So the question was, based on your
4 testimony, the TI_Mastermind means that it's
5 TI's representative.
6 **A. Yes.**
7 Q. And my question was, how do you know that
8 TI_Mastermind means that it is TI's
9 representative?
10 MR. HOLT: Objection. Form.
11 **A. From my previous experience, I know that if**
12 **you have a question about Texas Instruments**
13 **product, so you can go to this exchange and**
14 **questions will be answered by an expert.**
15 **BY MR. KIM:**
16 Q. I'm not sure that answers the question. Do
17 you know if Praveen Aroul, who posted this
18 article on page 28 of Exhibit 2116, is
19 employed by Texas Instruments?
20 MR. HOLT: Same objections.
21 **A. I do not know if he -- if he's employed, but**
22 **he is an expert. Could be consultant, but**

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1 **he's an expert.**
2 **Because if I may, to add to that,**
3 **the previous Matthew Tomback is listed as a**
4 **community member, registered as a community**
5 **member, and Praveen Aroul is a TI_Mastermind,**
6 **not a community member. And this is an**
7 **authorized website, news group of Texas**
8 **Instruments which where developers ask**
9 **questions.**
10 **And if I may, it does say here**
11 **another option to include SNR is to increase**
12 **pulse rate, PRF.**
13 **BY MR. KIM:**
14 Q. Okay.
15 MR. HOLT: Can we go off the record?
16 MR. KIM: Sure.
17 (Off the record at 1:37 p.m.)
18 (Back on the record at 2:10 p.m.)
19 VIDEO TECHNICIAN: Welcome back,
20 Dr. Efimov.
21 THE WITNESS: Thank you.
22 BY MR. KIM:

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1 Q. So we were discussing Exhibit 2116 in
2 IPR2025-01250 before the break.
3 **A. Correct.**
4 Q. So in that exhibit, we have seen that on this
5 claim chart with respect to element 5[b]
6 relies on Texas Instruments AFE4403, AFE4432
7 and AFE4510. Correct?
8 MR. HOLT: Objection. Form.
9 **A. Yeah. Correct.**
10 **BY MR. KIM:**
11 Q. And there was no mention of any Samsung
12 confidential document in the claim chart in
13 relation to element 5[b] of the '533 patent.
14 Correct?
15 **A. I don't -- I don't believe it was.**
16 Q. And to confirm whether the functions in the
17 AFE chips were implemented in Samsung's
18 accused products, what would you need to
19 review?
20 MR. HOLT: Objection. Form.
21 **A. Well, it has to be mentioned in the -- in**
22 **the -- of course ideally would be -- have**

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1 **physical device for technical description.**
2 **BY MR. KIM:**
3 Q. And when you say "technical description," did
4 you mean technical description of the accused
5 products?
6 **A. Yeah.**
7 Q. Okay. And you testified earlier that you did
8 not know which AFE chip is implemented in
9 Samsung's accused products. Correct?
10 MR. HOLT: Objection. Form.
11 **A. It probably depends on the product. There**
12 **are many products.**
13 **BY MR. KIM:**
14 Q. Focusing on Galaxy Watch Ultra 7, do you know
15 which AFE chip is implemented in the product?
16 MR. HOLT: Objection. Form.
17 **A. Not off the top of my head, but I can review**
18 **and find it in this chart if you can point me**
19 **to that part.**
20 **BY MR. KIM:**
21 Q. Okay. Did you review any -- strike that.
22 And before the break, you also

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1 testified that you reviewed the entirety of
2 the claim chart as opposed to the specific
3 portions of the claim chart; is that right?
4 MR. HOLT: Objection. Form.
5 **A. Well, I flipped all the pages, but like I**
6 **said, I focused primarily on those**
7 **limitations which are included in my report.**
8 **But I did -- I did read all the pages.**
9 **BY MR. KIM:**
10 Q. Was there anything in the claim chart that you
11 disagreed with?
12 MR. HOLT: Objection. Form.
13 **A. Not really. I agree with it.**
14 MR. KIM: Okay, I'm going to show you
15 a document that's been marked as Exhibit 2043
16 in IPR-1254.
17 ENTERED INTO THE RECORD:
18 PREVIOUSLY MARKED IPR2025-01254
19 EXHIBIT 2043
20 2:13 p.m.
21 **A. Okay, I opened it.**
22 **BY MR. KIM:**

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1 Q. Okay. Have you seen this document before?
2 **A. Yes, it's my declaration for the '475 patent.**
3 Q. Okay. And did you prepare this declaration on
4 your own?
5 **A. Well, as I explained before, it is my**
6 **declaration. I stand by it. But certain**
7 **parts were -- I was assisted with in**
8 **preparing with attorneys because I'm not a**
9 **lawyer, and also we discussed different**
10 **concepts, but these are my ideas and I**
11 **approved it and signed it.**
12 Q. Understood. If we can go to page 153 of the
13 PDF.
14 **A. 153. It's just 150 of the document, right?**
15 Q. Correct.
16 **A. Okay.**
17 Q. It also talks -- strike that.
18 You also opine that you "have
19 reviewed the claim chart in Exhibit 2116 and
20 agree with the analysis therein."
21 Do you see that?
22 **A. I do.**

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1 Q. And Exhibit 2116 is the claim chart for the
2 '475 patent. Correct?
3 **A. Correct.**
4 Q. And your opinion here is that you agree with
5 the analysis in Exhibit 2116 in its entirety;
6 is that correct?
7 MR. HOLT: Objection. Form.
8 **A. For the purposes of this document, I agreed**
9 **with the specific analysis listed here.**
10 **BY MR. KIM:**
11 Q. So you're not necessarily agreeing with the
12 remainder of the 21 -- Exhibit 2116?
13 **A. Well, like I said, I studied the whole**
14 **document, read through all the pages, but for**
15 **the purposes of this declaration I focused on**
16 **these particular features, these limitations**
17 **of the claims. I did not spend as much time**
18 **reviewing other parts which are not relevant**
19 **for these limitations. It's just too much**
20 **volume.**
21 Q. So outside of the listed techniques identified
22 in paragraph 328, you do not have any opinion

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1 as to the other portions of the claim chart?
2 **A. Well, for the different patent I believe it**
3 **might have been different parts of the chart.**
4 **But for this particular declaration, I**
5 **focused on this -- on these parts.**
6 Q. I'm trying to understand your testimony, "for
7 the different patent I believe it might have
8 been different parts of the chart." What did
9 you mean by that?
10 **A. Well, for different declarations, this part**
11 **about copying referred to different features,**
12 **different technologies. And some -- and some**
13 **pieces are the same, of course, but some are**
14 **different and they refer to different parts**
15 **of the chart.**
16 Q. Got it. So correct me if I'm wrong. So your
17 testimony is that for the '475 patent, which
18 is subject to IPR2025-01254, the claim chart
19 in Exhibit 2116, you only reviewed the
20 portions relevant to the techniques identified
21 in paragraph 328. Is that your testimony?
22 **A. I didn't follow. Can you repeat that,**

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1 **please?**
2 Q. So you identify techniques in paragraph 328.
3 Correct?
4 **A. Yes. Uh-huh.**
5 Q. And your review of Exhibit 2116, which is on
6 this infringement claim chart, was limited to
7 the portions relating to those alleged
8 techniques. Correct?
9 **A. I also based it on 2106. Basically, the**
10 **features which are included in my analysis**
11 **were driven by the slide which was presented**
12 **to the -- to Dr. Hong and Mr. Lee, which is**
13 **2106. And I am -- I refer it here.**
14 Q. Okay. Let's focus on Exhibit 2116 for now.
15 Did you review any portions outside of those
16 relating to the alleged techniques identified
17 in paragraph 358 -- 328 in reviewing the
18 Exhibit 2116?
19 MR. HOLT: Objection. Form.
20 **A. I already said that I did review the entire**
21 **document, but with different depth. So for**
22 **this particular declaration I focused on**

