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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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Transcript of Igor Efimov, Ph.D.
Conducted on July 16, 2026

1 (1 to 4)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	1 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 [REDACTED] 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	3 A P P E A R A N C E S ON BEHALF OF THE PETITIONER HYUN-JOONG (DANIEL) KIM, ESQUIRE Sheppard 30 Rockefeller Plaza New York, New York 10112 212.653.8708 hykim@sheppard.com ON BEHALF OF THE PATENT OWNER BENJAMIN R. HOLT, ESQUIRE Nixon Peabody LLP 799 9th Street NW Suite 500 Washington, D.C. 20001 202.585.8048 bholt@nixonpeabody.com
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	2 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.	4 A P P E A R A N C E S C O N T I N U E D ON BEHALF OF THE PATENT OWNER ANGELO CHRISTOPHER, ESQUIRE Nixon Peabody LLP 70 West Madison Street Suite 5200 Chicago, Illinois 60602 312.977.4391 achristopher@nixonpeabody.com ALSO PRESENT: Lucien Newell, exhibit technician

Transcript of Igor Efimov, Ph.D.
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2 (5 to 8)

5	7
1 T A B L E O F C O N T E N T S	1 DEPOSITION OF IGOR EFIMOV, Ph.D.
2	2 Thursday, July 16, 2026
3 Witness Page	3
4 IGOR EFIMOV, Ph.D.	4 STENOGRAPHER: The attorneys
5	5 participating in this deposition and the
6 EXAMINATION	6 witness have verified that he is Igor Efimov,
7 BY MR. KIM: 8	7 Ph.D. In lieu of an oath administered in
8 EXAMINATION	8 person, the witness will visually affirm his
9 BY MR. HOLT: 236	9 testimony in this matter is under penalty of
10	10 perjury.
11 E X H I B I T I N D E X	11 The parties and their counsel consent
12	12 to this arrangement and waive any objections
13 Exhibit Page	13 to this manner of reporting or admissibility
14 (Exhibits retained by Counsel.)	14 of the transcript.
15	15 Would counsel please state their
16 PREVIOUSLY MARKED IPR2025-01250 33	16 appearance and any objections to proceeding in
17 EXHIBIT 1008	17 this manner, starting with scheduling counsel.
18 PREVIOUSLY MARKED IPR2025-01250 39	18 MR. KIM: Sure, this is Daniel Kim
19 EXHIBIT 1025	19 from Sheppard Mullin on behalf of Petitioners
20 PREVIOUSLY MARKED IPR2025-01250 53	20 Samsung Electronics Co Ltd and Samsung
21 EXHIBIT 2043	21 Electronics America Inc.
22 PREVIOUSLY MARKED IPR2025-01250 111	22 MR. HOLT: Good morning. This is
6	8
1 EXHIBIT 2100	1 Benjamin Holt from Nixon Peabody on behalf of
2 PREVIOUSLY MARKED IPR2025 01250 114	2 Patent Owner Omni MedSci Inc.
3 EXHIBIT 2106	3 STENOGRAPHER: Thank you.
4 E X H I B I T I N D E X C O N T I N U E D	4 Hearing no objections, Dr. Efimov,
5	5 would you please raise your right hand.
6 PREVIOUSLY MARKED IPR2025-01250 142	6 Do you swear or affirm the testimony
7 EXHIBIT 2116	7 you are about to give in this matter will be
8 PREVIOUSLY MARKED IPR2025-01254 171	8 the truth, the whole truth, and nothing but
9 EXHIBIT 2043	9 the truth?
10 PREVIOUSLY MARKED IPR2025-01254 178	10 DR. EFIMOV: I do.
11 EXHIBIT 2116	11 STENOGRAPHER: Thank you.
12 PREVIOUSLY MARKED IPR2025-01252 189	12 You may proceed.
13 EXHIBIT 2043	13 IGOR EFIMOV, Ph.D.,
14 PREVIOUSLY MARKED IPR2025-01252 191	14 was thereupon called as a witness herein, and
15 EXHIBIT 1001	15 after having first been duly sworn to testify
16 PREVIOUSLY MARKED IPR2025-01251 194	16 to the truth, the whole truth and nothing but
17 EXHIBIT 2043	17 the truth, was examined and testified as
18 PREVIOUSLY MARKED IPR2025-01251 197	18 follows:
19 EXHIBIT 1016	19 MR. KIM: Good morning, Dr. Efimov.
20 PREVIOUSLY MARKED IPR2025-01251 208	20 THE WITNESS: Good morning.
21 EXHIBIT 1001	21 EXAMINATION
22	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	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
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	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.	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 --
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	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.

