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Transcript of Jianzhong Jiao, Ph.D.

Date: January 29, 2024

Case: Volkswagen Group of America, Inc. -v- Spero (PTAB)

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Conducted on January 29, 2024

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 ----- VOLKSWAGEN GROUP OF AMERICA, INC., Petitioner, v. YECHZKAL EVAN SPERO, Patent Owner. ----- Case No. IPR2023-00197 Case No. IPR2023-00328 Case No. IPR2023-00335 U.S. Patent No. 10,894,503 DEPOSITION OF JIANZHONG JIAO, PH.D. Washington, D.C. Monday, January 29, 2024 9:33 a.m. Job No.: 522680 Pages 1 - 139 Reported By: Joan V. Cain	3 A P P E A R A N C E S ON BEHALF OF PETITIONER: JASON A. FITZSIMMONS, ESQUIRE IAN SOULE, ESQUIRE JOHN D. HIGGINS, ESQUIRE (VIA WEBEX) STERNE KESSLER GOLDSTEIN & FOX, P.L.L.C. 1101 K Street, NW Washington, D.C. 20005 Telephone: (202) 371-2600 ON BEHALF OF PATENT OWNER VIA WEBEX: SANGEETA G. SHAH, ESQUIRE BROOKS KUSHMAN P.C. 150 W. 2nd Street Suite 400N Royal Oaks, Michigan 48067 Telephone: (248) 358-4400
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	2 Deposition of JIANZHONG JIAO, PH.D., held at the law offices of: STERNE KESSLER GOLDSTEIN & FOX, P.L.L.C. 1101 K Street, Northwest Washington, D.C. 20005 (202) 371-2600 Pursuant to Notice, before Joan V. Cain, Court Reporter and Notary Public in and for the District of Columbia.	4 A P P E A R A N C E S C O N T I N U E D ALSO PRESENT: Adam Vaughn, Planet Depos, On-Site Technician Leyhbert Sharp, Planet Depos WebEx Technician

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5 1 C O N T E N T S 2 EXAMINATION OF JIANZHONG JIAO, PH.D. PAGE 3 By Ms. Shah 8 4 5 6 PREVIOUSLY MARKED EXHIBITS 7 (Provided to the Witness.) 8 DEPOSITION EXHIBITS PAGE 9 EXHIBIT 1001 U.S. Patent 10,894,503 B2 10 10 EXHIBIT 1003 Declaration of Jianzhong 97 11 Jiao, Ph.D., in Support of 12 Petition for Inter Partes 13 Review of U.S. Patent No. 14 10,894,503, 11/16/22 15 EXHIBIT 1005 U.S. Patent No. 6,144,158, 70 16 11/7/00 (Beam) 17 EXHIBIT 1010 International Application 128 18 Published Under the Patent 19 Cooperation Treaty, 20 Publication No. WO 21 98/54030, 12/3/98 22 (Karlsson)	7 1 P R O C E E D I N G S 2 - - - 3 9:33 a.m. EST 4 January 29, 2024 5 - - - 6 THE TECHNICIAN: Good morning, and thank 7 you to everyone for attending this proceeding 8 remotely, which we anticipate will run smoothly. 9 Please remember to speak slowly and do your best not 10 to talk over one another. 11 And please be aware that we're recording 12 this proceeding via WebEx just for backup purposes 13 only. Any off-the-record discussions should be had 14 away from the computer, and just remember to mute 15 your microphone for those conversations. 16 Please have your video enabled to help our 17 court reporter identify who is speaking, in this 18 case the participants who are attending remotely. 19 If you're unable to connect via video and are 20 connecting via phone, please voice identify yourself 21 each time before speaking. 22 I apologize in advance for any technical
6 1 PREVIOUSLY MARKED EXHIBITS (Continued) 2 (Provided to the Witness.) 3 DEPOSITION EXHIBITS PAGE 4 EXHIBIT 1011 International Application 123 5 Published Under the Patent 6 Cooperation Treaty, 7 Publication No. WO 8 01/01038 A1 (Harbers) 9 EXHIBIT 1051 Declaration of Jianzhong 68 10 Jiao, Ph.D., in Support of 11 Petitioner's Reply, 1/5/24 12 13 14 15 16 17 18 19 20 21 22	8 1 related interruptions. Thank you. 2 Madam Court Reporter, you may proceed. 3 Thank you. 4 Whereupon, 5 JIANZHONG JIAO, PH.D., 6 having been duly sworn under penalties of perjury by 7 the Notary Public, was examined and did testify as 8 follows: 9 THE COURT REPORTER: Thank you. 10 Please begin. 11 EXAMINATION BY COUNSEL FOR THE PATENT 12 OWNER 13 BY MS. SHAH: 14 Q Good morning, Dr. Jiao. 15 A Good morning, Sangeeta. 16 Q As before, we'll go through some basic 17 instructions. You'll be asked a series of questions 18 in this deposition. Those questions relate to 19 declaration testimony you've provided in this 20 particular series of IPRs. There are three IPRs 21 related to what we're referring to as the '503 22 patent that is the subject of today's deposition