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1 **those parts which are referred here, but I**
2 **did look at other parts as well.**
3 **BY MR. KIM:**
4 Q. So you did review 2116 in its entirety.
5 **A. Not --**
6 MR. HOLT: Objection.
7 **A. -- if it's with the same depth, not every**
8 **word of it, because it's a very large number**
9 **of documents, but I did flip through pages,**
10 **yes.**
11 **BY MR. KIM:**
12 Q. Was there anything that you disagreed with in
13 Exhibit 2116?
14 **A. I did not find anything I disagreed with.**
15 Q. Okay.
16 **A. I agreed to -- with the analysis which I**
17 **reviewed.**
18 Q. So your statement here that "I've reviewed the
19 claim chart in Exhibit 2116 and agree with the
20 analysis therein," applies to Exhibit 2116 as
21 a whole, not limited to the portions relating
22 to the particular techniques identified in

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1 paragraph 328 of your declaration?
2 MR. HOLT: Objection. Form.
3 **A. It's probably too general. Like I said**
4 **already, due to limitation of time I focused**
5 **primarily on features which are listed in**
6 **these four declarations and I analyzed them**
7 **fully. But the other parts I looked through,**
8 **I did not find anything I disagree with, but,**
9 **again, I wouldn't subscribe that I fully**
10 **approve everything because I didn't review**
11 **them as thoroughly.**
12 **BY MR. KIM:**
13 Q. So I -- Dr. Efimov, I'm just trying to
14 understand what you meant by the statement
15 here. It says, "I reviewed the claim chart in
16 Exhibit 2116 and agree with the analysis
17 therein."
18 It's not limited to any particular
19 portion. I'm trying to get your answer as to
20 whether you agreed with Exhibit 2116 in its
21 entirety or not.
22 MR. HOLT: Objection. Form. Asked

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1 and answered.
2 **A. Like I said, I reviewed the relevant parts, I**
3 **agree with those. I did not find anything I**
4 **disagree with.**
5 **BY MR. KIM:**
6 Q. Outside of the parts that you consider
7 relevant, was there anything that you
8 disagreed with in Exhibit 2116?
9 MR. HOLT: Same objections.
10 **A. I already answered that, no, I did not find**
11 **anything I disagreed with.**
12 MR. KIM: Okay, I'm going to show you
13 Exhibit 2116 of IPR2025-01254.
14 ENTERED INTO THE RECORD:
15 PREVIOUSLY MARKED IPR2025-01254
16 EXHIBIT 2116
17 2:22 p.m.
18 **A. Is it a new exhibit?**
19 **BY MR. KIM:**
20 Q. Should be, I believe.
21 **A. Okay. Then can I close some of the previous**
22 **exhibits? Because I have too many things**

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1 **open.**
2 Q. Yes, go ahead.
3 **A. So like first few, right?**
4 Q. Feel free to close everything. If we need to
5 go back to those, I'll let you know.
6 **A. Okay. I just left my declaration open --**
7 Q. Okay.
8 **A. -- for '475, which is a new one. No, but**
9 **this is 2116, what I see.**
10 Q. Right. So I believe --
11 [Simultaneous Speaking]
12 Q. -- claims are all under the same number, 2116.
13 **A. Okay.**
14 Q. But they're just filed in different IPRs
15 depending on which patent they relate to.
16 **A. All right. Yeah. It was confusing. And**
17 **they are very different size.**
18 Q. Okay. Do you have the document open?
19 **A. I have it, just I am opening it.**
20 Q. Okay.
21 **A. Okay, I have it.**
22 Q. All right. Have you seen this document

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1 before?
2 **A. Yes, I have.**
3 Q. Okay. And this is the Exhibit 2116 cited in
4 your declaration in IPR2025-01254. Correct?
5 **A. Correct.**
6 Q. One second.
7 **A. How do we distinguish them if they are the**
8 **same number, 2116?**
9 Q. Sorry, can you repeat the question again?
10 **A. How do I distinguish them for purposes of**
11 **referencing if they are the same number,**
12 **Exhibit Number 2116?**
13 Q. Understood. So I'll refer to both the exhibit
14 number and the case number --
15 **A. Oh, okay.**
16 Q. -- to avoid the confusion.
17 **A. Yeah.**
18 Q. Does that work for you?
19 **A. Yeah.**
20 Q. Okay. So can you go to page 4 of this
21 document?
22 **A. Okay.**

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Q. Did you review the portion of the Exhibit 2116 in IPR2025-01254?
A. I have to look at my references, but it looks familiar.
Q. Okay. The claim limitation is 1[a], "one or more bio-sensors." Do you see that on page 4?
A. I do.
MR. HOLT: Objection. Scope.
BY MR. KIM:
Q. And if you can go to page 7.
A. Okay.
Q. Before this limitation, bio-active sensor is referenced as satisfying the claim limitation. Correct?
A. Correct.
Q. Okay. And if we can go to page 18.
A. Okay.
Q. This is for claim limitation 1[d], "a light source comprising a plurality of light emitting diodes." Correct?
A. Correct.
Q. And if we can go to page 19.

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A. Yes.
Q. For this limitation, the claim chart is relying on the LEDs in the bio-active sensor that we saw earlier. Correct?
A. Yeah, they are LEDs with optimal arrangement and you can see by color they are all different wavelength.
Q. Okay. If you can go, please, to page 28.
A. Okay.
Q. This is for claim limitation 1[f]. Correct?
A. Yes, that's correct.
Q. And it is for a detection system configured to receive at least a portion of the lens output light.
A. Correct.
Q. And you testified earlier you at least reviewed a portion of this claim chart. Correct?
MR. HOLT: Objection. Form.
A. I need to verify exact pages, but it does look familiar.
BY MR. KIM:

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Q. In the second paragraph, it reads, "The BioActive sensor in the Accused Smartwatch comprises a detection system that (a) receives light initially output from LEDs, and (b) generates an output PPG signal having a signal-to-noise ratio."
Do you see that?
A. Yes, I do.
Q. So Omni's contention is that the detection system within the bio-active sensor satisfies claim element 1[f]. Correct?
MR. HOLT: Objection. Form. Scope.
A. Not just one page, I believe, but also continuation pages.
BY MR. KIM:
Q. Right. But the question was, Omni's contention is that the detection system within the bio-active sensor satisfies claim element 1[f]. Correct?
MR. HOLT: Objection. Form. Scope.
A. This language as well as the images shown later.

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BY MR. KIM:
Q. Right. I'm not sure if that answers the question.
Omni's contention here for claim element 1[f] is that the bio-active sensor and the detection system within the bio-active sensor satisfies this limitation. Correct?
MR. HOLT: Objection. Scope. Form.
A. Are you referring just to page 28 or all pages -- all relevant pages?
BY MR. KIM:
Q. I was referring to 28.
A. Well, again, my answer would be it goes beyond that. There are additional pages. Like, for example, page 31 talks about specific AFE chip from Texas Instruments. Page 30 shows the family of sensors and light sources in bio-active sensor, et cetera, so there are a number of pages.
Q. Okay. I understand that, but here on this contention is the bio-active sensor in the Accused Smartwatch comprises a detection

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1 system. Correct?
2 **A. Correct.**
3 MR. HOLT: Same objections.
4 BY MR. KIM:
5 Q. Okay. And if we can go to page 51.
6 **A. Okay.**
7 Q. In the second row, this is for claim element
8 1[h], it reads, "wherein the detection system
9 comprises a plurality of detectors."
10 Do you see that?
11 **A. I do.**
12 Q. And Omni's contention here is that the
13 "Bioactive Sensor ('detection system')
14 includes multiple spatially separated
15 photodiodes/PDs (detectors)."
16 Do you see that?
17 **A. Correct.**
18 Q. Do you agree with this statement?
19 **A. I do.**
20 MR. HOLT: Objection. Form. Scope.
21 BY MR. KIM:
22 Q. Okay.