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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	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
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, coronary disease, and various 22 other types of cardiovascular disease.	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

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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	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
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	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.	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
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	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 1 BY MR. KIM: 2 Q. Let's forget about optimization for now. I'm 3 just asking whether it was known in the art to 4 increase a signal-to-noise ratio by increasing 5 the light intensity before 2012. 6 MR. HOLT: Same objections. 7 A. And again I would say the same answer, that 8 it depends on application. In some cases 9 increasing intensity will be helpful, in some 10 cases it will not be helpful. 11 BY MR. KIM: 12 Q. Again, that's not the question I asked. Let 13 me -- let me ask the question again. 14 Before 2012, it was known in the art 15 to increase the signal-to-noise ratio by 16 increasing the light intensity being used in 17 physiological monitoring devices. Correct? 18 MR. HOLT: Objection to form and 19 scope. 20 A. Well, like I said, again, I already answered 21 this question. It depends. You cannot be 22 generic about it because for a specific	31 1 before 2012 to increase signal-to-noise ratio 2 by increasing the light intensity of the pulse 3 oximeter? 4 MR. HOLT: Objection to form and 5 scope. 6 A. So, again, I can think of examples where 7 increasing light intensity beyond certain 8 threshold would be detrimental. It will 9 saturate the sensor and you will not get 10 improvement in signal-to-noise ratio. 11 BY MR. KIM: 12 Q. Again, I'm not asking for an example. I'm 13 asking whether the concept of increasing the 14 signal-to-noise ratio by increasing light 15 intensity was known in the art before 2012. 16 MR. HOLT: Objection. Form. Scope. 17 A. That is one of the approaches but, like, 18 again, it -- depending on the design. 19 BY MR. KIM: 20 Q. Again, I'm not asking for a process and I'm 21 not asking for a design. I'm asking whether 22 the concept of increasing signal-to-noise
30 1 application you have to design properly the 2 relation between light intensity of light 3 source and your sensitivity of your sensor. 4 So in some cases it would be helpful, in some 5 cases it will not be helpful. 6 BY MR. KIM: 7 Q. Again, I'm not asking whether it would be 8 helpful in all the instances. I'm just asking 9 whether it was known in the art to increase 10 the signal-to-noise ratio by increasing light 11 intensity before 2012. 12 MR. HOLT: Same objections. 13 A. Well, again, you have to give me more precise 14 example, in what particular sensor, because I 15 can essentially think of some in which it 16 will not be helpful. 17 BY MR. KIM: 18 Q. Let's use pulse oximeter as an example, and 19 let's assume that the initial light intensity 20 is very low. 21 A. Uh-huh. 22 Q. And in that instance, was it known in the art	32 1 ratio by increasing the light intensity was 2 known in the art before 2012. 3 MR. HOLT: Same objections. 4 A. Same answer. Basically, like I said, you 5 cannot take this concept in isolation. It 6 has to be for a specific application for 7 specific design. And you have to understand 8 that increasing intensity beyond certain 9 threshold is detrimental. 10 BY MR. KIM: 11 Q. So was it known in the art before 2012 that 12 increasing light intensity before the 13 threshold you mentioned could increase the SNR 14 or signal-to-noise ratio? 15 MR. HOLT: Objection. Form. Scope. 16 A. For some applications, yes. For some, no. 17 BY MR. KIM: 18 Q. What are the applications that the 19 signal-to-noise ratio would increase? 20 MR. HOLT: Objection. Form. Scope. 21 A. Well, for example, in case of what I 22 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:	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?
34 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	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	39 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
38 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.	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.

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	41 43 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.
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.	44 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.	47 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:
46 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.	48 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

49 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?	51 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
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	52 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.	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.
54 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?	56 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

57 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]	59 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
58 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.	60 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 --

61 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.	63 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
62 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.	64 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

65 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.	67 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
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.	68 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.

69 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	71 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
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	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

73 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	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.
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	76 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

77 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	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,
78 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	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,

81 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	83 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
82 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.	84 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

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	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
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	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

89 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	91 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:
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	92 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	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
94 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.	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.

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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	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
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	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  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

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1 declaration of Dr. Islam, he was also
2 [REDACTED]
3 [REDACTED]
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."