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1 MR. HOLT: I'll remind Dr. Efimov to
2 allow time for me to lodge objections if
3 necessary after the question before your
4 answer.
5 BY MR. KIM:
6 Q. So you agree with Omni's contentions that we
7 reviewed in Exhibit 2116 in IPR2025-01254; is
8 that correct?
9 MR. HOLT: Objection. Form. Scope.
10 **A. Can you be more specific?**
11 **BY MR. KIM:**
12 Q. Okay. So we saw earlier that Omni's claim
13 chart was referring to the bio-active sensor
14 to satisfy one or more bio-sensors in claim
15 element 1[a]. Correct?
16 MR. HOLT: Objection. Form. Scope.
17 **A. We are now looking at different, at 1[h], but**
18 **we did talk about 1[a].**
19 **BY MR. KIM:**
20 Q. Okay. And do you agree with Omni's
21 contention?
22 MR. HOLT: Objection. Scope. Form.

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1 **A. In 1[a] or 1[h]?**
2 **BY MR. KIM:**
3 Q. 1[a], as in alpha.
4 **A. Can I look at where -- where exactly what**
5 **you're referring to because --**
6 Q. Sure. It's on page 4 that we reviewed
7 earlier.
8 **A. So you're referring to, "The Accused**
9 **Smartwatch comprises one or more bio-sensors**
10 **adapted to be placed on the user, wherein one**
11 **or more physiological parameters are**
12 **measured, either literally or under the**
13 **doctrine of equivalents." Right?**
14 Q. No. I was referring to the claim language of
15 1[a] on page 4. So 1[a], "one or more
16 bio-sensors." Do you see that?
17 **A. Yes, I do.**
18 Q. If you go to page 7, Omni's relying on the
19 bio-active sensor to satisfy the limitation.
20 Correct?
21 MR. HOLT: Objection. Scope. Form.
22 **A. Yeah, I see multiple sensors, not multiple**

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1 **light-emitting diodes.**
2 **BY MR. KIM:**
3 Q. Okay. Do you agree with Omni's contention
4 that the bio-active sensor satisfies claim
5 element 1[a]?
6 MR. HOLT: Objection. Scope. And
7 form.
8 **A. Yeah, based on my analysis, it does appear**
9 **so.**
10 **BY MR. KIM:**
11 Q. Okay. And then we also saw that for the light
12 source comprising a plurality of
13 light-emitting diodes, Omni's contentions
14 relied on the LEDs inside the bio-active
15 sensor. Do you recall our discussion?
16 **A. I do, but, again, show me -- please show me**
17 **the image where it -- we saw it with multiple**
18 **light-emitting diodes.**
19 Q. Okay. It's on page 19.
20 **A. That's right. But also there was another**
21 **one, but 19 would be one example.**
22 Q. Okay. Do you agree with Omni's contention

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1 that the LEDs inside the bio-active sensor
2 satisfies claim element 1[d]?
3 MR. HOLT: Objection. Scope. Form.
4 **A. Yeah, in the part they discuss multiple**
5 **light-emitting diode sensors, it shows**
6 **multiple sensors.**
7 **BY MR. KIM:**
8 Q. Okay. Sorry, I'm just reorienting myself.
9 **A. No problem. Take your time.**
10 MR. KIM: I'm going to show you a
11 document that's been marked as Exhibit 2043 in
12 IPR2025-01252.
13 ENTERED INTO THE RECORD:
14 PREVIOUSLY MARKED IPR2025-01252
15 EXHIBIT 2043
16 2:36 p.m.
17 **A. Is it a new document?**
18 **BY MR. KIM:**
19 Q. Yes.
20 **A. Okay. I have it open. 2043.**
21 Q. Okay. And this is the declaration that you
22 filed in IPR2025-01252. Correct?

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1 **A. Correct.**
2 Q. And this declaration was prepared in a similar
3 fashion as you prepared the other
4 declarations; is that correct?
5 **A. Correct. And signed on the same day.**
6 Q. Okay. If we can go to paragraph 151.
7 **A. Could you please tell me the page number?**
8 Q. It's 84 of the declaration and 87 of the PDF.
9 **A. Okay.**
10 Q. Okay. In paragraph 151, you mention that,
11 "The '455 patent specification specifically
12 depicts an embodiment with six light-emitting
13 diodes in Figure 18B."
14 Do you see that?
15 **A. Yes, I do.**
16 Q. And you can see the figure on the next page if
17 you want to take a look.
18 **A. Right. Correct.**
19 Q. And here you're citing to Exhibit 1001.
20 **A. This is correct.**
21 Q. And that's the '455 patent. Correct?
22 **A. I believe so.**

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1 Q. Okay. Why don't you take a look at the
2 Exhibit 1001. I'll show you the document.
3 **A. Are you going to share it or you just show it**
4 **to me?**
5 Q. Is it not being shared yet?
6 PLANET DEPOS TECH: Sorry, what is
7 the final number sequence?
8 MR. KIM: 1001 in IPR2025-01252.
9 **A. I don't believe so.**
10 PLANET DEPOS TECH: Okay. Thank you.
11 ENTERED INTO THE RECORD:
12 PREVIOUSLY MARKED IPR2025-01252
13 EXHIBIT 1001
14 2:38 p.m.
15 PLANET DEPOS TECH: It's uploading
16 now.
17 **A. Okay, I have it.**
18 **BY MR. KIM:**
19 Q. Okay. Have you seen this document before?
20 **A. Yeah, it's the '455 patent.**
21 Q. And did you review this document in forming
22 your opinion?

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1 **A. I did.**
2 Q. Okay. When was the last time you looked at
3 this document?
4 **A. I believe, yesterday. Briefly.**
5 Q. Let's go to column 28, line 16. That's on
6 page 127 of the '455 patent.
7 **A. 28, line 27?**
8 Q. 28, line 16. Sorry.
9 **A. I'm sorry, 16. Okay.**
10 Q. Do you see the paragraph starting with, "In
11 yet another embodiment"?
12 **A. Uh-huh. Yeah, I do.**
13 Q. Okay. And the first and second sentence of
14 the paragraph is discussing Figure 18B of the
15 '455 patent --
16 **A. Okay.**
17 Q. -- and that's the same figure that we looked
18 at in your declaration. Correct?
19 **A. I have to look at it, but I believe so, if**
20 **you represent it to me, yeah.**
21 Q. Okay. And if we go to -- towards the end of
22 the paragraph, if we -- "As an example, the

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1 mouth guard may have one or more light source
2 input ports 1852, 1853 and one or more
3 detector output ports 1854, 1855. Although
4 six input and output ports are illustrated,
5 any number of ports may be used."
6 Do you see that?
7 **A. I do.**
8 Q. So Figure 18B can be used with more than six
9 input or output ports. Correct?
10 MR. HOLT: Objection. Scope.
11 **A. But it depicts six in this embodiment.**
12 **BY MR. KIM:**
13 Q. Right. And it also states that any number of
14 ports may be used, so it's not limited to six.
15 Correct?
16 **A. But it's very specific in this embodiment.**
17 **It does say six and it does say more.**
18 Q. Okay.
19 MR. KIM: Why don't we take a
20 ten-minute break.
21 (Off the record at 2:42 p.m.)
22 (Back on the record at 2:53 p.m.)

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1 BY MR. KIM:
2 Q. Welcome back, Dr. Efimov.
3 **A. Hi.**
4 MR. KIM: I am going to show you a
5 document that's been marked as Exhibit 2043 in
6 IPR2025-01251.
7 ENTERED INTO THE RECORD:
8 PREVIOUSLY MARKED IPR2025-01251
9 EXHIBIT 2043
10 2:54 p.m.
11 **A. This is a new document, right?**
12 **BY MR. KIM:**
13 Q. Correct.
14 PLANET DEPOS TECH: I'm sorry -- oh,
15 I see it. One second.
16 **A. Okay, I have it.**
17 **BY MR. KIM:**
18 Q. Okay. Have you seen this document before?
19 **A. Yes.**
20 Q. And this is the last declaration that you
21 filed in these IPRs. Correct?
22 **A. Correct, for patent '304.**

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1 Q. Correct. And preparation of this declaration
2 was also similar to the other declarations
3 filed in the other IPRs. Correct?
4 **A. Correct.**
5 Q. And substantive portions are all your
6 opinions.
7 **A. Correct.**
8 Q. Okay. If we could go to page 82 of the PDF.
9 **A. Okay.**
10 Q. Here this is your opinion that Lisogurski Does
11 Not Disclose "Identification of an Object."
12 Do you see that?
13 **A. I do. It's my opinion.**
14 Q. Okay. And if we can go to page 84 of the PDF.
15 **A. Okay.**
16 Q. And before we discuss that page, you do
17 understand that the Board construed "to
18 identify an object" limitation. Correct?
19 **A. I believe so, yes.**
20 Q. Okay. Do you recall what the construction
21 was?
22 **A. Not off the top of my head.**

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1 Q. Okay. If you can go to paragraph 71, which is
2 in page 41 of the PDF.
3 **A. All right. So I understand that the prior**
4 **IPR involved in U.S. Patent Number '484,**
5 **which is related to the patent '304, "The**
6 **Board construed the term 'to identify an**
7 **object' to mean 'to recognize or establish an**
8 **object as being a particular thing,'" in**
9 **Exhibit 1015.**
10 Q. Yes. And the Board -- sorry, go ahead.
11 **A. Yeah, and then to continue reading this, "In**
12 **construing this phrase for the '484 Patent,**
13 **the Board 'decline[d] to adopt Petitioner's**
14 **proposal to construe the term 'identify an**
15 **object' and 'detect an object' to have the**
16 **same meaning."**
17 **So these are basically two different**
18 **terms.**
19 Q. Right. And do you understand that the Board
20 found that Lisogurski discloses to "identify
21 an object" limitation?
22 **A. So can you again point me to the right part**

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1 **of it?**
2 Q. Sure. Let's keep this document open and I'll
3 show you the document in a bit.
4 **A. Okay.**
5 MR. KIM: It is Exhibit 1016 in
6 IPR2025-01251.
7 ENTERED INTO THE RECORD:
8 PREVIOUSLY MARKED IPR2025-01251
9 EXHIBIT 1016
10 2:59 p.m.
11 **A. Okay, I have it.**
12 **BY MR. KIM:**
13 Q. Okay. Have you seen this document before?
14 **A. Yeah, I reviewed it.**
15 Q. Okay. This is the Board's final written
16 decision in the '484 patent. Correct?
17 **A. Correct. Which is related to the previous**
18 **patent. Right.**
19 Q. Yes. And if we can go to page 7.
20 **A. I am there.**
21 Q. At the end of the first paragraph on page 7,
22 it reads, "As Lisogurski discloses a method of

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1 measuring oxygen saturation that uses
2 different wavelengths to distinguish
3 hemoglobin from oxygen carrying hemoglobin,
4 i.e., oxyhemoglobin, Lisogurski teaches
5 identifying an object, i.e., the blood
6 constituent oxyhemoglobin."
7 Do you see that?
8 **A. I do.**
9 Q. So do you now have the recollection that the
10 Board found Lisogurski discloses "identifying
11 an object" limitation?
12 **A. I do see the Board decided about that, but**
13 **I'm not sure I agree with that.**
14 Q. So you're disagreeing with the Board; is that
15 your testimony?
16 **A. On that particular subject.**
17 Q. When you say "subject," as to the "identifying
18 an object" limitation, you disagree with the
19 Board's finding; is that your testimony?
20 **A. Yeah, I disagree that there was**
21 **identification of oxyhemoglobin.**
22 Q. Okay. Let's go back to your declaration.

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1 **A. It's 2043, Right?**
2 Q. Correct. In IPR2025-01251.
3 **A. Uh-huh. Okay.**
4 Q. And we were at paragraph 161.
5 **A. 161. I don't see 161.**
6 Q. That's page 86 of the PDF.
7 **A. Okay. I'm there.**
8 Q. Okay. The first sentence of paragraph 161
9 was, "Distinguishing an object is distinct
10 from measurement."
11 Do you see that?
12 **A. I'm sorry, maybe I'm -- I'm at page 83,**
13 **right? Oh, yeah. You mean -- you're**
14 **referring to the last paragraph. Okay.**
15 **Yeah.**
16 Q. Yes.
17 **A. Not the first. Okay. Got it. Yes.**
18 Q. Okay. So is it your opinion that
19 identification of an object requires
20 distinguishing an object?
21 **A. Well, identification means identifying an**
22 **object to be a particular thing, according to**

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1 **construction.**
2 Q. Right. But the question was, does
3 identification of an object require
4 distinguishing an object.
5 **A. Right.**
6 Q. So your answer is, yes, it does require
7 distinguishing an object? That's your
8 testimony?
9 MR. HOLT: Objection. Form.
10 **A. Distinguishing an object is distinct from**
11 **measurement. Yes, it is required.**
12 **BY MR. KIM:**
13 Q. Okay. And in paragraph 162, which is the next
14 page, you identify pattern matching algorithms
15 to identify an object. Do you see that?
16 **A. Yes. "Patent describes using 'pattern**
17 **matching algorithms and other software and**
18 **mathematical methods to identify the blood**
19 **constituents of interest," end quote,**
20 **Exhibit 1001.**
21 Q. Is pattern matching algorithm required to
22 identify an object?

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1 MR. HOLT: Objection. Form.
2 **A. So in this particular embodiment where -- if**
3 **you go one further up above, it talks about**
4 **distinct signatures, spectral signatures in**
5 **the short wavelength, short infrared. So**
6 **basically it will be spectrum for a**
7 **particular constituent consisting of multiple**
8 **peaks, so you have to match pattern of those**
9 **peaks to your library to identify it, similar**
10 **to spectral fingerprinting or distinct**
11 **spectral signatures. So it's a pattern**
12 **matching, yes.**
13 **BY MR. KIM:**
14 Q. I don't think that answers the question.
15 The question was, can you identify an
16 object without employing a pattern matching
17 algorithm?
18 **A. You have to be more specific, what type of**
19 **object. In this context, we are talking**
20 **about chemical constituents which yield**
21 **specific spectral characteristics.**
22 **In this case, you don't need pattern**

202

1 **matching, but you can also think of some other**
2 **applications where it could be done**
3 **differently.**
4 Q. So in short, it's not required to identify an
5 object?
6 **A. Well, it cannot be short. It depends.**
7 Q. So there are instances where pattern matching
8 algorithm is not required to identify an
9 object. Is that your testimony?
10 **A. In some cases, yes; in some cases, not.**
11 Q. As recited in the claim language of the '304
12 patent, is pattern matching algorithm required
13 to satisfy the "identification of an object"
14 limitation?
15 MR. HOLT: Objection. Form.
16 **A. So, again, like I said, in general terms, you**
17 **can think of different algorithm for**
18 **identifying an object, but here for**
19 **identification of a chemical constituent in**
20 **the mix of chemicals, you need optical**
21 **signature or short-wave infrared signature in**
22 **the spectrum in pattern matching.**

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1 MR. KIM: I move to strike everything
2 as irrelevant and nonresponsive.
3 BY MR. KIM:
4 Q. The question again, Dr. Efimov, is, as recited
5 in the claim language of the '304 patent, is
6 pattern matching algorithm required to satisfy
7 the "identification of an object" limitation?
8 MR. HOLT: Objection. Form.
9 **A. I'm sorry, but I will answer the same way.**
10 **BY MR. KIM:**
11 Q. Are you refusing to answer the question?
12 **A. No, no, I answered already the question. I**
13 **don't know why you find it irrelevant. This**
14 **is relevant.**
15 **So if you're looking at the mix of**
16 **different chemical constituents such as blood,**
17 **where you have different chemicals, each of**
18 **them will yield certain spectra, and basically**
19 **looking at those spectra you can identify**
20 **them, but it has to be spectral pattern**
21 **matching.**
22 Q. So your testimony is that the pattern matching