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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. [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

103
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
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. [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
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. [REDACTED]

105
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
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**

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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 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]
108
1 [REDACTED]
2 [REDACTED]
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 **[REDACTED]**
17 **[REDACTED]**
18 **[REDACTED]**
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 **[REDACTED]**
8 **[REDACTED]**
9 **[REDACTED]**
10 **[REDACTED]**
11 **[REDACTED]**
12 **[REDACTED]**
13 **[REDACTED]**
14 **[REDACTED]**
15 **[REDACTED]**
16 **[REDACTED]**
17 **[REDACTED]**
18 **[REDACTED]**
19 **[REDACTED]**
20 **[REDACTED]**
21 **[REDACTED]**
22 **[REDACTED]**

113
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
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 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
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 [REDACTED]

115
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 Q. Okay.
10 A. [REDACTED]
11 [REDACTED]
12 Q. [REDACTED]
13 [REDACTED]
14 [REDACTED]
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 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 Do you see that?
8 A. Yes.
9 [REDACTED]
10 [REDACTED]
11 MR. HOLT: Objection. Form.
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
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. [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
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. [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 MR. HOLT: Objection. Form.
22 [REDACTED]

118
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 BY MR. KIM:
6 Q. [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 Q. [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

119
1 MR. HOLT: Objection. Form.
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
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. [REDACTED]

120
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 Do you see that?
5 A. I do.
6 Q. [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 MR. HOLT: Objection to form.
10 A. [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 BY MR. KIM:
17 Q. [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

121

1 [REDACTED]
2 [REDACTED]
3 Q. [REDACTED]
4 [REDACTED]
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. [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

122

1 MR. HOLT: Objection.
2 A. — [REDACTED] ?
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. [REDACTED]
12 [REDACTED]
13 A. I do.
14 Q. [REDACTED]
15 MR. HOLT: Objection. Form.
16 A. [REDACTED]. 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. [REDACTED]
21 [REDACTED]
22 [REDACTED]

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 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

124

1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
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. [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

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. [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 A. [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 A. Same answer. I don't know.
20 [REDACTED]
21 [REDACTED]
22 A. Sorry, which -- who? Could you repeat the

130

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

131

1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
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 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 A. I do not. Dr. Islam did not provide this

132

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

Transcript of Igor Efimov, Ph.D.
Conducted on July 16, 2026

34 (133 to 136)

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
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 BY MR. KIM:
6 [REDACTED]
7 [REDACTED] to the
8 entire Samsung group of subsidiaries?
9 MR. HOLT: Objection to form.
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 BY MR. KIM:
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

138
1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
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 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
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 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
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

140
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

142
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:**

143
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.

144
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-impedance 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.

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.

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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

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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

165
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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1 Q. Did you review the portion of the Exhibit 2116
2 in IPR2025-01254?
3 **A. I have to look at my references, but it looks**
4 **familiar.**
5 Q. Okay. The claim limitation is 1[a], "one or
6 more bio-sensors." Do you see that on page 4?
7 **A. I do.**
8 MR. HOLT: Objection. Scope.
9 BY MR. KIM:
10 Q. And if you can go to page 7.
11 **A. Okay.**
12 Q. Before this limitation, bio-active sensor is
13 referenced as satisfying the claim limitation.
14 Correct?
15 **A. Correct.**
16 Q. Okay. And if we can go to page 18.
17 **A. Okay.**
18 Q. This is for claim limitation 1[d], "a light
19 source comprising a plurality of light
20 emitting diodes." Correct?
21 **A. Correct.**
22 Q. And if we can go to page 19.

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

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1 Q. In the second paragraph, it reads, "The
2 BioActive sensor in the Accused Smartwatch
3 comprises a detection system that (a) receives
4 light initially output from LEDs, and (b)
5 generates an output PPG signal having a
6 signal-to-noise ratio."
7 Do you see that?
8 **A. Yes, I do.**
9 Q. So Omni's contention is that the detection
10 system within the bio-active sensor satisfies
11 claim element 1[f]. Correct?
12 MR. HOLT: Objection. Form. Scope.
13 **A. Not just one page, I believe, but also**
14 **continuation pages.**
15 **BY MR. KIM:**
16 Q. Right. But the question was, Omni's
17 contention is that the detection system within
18 the bio-active sensor satisfies claim element
19 1[f]. Correct?
20 MR. HOLT: Objection. Form. Scope.
21 **A. This language as well as the images shown**
22 **later.**