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1 algorithm is required to identify an object,
2 is that your testimony?
3 MR. HOLT: Objection. Form.
4 **A. For this particular application, for chemical**
5 **identification based on spectra, which is the**
6 **matter of this patent.**
7 **BY MR. KIM:**
8 Q. Is the claim limited to any particular
9 context?
10 MR. HOLT: Objection. Form.
11 **A. So as shown in -- on page 83, "The**
12 **specification explains that 'many solids have**
13 **distinct spectral signatures in the [short**
14 wave[length] infrared (SWIR)], so particular
15 solids may be identified using stand-off
16 detection or remote sensing. For instance,
17 many explosives have unique signatures in
18 this SWIR."
19 And similarly, already beyond this
20 quotation, blood constituents also have
21 different spectra.
22 So you need basically spectral

205

1 pattern matching to identify an object.
2 BY MR. KIM:
3 Q. Go to paragraph 167.
4 **A. Okay. Okay, I'm there.**
5 Q. Okay. There, you also opine about using
6 spectral data and algorithms to classify
7 unknown samples. Do you see that?
8 **A. Can you point me to the right line?**
9 Q. Sure. It's fourth from the bottom, "The '304
10 Patent describes how a wearable device may use
11 spectral data in algorithms to classify
12 unknown samples, identifying them through
13 techniques including spectral analysis and
14 library matching."
15 **A. That's right.**
16 Q. Do you see that?
17 **A. Yes, I'm -- that's what I just said before,**
18 **yeah.**
19 Q. And your opinion is that those techniques are
20 required to satisfy identification of an
21 object. Correct?
22 MR. HOLT: Objection. Form.

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1 **A. For a particular application, like I said.**
2 **BY MR. KIM:**
3 Q. And outside the particular application, are
4 those techniques required?
5 MR. HOLT: Objection. Form.
6 **A. It's a very general statement. You can think**
7 **of other types of measurements where you**
8 **would rely on other methods for**
9 **identification of an object. Like, for**
10 **example, facial, you know, biometrics. If**
11 **you look at the person, you would look at the**
12 **image or three-dimensional structure of the**
13 **face or fingerprints.**
14 **This is not spectral analysis, this**
15 **is different, but it's still analysis in**
16 **different realm, in different domain. It will**
17 **still be identification of an object but not**
18 **necessarily spectral matching.**
19 **But anything related or almost**
20 **anything related to chemical identification**
21 **and a mix of chemicals typically -- typically**
22 **has relied on spectral signatures of those**

207

1 **particular chemical species or chemical**
2 **constituents, which is what this patent is**
3 **about.**
4 **BY MR. KIM:**
5 Q. Can you tell me where in Claim 1 it requires
6 spectral matching in relation to
7 identification of an object?
8 MR. HOLT: Objection. Form. Scope.
9 **A. So let me open it. Is it 101 [sic]? 234,**
10 **Exhibit 101 [sic], right?**
11 **BY MR. KIM:**
12 Q. I don't think you have 1001 for this IPR yet,
13 but I can share that with you.
14 **A. I don't have Exhibit 1001.**
15 Q. For this IPR2025-01251?
16 MR. HOLT: No, I don't think you
17 shared that.
18 BY MR. KIM:
19 Q. Yes, we have the claim language on page 35 of
20 the PDF of your declaration.
21 **A. But I would like to look at the patent.**
22 Q. Sure.

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1 **A. Because you -- I just want to refresh my**
2 **memory. And you might be right, it's not in**
3 **the claim language, but it's in the**
4 **specifications.**
5 Q. No, the question was about the claim language.
6 **A. Well, let me look at it.**
7 MR. HOLT: Counsel, are you asking
8 Dr. Efimov to identify the -- or to look at
9 the claim limitation about identifying an
10 object in the '304 patent?
11 MR. KIM: Yes, that was the question.
12 **A. So can I look at the patent?**
13 **BY MR. KIM:**
14 Q. Sure. Oh, it hasn't been shared.
15 MR. KIM: Can you share 1001 in
16 IPR2025-01251?
17 ENTERED INTO THE RECORD:
18 PREVIOUSLY MARKED IPR2025-01251
19 EXHIBIT 1001
20 3:11 p.m.
21 BY MR. KIM:
22 Q. Do you have the document?

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A. I'm looking at -- yeah, I do. I have it in my Acrobat.
Q. Okay. And this is the '304 patent. Correct?
A. Yes, '304, on page -- I guess close to the end.
So I'm now looking at -- you are asking about Claim 1 specifically, right?
Q. Yes.
A. Uh-huh. So let me see if there is new language about spectral signature.
Could you please repeat the question so I could be more specific?
Q. Sure. You mentioned that spectral or pattern matching algorithm is required for identification of an object. I was asking if the claim language recites spectral matching or matching algorithm.
MR. HOLT: Objection. Form.
A. Spectral matching is not listed here, but like I said -- let me check. I can search for "spectral."
STENOGRAPHER: And, Counsel, when the

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witness is finished with this answer, if we could go off the record.
MR. KIM: Sure.
A. For example, on page -- I don't know what page this is. So, basically, column 4, the last paragraph of the patent, it says, "many other constituents in the blood also have signatures in the near-infrared, so spectroscopy and pattern matching, often called spectral fingerprinting, is required to distinguish the glucose with sufficient confidence.
[As read]: Second, non-invasive procedures have been transmitted or reflected light through the skin, and skin has many spectral artifacts in the near-infrared that may mask the glucose signatures. Moreover, skin have significant water and blood constituents, and on and on.
So, basically, spectral matching is -- or fingerprinting is similar term, is mentioned in this specification, so this

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patent, but not in the --
BY MR. KIM:
Q. Where -- where were you reading that from?
A. Column 4, Exhibit 101 [sic], line 58 to the end of the page. Column 4. So on page -- I don't see the page here.
Q. Okay. So you're looking at column 4, lines --
A. Line 37 -- I'm sorry, page 37, page 37.
Q. But this is not a claim language?
A. Right, but it is in the specifications.
Q. Okay.
STENOGRAPHER: Counsel, could we go off the record?
(Off the record at 3:15 p.m.)
(Back on the record at 3:23 p.m.)
BY MR. KIM:
Q. So we were discussing about the spectral analysis, and correct me if I'm wrong, but your testimony is that spectral analysis is required for identification of an object; is that right?
MR. HOLT: Objection. Form.

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A. For a particular application.
BY MR. KIM:
Q. Okay. And how about library matching; is library matching required for identification of an object?
MR. HOLT: Objection. Form.
A. It's one way to do it because, like I said, the fingerprinting usually goes against stored data, but it's one of the methods.
BY MR. KIM:
Q. But there could be other methods to satisfy identification of an object. That's your testimony?
MR. HOLT: Depending on the application, yes.
BY MR. KIM:
Q. For blood constituent identification, is library matching required?
MR. HOLT: Objection. Form.
A. Spectral fingerprinting can be implemented with or without library matching.
BY MR. KIM:

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1 Q. So is spectral fingerprinting required for
2 blood constituent identification?
3 MR. HOLT: Objection. Form.
4 **A. It's one of the methods.**
5 **BY MR. KIM:**
6 Q. Can identification of an object or blood
7 constituent be satisfied without using
8 spectral fingerprinting?
9 MR. HOLT: Objection. Form.
10 **A. It would be difficult.**
11 **BY MR. KIM:**
12 Q. When you say "difficult," is this impossible?
13 **A. It depends on the accuracy. So if you want**
14 **accurate estimation it would be required, but**
15 **with rough estimation, if you know a**
16 **presence, it could be done.**
17 Q. Does the claim require any particular level of
18 accuracy in identifying an object?
19 **A. Let me check. I'm going to page 54.**
20 **So, again, we're talking just about**
21 **Claim 1, right?**
22 Q. When you say pulling one, can you --

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1 **A. Claim 1.**
2 Q. Yes, Claim 1.
3 **A. Well, it does say about signal-to-noise**
4 **ratio, so there is a statement, "The**
5 **measurement system further configured to**
6 **improve the signal-to-noise ratio by**
7 **difference in the first signal and the second**
8 **signal."**
9 **So it does basically state about**
10 **accuracy. So there is a requirement to**
11 **maintain or improve the signal-to-noise ratio**
12 **for accuracy.**
13 Q. So in your opinion, does Claim 1 require any
14 particular level of accuracy?
15 MR. HOLT: Objection. Form.
16 **A. There is no specific number, if you're**
17 **referring to number, but it does require**
18 **accuracy.**
19 **BY MR. KIM:**
20 Q. What accuracy is required?
21 **A. Higher accuracy.**
22 MR. HOLT: Objection. Form.