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1 **BY MR. KIM:**
2 Q. Right. I'm not sure if that answers the
3 question.
4 Omni's contention here for claim
5 element 1[f] is that the bio-active sensor and
6 the detection system within the bio-active
7 sensor satisfies this limitation. Correct?
8 MR. HOLT: Objection. Scope. Form.
9 **A. Are you referring just to page 28 or all**
10 **pages – all relevant pages?**
11 **BY MR. KIM:**
12 Q. I was referring to 28.
13 **A. Well, again, my answer would be it goes**
14 **beyond that. There are additional pages.**
15 **Like, for example, page 31 talks about**
16 **specific AFE chip from Texas Instruments.**
17 **Page 30 shows the family of sensors and light**
18 **sources in bio-active sensor, et cetera, so**
19 **there are a number of pages.**
20 Q. Okay. I understand that, but here on this
21 contention is the bio-active sensor in the
22 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?

Conducted on July 16, 2026

201 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	203 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
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.	204 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

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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

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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.

208
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?

209
1 A. I'm looking at -- yeah, I do. I have it in
2 my Acrobat.
3 Q. Okay. And this is the '304 patent. Correct?
4 A. Yes, '304, on page -- I guess close to the
5 end.
6 So I'm now looking at -- you are
7 asking about Claim 1 specifically, right?
8 Q. Yes.
9 A. Uh-huh. So let me see if there is new
10 language about spectral signature.
11 Could you please repeat the question
12 so I could be more specific?
13 Q. Sure. You mentioned that spectral or pattern
14 matching algorithm is required for
15 identification of an object. I was asking if
16 the claim language recites spectral matching
17 or matching algorithm.
18 MR. HOLT: Objection. Form.
19 A. Spectral matching is not listed here, but
20 like I said -- let me check. I can search
21 for "spectral."
22 STENOGRAPHER: And, Counsel, when the

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

211
1 patent, but not in the --
2 BY MR. KIM:
3 Q. Where -- where were you reading that from?
4 A. Column 4, Exhibit 101 [sic], line 58 to the
5 end of the page. Column 4. So on page -- I
6 don't see the page here.
7 Q. Okay. So you're looking at column 4, lines --
8 A. Line 37 -- I'm sorry, page 37, page 37.
9 Q. But this is not a claim language?
10 A. Right, but it is in the specifications.
11 Q. Okay.
12 STENOGRAPHER: Counsel, could we go
13 off the record?
14 (Off the record at 3:15 p.m.)
15 (Back on the record at 3:23 p.m.)
16 BY MR. KIM:
17 Q. So we were discussing about the spectral
18 analysis, and correct me if I'm wrong, but
19 your testimony is that spectral analysis is
20 required for identification of an object; is
21 that right?
22 MR. HOLT: Objection. Form.

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1 A. For a particular application.
2 BY MR. KIM:
3 Q. Okay. And how about library matching; is
4 library matching required for identification
5 of an object?
6 MR. HOLT: Objection. Form.
7 A. It's one way to do it because, like I said,
8 the fingerprinting usually goes against
9 stored data, but it's one of the methods.
10 BY MR. KIM:
11 Q. But there could be other methods to satisfy
12 identification of an object. That's your
13 testimony?
14 MR. HOLT: Depending on the
15 application, yes.
16 BY MR. KIM:
17 Q. For blood constituent identification, is
18 library matching required?
19 MR. HOLT: Objection. Form.
20 A. Spectral fingerprinting can be implemented
21 with or without library matching.
22 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:

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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 218 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.	219 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 220 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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221 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]: 222 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.	223 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 224 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

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.**

233 235

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**

234 236

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:**

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

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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1 **A. Yeah, I do remember being asked.**
2 STENOGRAPHER: I couldn't hear that
3 answer.

4 THE WITNESS: Really? Can you hear
5 me now?

6 STENOGRAPHER: Yeah, it sounds a
7 little more muffled.

8 **A. I do remember being asked.**

9 STENOGRAPHER: Thanks.

10 BY MR. HOLT:

11 Q. As part of your assignment, did you analyze
12 and provide an opinion on whether you agree or
13 disagree with every aspect of that decision?