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1 BY MR. KIM:
2 Q. So if there is no higher accuracy, the claim
3 limitation is not met?
4 MR. HOLT: Objection. Form. Scope.
5 **A. I wouldn't answer -- I couldn't answer this**
6 **one way or another because there's no**
7 **specific threshold indicated for that**
8 **particular point.**
9 **BY MR. KIM:**
10 Q. Well, you testified that higher accuracy is
11 required by Claim 1 of the '304 patent.
12 Correct?
13 MR. HOLT: Objection. Form.
14 **A. Multi-accuracy is required for any**
15 **measurement.**
16 **BY MR. KIM:**
17 Q. That's not the question I asked.
18 Does the language of Claim 1 of the
19 '304 patent require a higher accuracy?
20 MR. HOLT: Objection. Form.
21 **A. It requires to improve the signal-to-noise**
22 **ratio, which means it requires higher**

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1 **accuracy. It's in the language.**
2 **BY MR. KIM:**
3 Q. So improved signal-to-noise ratio always means
4 higher accuracy, is that your testimony?
5 MR. HOLT: Objection. Form.
6 **A. Well, improving means make it higher, in**
7 **plain language.**
8 **BY MR. KIM:**
9 Q. Okay. It's a yes-or-no question. If
10 signal-to-noise ratio is improved, is the
11 accuracy always higher?
12 MR. HOLT: Objection. Form. Scope.
13 **A. So signal-to-noise ratio refers to accuracy,**
14 **so if it's higher, accuracy is higher.**
15 **BY MR. KIM:**
16 Q. Okay. In the '304 patent, is identification
17 of an object tied to any particular level of
18 accuracy?
19 MR. HOLT: Objection. Form.
20 **A. Like I said, there is no specific number**
21 **indicated.**
22 **BY MR. KIM:**

217

1 Q. Okay. And going back to our earlier
2 discussion, is spectral fingerprinting
3 required to satisfy the "identification of an
4 object" limitation when there is no particular
5 level of accuracy required by a claim?
6 MR. HOLT: Objection. Form.
7 **A. So, again, like I said, there is no specific**
8 **requirement or indication of what level of**
9 **accuracy is, but it depends on the**
10 **application.**
11 **So if you have complex chemical mix,**
12 **so you have many, many spectral you have to**
13 **compare versus if you have a relatively simple**
14 **chemical mix with fewer chemicals present --**
15 **fewer constituents present, then essentially**
16 **accuracy will be less, so it really depend on**
17 **the application. You cannot generalize it.**
18 **BY MR. KIM:**
19 Q. I'm not asking about accuracy. I'm asking
20 what the claim limitation "identification of
21 an object" limitation -- strike that.
22 I'm asking what the claim limitation

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1 identification of an object requires.
2 **A. But it is my understanding that claim**
3 **limitations also rely on specifications which**
4 **are in the body of the patent and they**
5 **specifically talk about fingerprinting, about**
6 **various methods to improve fingerprinting, so**
7 **there is paragraph after paragraph describing**
8 **different methods how to improve it.**
9 Q. So if you're not employing the techniques
10 identified in the specification, can you still
11 satisfy the claim limitation "identification
12 of an object"?
13 MR. HOLT: Objection. Form.
14 **A. Again, it's a general question, like I said**
15 **before, the application in the patent, which**
16 **is basically chemical identification, so it's**
17 **spectral fingerprinting and pattern matching.**
18 **BY MR. KIM:**
19 Q. Is the '304 patent claim limited to chemical
20 constituent identification?
21 MR. HOLT: Objection. Form.
22 **A. Well, let's look at the introduction.**

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1 **So, basically, abstract describes**
2 **optical system for interrogation of systems**
3 **which yield different spectral**
4 **characteristics, which is basically talking**
5 **about light intensity, talking about**
6 **plurality of semiconductor sources, the**
7 **information.**
8 **So this is, in my reading and in my**
9 **understanding, is essentially spectral**
10 **matching, and subsequent specifications talk**
11 **about specific applications, for example, for**
12 **ophthalmology, for different other**
13 **applications based on spectra and spectral**
14 **matching.**
15 **BY MR. KIM:**
16 Q. And where were you reading that from?
17 **A. I refer to abstract on page 1.**
18 Q. So it was the abstract of the '304 patent that
19 you're reading from?
20 **A. Correct.**
21 Q. Okay. So in your opinion, what is disclosed
22 in the abstract of a patent limits the scope

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1 of the claim language?
2 MR. HOLT: Objection. Form.
3 **A. It doesn't limit. It describes a general**
4 **field of application and general description**
5 **of the claims. Claims would be more detailed**
6 **elaboration on the abstract.**
7 **BY MR. KIM:**
8 Q. Can the scope of the claim language go beyond
9 the field of application described in the
10 abstract?
11 **A. It would be more specific.**
12 MR. HOLT: Objection to form. I'm
13 not sure what you mean by "beyond."
14 BY MR. KIM:
15 Q. When you say "more specific," the claim
16 language -- the scope of the claim language
17 still has to fall within the scope of the
18 general field of application described in the
19 abstract. Is that your testimony?
20 MR. HOLT: Objection. Form.
21 **A. It's a simplification. In some cases you can**
22 **also offer different additional embodiments**

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1 **adjacent to the field, at least in my**
2 **experience.**
3 **BY MR. KIM:**
4 Q. Okay. Going back to page 1 of the '304
5 patent --
6 **A. Okay.**
7 Q. -- other than the spectral fingerprinting that
8 we discussed, are there other ways to satisfy
9 "identification of an object" limitation?
10 **A. I'm not sure what the question is.**
11 Q. You were saying that spectral fingerprinting
12 was required to satisfy the "identification of
13 an object" limitation, and I'm asking whether
14 there are other ways to satisfy the
15 "identification of an object" limitation
16 without using spectral fingerprinting.
17 MR. HOLT: Objection. Form.
18 **A. Well, again, like I said, spectral**
19 **fingerprinting is one embodiment of that. It**
20 **can be done also by pattern matching, by**
21 **comparison with database as described in**
22 Claim 1, which states that [as read]:

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1 Transmit at least a portion of processed
2 output signal over the wireless transmission
3 link; and a cloud configured to: receive over
4 the wireless transmission link, an output
5 status comprising at least portion of the
6 processed output signal, process the received
7 output status to generate processed data and
8 store the processed data.
9 So basically, this is where this -- I
10 understand where pattern matching and spectral
11 fingerprinting is happening.
12 BY MR. KIM:
13 Q. What does wireless transmission link have to
14 do with identification of an object?
15 **A. You have to --**
16 MR. HOLT: Objection. Scope. Form.
17 **A. You have to compute it somewhere.**
18 **BY MR. KIM:**
19 Q. So identification of an object cannot be done
20 at the measurement device level? That's your
21 testimony?
22 MR. HOLT: Objection. Form.

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1 **A. No, no, limitation -- previous limitation, it**
2 says [as read]: A smart phone or tablet
3 comprising a wireless receiver, wireless
4 transmitter, and microphone, speaker, et
5 cetera, microprocessor.
6 So it could also be done at the
7 level of computer before transmission, but
8 basically computer is required, either
9 wireless or wired.
10 BY MR. KIM:
11 Q. All right. But you testified earlier that --
12 strike that.
13 For blood constituent identification,
14 can you satisfy "identification of an object"
15 limitation without using spectral
16 fingerprinting?
17 MR. HOLT: Objection. Form. Asked
18 and answered.
19 **A. Yeah, so, again, like I said, you have to**
20 **have more comprehensive information. You**
21 **have a spectrum of blood constituents. It's**
22 **a chemical, it's a protein which you have**

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1 **specific peaks which you have to assess,**
2 **measure, and pattern match your fingerprint**
3 **against the existing database.**
4 **And, again, the patent, in column**
5 **35, just before the claims, states that there**
6 **is many embodiments, a myriad of changes,**
7 **variations, alterations, transformations, and**
8 **modifications may be suggested to one skilled**
9 **in the art, and it is intended that the**
10 **present disclosure encompass such changes,**
11 **variations, alterations, modifications,**
12 **et cetera, so basically it describes specific**
13 **embodiments such as spectral fingerprinting.**
14 **But you need to have accurate**
15 **optical concordance in the range of spectrum**
16 **to identify blood constituents.**
17 **BY MR. KIM:**
18 Q. And again, we discussed earlier that the
19 Claim 1 of the '304 patent does not require
20 any particular level of accuracy. Correct?
21 **A. It doesn't state specific number, but it does**
22 **say that it expects to improve**

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1 signal-to-noise ratio, so basically it has to
2 be sufficiently high. And, again, it will
3 depend on the application and the complexity
4 of your sample.
5 If your sample is relatively simple,
6 with only a few constituents, you can measure
7 accurately, identify accurately with
8 relatively low accuracy of your measuring
9 device. But if it's a very complex
10 biological sample from a living person, for
11 example, with numerous blood constituents,
12 including hemoglobin in both forms, oxy and
13 deoxy, you have to have a high accuracy of
14 measurements in spectral domain.
15 Q. If you look at Claim 12 --
16 A. Okay.
17 Q. -- the second limitation, it reads, "wherein
18 the measurement system is at least in part
19 configured for selection or identification of
20 an object, and wherein the measurement system
21 is configured to improve a signal-to-noise
22 ratio of the selection or identification."

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1 Do you see that?
2 A. I do.
3 Q. And it requires improving the signal-to-noise
4 ratio of the identification by applying
5 regression signal processing methodologies or
6 multivariate techniques. Do you see that?
7 A. Correct. Correct.
8 Q. And you mentioned that identification of an
9 object has to be done to improve the
10 signal-to-noise ratio.
11 A. Not -- the other way around.
12 MR. HOLT: Objection. Form.
13 BY MR. KIM:
14 Q. So signal-to-noise ratio has to be improved to
15 identify an object? Was that the testimony?
16 A. Right.
17 Q. Okay. But here it requires improving the
18 signal-to-noise ratio -- strike that.
19 In Claim 12, it requires improving a
20 signal-to-noise ratio of identification by
21 applying regression signal processing
22 methodologies or multivariate techniques. Do

227

1 you see that?
2 A. Yes.
3 Q. And those are different techniques from
4 spectral fingerprinting. Correct?
5 A. It's a part of spectral fingerprinting.
6 Basically, what you do during spectral
7 fingerprinting, first you acquire optical
8 signal, which is essentially densities of
9 your light depending on the frequency. After
10 that, you are processing it, you're filtering
11 it, you're applying regression signal
12 processing methodologies, multivariable
13 techniques, so you extract specific features
14 such as known peaks.
15 For each chemical you have several
16 known peaks in the spectrum which correspond
17 to that particular chemical group, and you
18 improve that signal-to-noise ratio by applying
19 those techniques, and only after that you
20 essentially identify an object.
21 Q. So are you saying that the claim language "by
22 applying regression signal processing

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1 methodologies or multivariate techniques" are
2 referring to spectral fingerprinting?
3 A. It's a --
4 MR. HOLT: Objection. Form.
5 A. It's referring to identification of an
6 object. One of the embodiments of that is
7 spectral fingerprinting.
8 If I may refer you to Claim 9, for
9 example. So in Claim 9, line 25, it talks
10 about "measurement system is configured to
11 perform pattern identification or
12 classification." And this is basically --
13 fingerprinting is pattern identification
14 classification.
15 So you have spectrum, you have
16 certain pattern of the spectrum, and you
17 match it, similar like when you take
18 fingerprint of a person you're looking at
19 pattern of your imprint. So here you are
20 looking at the pattern in the spectrum.
21 BY MR. KIM:
22 Q. Okay. So your opinion is still that

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1 identification of an object requires the
2 device to differentiate an object from other
3 objects; is that right?
4 MR. HOLT: Objection. Form.
5 **A. Based on pattern matching, yes, for basically**
6 **each object in this particular case has its**
7 **own pattern of spectrum, and you can go**
8 **through pattern matching fingerprinting,**
9 **you'll find, essentially, fingerprint of a**
10 **particular chemical constituent.**
11 **BY MR. KIM:**
12 Q. Okay. And once you differentiate the object
13 that you're looking for, you also need to
14 confirm what exactly the object is, is that --
15 is that also your testimony?
16 **A. I'm not sure what you mean by --**
17 MR. HOLT: Objection. Form.
18 **A. -- "confirm." What do you mean by "confirm"?**
19 **BY MR. KIM:**
20 Q. Do you have to know what the object is in
21 order to satisfy the "identification of an
22 object" limitation?

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1 **A. Yes, because object has its own fingerprint,**
2 **so you can identify it.**
3 Q. So just to combine your testimony so far, is
4 your opinion that identification of an object
5 requires the device to, one, differentiate the
6 object from other objects, and, two, be able
7 to tell what the object is?
8 MR. HOLT: Objection. Form.
9 **A. Well, the language was -- very similar**
10 **meaning, but the language was to identify a**
11 **particular thing, that the object is a**
12 **particular thing. And particular --**
13 **particular thing is -- in this language, is a**
14 **chemical constituent with a particular**
15 **spectral signature or spectral fingerprint.**
16 **BY MR. KIM:**
17 Q. Right. But you also -- is it also your
18 testimony that identification of an object
19 requires differentiating the object from other
20 objects?
21 MR. HOLT: Objection. Form.
22 **A. Differentiating in a sense or different**

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1 **spectral signature.**
2 **BY MR. KIM:**
3 Q. Does that mean that identification of an
4 object also requires recognizing what the
5 other objects are?
6 **A. Not necessarily. If you are only after a**
7 **particular object you want to identify, you**
8 **really don't need to identify all the other**
9 **objects. If you have a very complex mix of**
10 **objects with -- especially if there is very**
11 **different concentrations, very unlikely you**
12 **will be able to identify constituents which**
13 **are at very low concentrations, so signal**
14 **level not good enough, so you do not identify**
15 **other objects to identify just one you are**
16 **looking for.**
17 **It's similar to fingerprints. When**
18 **you identify someone, you identify this**
19 **particular person, you don't need to identify**
20 **everyone else around.**
21 Q. Okay. So as long as you can recognize the
22 object that you're seeking to identify,

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1 identification of an object is satisfied. Did
2 I get that right?
3 **A. I believe so.**
4 Q. Okay. Let's say there is a device that's
5 configured to detect a human wrist. It has no
6 algorithm to determine whether an object is
7 actually a wrist, but once a list of
8 conditions are met then it concludes that it
9 is worn by a user and therefore there is a
10 human wrist.
11 Do you think the device would satisfy
12 identification of -- strike -- "identification
13 of an object" limitation?
14 MR. HOLT: Objection. Form. Outside
15 the scope.
16 **A. I'm not sure I understand the question**
17 **because first you have to define how exactly**
18 **identification of a human wrist was done, was**
19 **it really accurate, and also compared to**
20 **what. You are identifying a human wrist in**
21 **comparison to what other objects would be**
22 **compared to.**

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1 **BY MR. KIM:**
2 Q. Again, in this scenario, is any particular
3 level of accuracy required for you to confirm
4 whether the "identification of an object"
5 limitation is met or not?
6 MR. HOLT: Objection. Form.
7 **A. Any measurement system have this requirement**
8 **of particular level of accuracy, but, again,**
9 **in the case of identifying a human wrist by a**
10 **worn device, you have to decide what**
11 **parameters you're going to use.**
12 **For example, you can use blood**
13 **constituents presence or absence, specific**
14 **blood constituents. You can you EKG. You**
15 **can use PPG and look at waveforms. So there**
16 **are many ways to implement that, and for each**
17 **of those parameters could be definitively**
18 **answer the question that this is indeed a**
19 **human wrist, but for each parameter you also**
20 **need accuracy so you have to answer the**
21 **question, is it really a pulse wave, is it**
22 **really EKG, is it really signature of a**