14 **A. No, I don't know part of my assignment.**

15 STENOGRAPHER: Did you guys move the
16 microphone?

17 THE WITNESS: Yeah, it was actually
18 green before, now it's white. Maybe I need to
19 push it again.

20 MR. HOLT: Let's go off the record.

21 (Off the record at 4:32 p.m.)

22 (Back on the record at 4:34 p.m.)

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1 MR. HOLT: Back on the record.

2 BY MR. HOLT:

3 Q. Dr. Efimov, do you recall counsel asking you a
4 series of questions about how one might
5 confirm whether a hypothetical device has
6 certain features or functionalities?

7 **A. Yes, of course I do remember this.**

8 MR. KIM: Objection. Form.

9 THE WITNESS: I'm sorry? Can you
10 hear me?

11 MR. KIM: Yes, I can. It was just an
12 objection.

13 THE WITNESS: Oh, sorry.

14 BY MR. HOLT:

15 Q. Dr. Efimov, do you recall providing examples
16 for how one might confirm whether the features
17 or functions that counsel was asking about are
18 present in a hypothetical device?

19 **A. Yeah, I –**

20 MR. KIM: Objection. Form.

21 **A. I gave three examples, I believe.**

22 BY MR. HOLT:

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1 Q. Okay. Were the examples you gave the only
2 ways in which one could confirm whether those
3 features or functions were present in a
4 hypothetical device?

5 **A. No, these are just examples. There could be
6 other ways.**

7 Q. Dr. Efimov, do you recall discussing the
8 phrase "identify an object" in the '304
9 patent?

10 **A. I do.**

11 Q. Do you recall looking at the claim
12 construction for the phrase "identify an
13 object" in the '304 patent?

14 **A. I do.**

15 Q. Did you apply that claim construction in your
16 analysis?

17 **A. I did.**

18 MR. KIM: Objection. Form.

19 BY MR. HOLT:

20 Q. Do you recall being asked about pattern
21 matching?

22 **A. I do.**

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1 MR. KIM: Objection. Form.

2 BY MR. HOLT:

3 Q. Does the claim construction for "identify an
4 object" require pattern matching?

5 **A. No.**

6 MR. KIM: Objection. Form.

7 BY MR. HOLT:

8 Q. Do you recall being asked about spectral
9 fingerprinting?

10 MR. KIM: Objection. Form.

11 **A. I do remember that.**

12 BY MR. HOLT:

13 Q. Does the claim construction for "identify an
14 object" require using spectral fingerprinting?

15 MR. KIM: Objection. Form.

16 **A. No, it does not.**

17 BY MR. HOLT:

18 Q. Do you recall counsel asking you a
19 hypothetical involving a wrist-worn device and
20 whether detecting that this device is being
21 worn meets the "identify an object"
22 requirement?

Transcript of Igor Efimov, Ph.D.
Conducted on July 16, 2026

61 (241 to 244)

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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.)
21
22

1 ACKNOWLEDGMENT OF DEPONENT
2
3 I, IGOR EFIMOV, Ph.D., do hereby
4 acknowledge that I have read and examined the
5 foregoing testimony and the same is a true,
6 correct, and complete transcription of the
7 testimony given by me and any corrections
8 appear on the attached errata sheet signed by
9 me.
10

11 (SIGNATURE) (DATE)
12
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242

1 CERTIFICATE OF NOTARY
2
3 STATE OF MICHIGAN)
4) SS
5 COUNTY OF OAKLAND)
6
7 I, ALISON WEBSTER, stenographic
8 reporter and notary public in and for the
9 state of Michigan do hereby certify:
10 That the deposition of IGOR EFIMOV,
11 Ph.D. was taken before me via
12 videoconference on the date hereinbefore set
13 forth; that the foregoing questions and
14 answers were recorded by me stenographically
15 and reduced to computer transcription; that
16 this is a true, full, and correct transcript
17 of my stenographic notes so taken; and that
18 I am not related to, nor of counsel to,
19 either party nor interested in the event of
20 this cause.
21 I further certify that the adverse
22 party was represented by counsel at the
deposition.
I further certify that the deposition
of IGOR EFIMOV, Ph.D., occurred via Zoom
videoconference on Thursday, July 16, 2026,
commencing at 10:04 a.m. Eastern Time, and
ending at 4:37 p.m.

Alison C. Webster
ALISON C. WEBSTER, CSR-6266
RPR, RMR, CRR, RDR
Notary Public, Oakland County, Michigan
My commission expires: May 1, 2029

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