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1 **particular blood constituent. In each case,**
2 **accuracy will be required.**
3 Q. And if you're not using those physiological
4 parameters in determining whether the wrist is
5 there or not, can the device still satisfy
6 "identification of an object" limitation?
7 MR. HOLT: Objection. Form. Outside
8 the scope.
9 **A. Well, it's in isolation. You have to look at**
10 **the whole language of the claim. It's not**
11 **just identification of an object. But as**
12 **long as identification is done, it is**
13 **identification of an object.**
14 **BY MR. KIM:**
15 Q. Even if you cannot tell the difference between
16 a wrist or other objects?
17 MR. HOLT: Same objections.
18 **A. It's a hypothetical. Of course if it doesn't**
19 **identify an object -- a wrist versus, I don't**
20 **know, stick, then of course it will not be**
21 **satisfying this requirement.**
22 **BY MR. KIM:**

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1 Q. And if the device presupposes that whatever
2 it's detecting is a human wrist, could there
3 be an identification of an object?
4 MR. HOLT: Objection. Form. Outside
5 the scope.
6 **A. I'm not sure what it means, what -- a device**
7 **cannot suppose. It's basically identifying**
8 **or not identifying.**
9 MR. KIM: Why don't we go off the
10 record.
11 (Off the record at 3:52 p.m.)
12 (Back on the record at 4:00 p.m.)
13 MR. KIM: Welcome back, Dr. Efimov.
14 THE WITNESS: Hi.
15 BY MR. KIM:
16 Q. Did you talk to anyone during the break?
17 **A. Nope.**
18 Q. Okay. We were talking about a device that has
19 a wear-detection function. Do you remember?
20 **A. Yes.**
21 Q. Okay. If the device determines that the
22 device is being worn but does not know what is

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1 wearing the device, can it satisfy the
2 "identification of an object" limitation?
3 MR. HOLT: Objection. Form. Outside
4 the scope.
5 **A. If it's not identified, it does not satisfy**
6 **it.**
7 MR. KIM: Okay, I have no further
8 questions. Thank you for your time. Unless
9 Mr. Holt has any further questions.
10 MR. HOLT: Yeah, let's go off the
11 record.
12 (Off the record at 4:01 p.m.)
13 (Back on the record at 4:30 p.m.)
14 MR. HOLT: Let's go back on the
15 record.
16 EXAMINATION
17 BY MR. HOLT:
18 Q. Dr. Efimov, do you recall being asked whether
19 you agree or disagree with certain findings in
20 the Board's prior final written decision
21 concerning the '533 patent as set forth in
22 Exhibit 1008 in the '533 patent IPR?

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A. Yeah, I do remember being asked.
STENOGRAPHER: I couldn't hear that answer.
THE WITNESS: Really? Can you hear me now?
STENOGRAPHER: Yeah, it sounds a little more muffled.
A. I do remember being asked.
STENOGRAPHER: Thanks.
BY MR. HOLT:
Q. As part of your assignment, did you analyze and provide an opinion on whether you agree or disagree with every aspect of that decision?
A. No, I don't know part of my assignment.
STENOGRAPHER: Did you guys move the microphone?
THE WITNESS: Yeah, it was actually green before, now it's white. Maybe I need to push it again.
MR. HOLT: Let's go off the record.
(Off the record at 4:32 p.m.)
(Back on the record at 4:34 p.m.)

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MR. HOLT: Back on the record.
BY MR. HOLT:
Q. Dr. Efimov, do you recall counsel asking you a series of questions about how one might confirm whether a hypothetical device has certain features or functionalities?
A. Yes, of course I do remember this.
MR. KIM: Objection. Form.
THE WITNESS: I'm sorry? Can you hear me?
MR. KIM: Yes, I can. It was just an objection.
THE WITNESS: Oh, sorry.
BY MR. HOLT:
Q. Dr. Efimov, do you recall providing examples for how one might confirm whether the features or functions that counsel was asking about are present in a hypothetical device?
A. Yeah, I --
MR. KIM: Objection. Form.
A. I gave three examples, I believe.
BY MR. HOLT:

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Q. Okay. Were the examples you gave the only ways in which one could confirm whether those features or functions were present in a hypothetical device?
A. No, these are just examples. There could be other ways.
Q. Dr. Efimov, do you recall discussing the phrase "identify an object" in the '304 patent?
A. I do.
Q. Do you recall looking at the claim construction for the phrase "identify an object" in the '304 patent?
A. I do.
Q. Did you apply that claim construction in your analysis?
A. I did.
MR. KIM: Objection. Form.
BY MR. HOLT:
Q. Do you recall being asked about pattern matching?
A. I do.

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MR. KIM: Objection. Form.
BY MR. HOLT:
Q. Does the claim construction for "identify an object" require pattern matching?
A. No.
MR. KIM: Objection. Form.
BY MR. HOLT:
Q. Do you recall being asked about spectral fingerprinting?
MR. KIM: Objection. Form.
A. I do remember that.
BY MR. HOLT:
Q. Does the claim construction for "identify an object" require using spectral fingerprinting?
MR. KIM: Objection. Form.
A. No, it does not.
BY MR. HOLT:
Q. Do you recall counsel asking you a hypothetical involving a wrist-worn device and whether detecting that this device is being worn meets the "identify an object" requirement?

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1 MR. KIM: Objection. Form.
2 **A. I remember this line of questions.**
3 **BY MR. HOLT:**
4 Q. Did you analyze whether such a hypothetical
5 device meets the "identify an object" claim
6 construction as part of your assignment?
7 MR. KIM: Objection. Form.
8 **A. No, it was not part of my assignment.**
9 **BY MR. HOLT:**
10 Q. Have you formed any opinions about whether
11 such a hypothetical wrist-worn device would
12 meet the claim construction?
13 MR. KIM: Objection. Form.
14 **A. No, because I didn't analyze it. I didn't**
15 **form any opinion.**
16 MR. HOLT: That's all the questions
17 patent owner has on redirect.
18 MR. KIM: No further questions from
19 Samsung.
20 (Proceedings concluded at 4:37 p.m.
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1 CERTIFICATE OF NOTARY
2
STATE OF MICHIGAN)
3) SS
COUNTY OF OAKLAND)
4
5 I, ALISON WEBSTER, stenographic
reporter and notary public in and for the
6 state of Michigan do hereby certify:
That the deposition of IGOR EFIMOV,
7 Ph.D. was taken before me via
videoconference on the date hereinbefore set
8 forth; that the foregoing questions and
answers were recorded by me stenographically
9 and reduced to computer transcription; that
this is a true, full, and correct transcript
10 of my stenographic notes so taken; and that
I am not related to, nor of counsel to,
11 either party nor interested in the event of
this cause.
12 I further certify that the adverse
party was represented by counsel at the
13 deposition.
I further certify that the deposition
14 of IGOR EFIMOV, Ph.D., occurred via Zoom
videoconference on Thursday, July 16, 2026,
15 commencing at 10:04 a.m. Eastern Time, and
ending at 4:37 p.m.
16
17
18
19 Alison C. Webster
20 ALISON C. WEBSTER, CSR-6266
RPR, RMR, CRR, RDR
21 Notary Public, Oakland County, Michigan
My commission expires: May 1, 2029
22

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1 ACKNOWLEDGMENT OF DEPONENT
2
I, IGOR EFIMOV, Ph.D., do hereby
3 acknowledge that I have read and examined the
foregoing testimony and the same is a true,
4 correct, and complete transcription of the
testimony given by me and any corrections
5 appear on the attached errata sheet signed by
me.
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11 (SIGNATURE) (DATE)
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