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9 1 testimony. 2 Is that your understanding of what today's 3 deposition is about? 4 A Yes. 5 Q Have you prepared then for -- have you 6 reviewed the declarations you've provided in 7 relationship to the three IPRs related to the '503 8 patent? 9 A Yes, I have. 10 Q If you have any questions, if you don't 11 understand any of the questions that I ask you, 12 please free to let me know so that I can clarify the 13 question for you. 14 If I ask you a question and you either 15 cannot answer or refuse to answer, I will note that 16 on the record. Please recognize that the deposition 17 is about testing your understanding of the various 18 opinions you've provided in your declaration and is 19 not merely reading from the declaration. So to the 20 extent the question requires you to do something 21 other than read from your declaration, and you do 22 not either -- like I said, you either cannot or	11 1 please? 2 A Yes. 3 Q Can you read the last sentence of the 4 abstract for me out loud? 5 A "Utilizing real-time sensor data regarding 6 beings, objects and vehicles in the way-ahead, as 7 well as optional information on the driver, vehicle 8 and environment, the local [sic] controller dynamics 9 [sic] adapts the headlight system's illumination so 10 as to provide vehicle operators with optimal 11 visibility while preventing discomfort-glare from 12 reaching the eyes oncoming traffic or pedestrians." 13 Q Is it accurate, then, to say that the 14 abstract of the '503 patent discusses the use of 15 real time sensor data to provide a mechanism for 16 dynamically adapting the headlight systems' 17 illumination? 18 A It is -- the abstract has stated it is 19 utilizing real time sensor data and utilize this 20 data for the purpose of adaptive illumination. 21 Q I'm sorry. Could you repeat the last part? 22 A Is to utilize these data to control
10 1 refuse to provide an answer, it will be noted as 2 such. 3 Do you understand that? 4 A I do. 5 Q Okay. So, then, let us begin. 6 If you can turn to the '503 patent now, 7 please? 8 - - - 9 (Exhibit 1001 was presented to the 10 witness.) 11 - - - 12 MR. FITZSIMMONS: And, Sangeeta, just for 13 the record, we have a number of clean copies of 14 exhibits -- 15 MS. SHAH: Okay. 16 MR. FITZSIMMONS: -- from the proceedings. 17 MS. SHAH: Thank you. 18 BY MS. SHAH: 19 Q You have the '503 patent in front of you, 20 Dr. Jiao? 21 A Yes. 22 Q Can you -- can you look at the abstract,	12 1 adaptive lighting system for preventing glare. 2 Q Okay. Thank you. 3 If you could turn to column 5. 4 A Yes. 5 Q If you could read the first paragraph, 6 starting with the word: "... it is the goal..." to 7 the end of the -- the end of that first paragraph, 8 please, if you could read that out loud. 9 A I'm sorry. Starting from column 5? 10 Q Okay. So -- yeah, so the second line of 11 column 5, line two, kind of right after the comma, 12 it starts with: "...It is the goal..." If you 13 could start with that and read through the end of 14 that paragraph, please, out loud. 15 A "...it is the goal of this disclosure to 16 teach how to construct a luminaire which will 17 radiate photons where needed, exactly in the correct 18 amounts to accomplish visual tasks and/or create an 19 atmosphere." 20 Q I'm sorry. If you could read through the 21 end of that paragraph. 22 A "The controlled radiation of light into a

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13 1 living space with a specific spatial intensity 2 distributions [sic] also having optimal spectral 3 characteristics for the seeing tasks at hand is 4 provide [sic] by the present invention. Each visual 5 task application has its own correct lighting 6 solution" which optimal -- "with optimal light 7 intensities, light color" enable -- "emanating an 8 [sic] angles which will not cause glare that 9 interferes with the [sic] vision or cause [sic] 10 discomfort. Tasks in living space [sic] vary with 11 the [sic] time so it is another objective of the 12 present invention is to provide...optimal lighting 13 solutions [sic] in 'real time' (at that specific 14 moment in time)." 15 Q Thank you. 16 Based on the paragraph that you just read, 17 is it accurate to say that the '503 patent, the -- 18 one of the goals of the '503 patent is to provide 19 optimal lighting solutions in real time? 20 A What I just read, the disclosure for the 21 invention '503, it is to provide optimal 22 illuminations in real time.	15 1 no, 63, the sentence that begins: "Such a 2 beam..." and continue through column 53, the end of 3 the first full paragraph, please, if you could read 4 that out loud. 5 A "Such a beam at the correct narrow aiming 6 can continue to illuminate far ahead (in high beam) 7 without blinding oncoming traffic. Analysis by a 8 detector or an imaging system of the oncoming 9 vehicle [sic] position (using its headlamps [sic] 10 for example) can be used to determine which exact 11 aiming is the maximum allowable for any given 12 traffic situation and road layout." 13 Q If you could also read that next paragraph, 14 please. 15 A "Using color and the [sic] pattern 16 recognition techniques it is possible to determine 17 what is a sign. It is then possible to provide the 18 equivalent of 'task lighting' and use the controller 19 and properly aimed SLS to allow [sic] and illuminate 20 distance [sic] overhead and roadside signs for" -- 21 longer time -- "for a longer time, yet not blind 22 oncoming traffic due to the narrow beam."
14 1 Q Is it also accurate to say that one of the 2 goals of the '503 patent is to provide, quote, 3 correct lighting solutions that do not cause glare? 4 A That is correct. 5 Q Is it also correct that one of the goals of 6 the '503 patent is to teach how to radiate photons 7 where needed exactly in the correct amounts to 8 accomplish visual tasks and/or create an atmosphere? 9 A What the description says is it controlled 10 radiations of light into the living space with the 11 specific spatial intensity distribution to have such 12 optimal -- and also have including optimal spectral 13 characteristics for seeing tasks. 14 And your question is specifically regarding 15 the photon radiation. I'll look at the way it 16 described the photon radiation. This is what it 17 says: "...will radiate photons where needed." 18 Yeah, the words that describe, in this 19 paragraph, as one of the goals. 20 Q Can you turn to column 52. 21 A Yes. 22 Q If you could read starting from lines 64 --	16 1 Q The paragraph -- the sentences that you 2 just read, is it accurate to say that they cover how 3 to create a narrow aiming to avoid blinding oncoming 4 traffic by use of a detector or an imaging system? 5 MR. FITZSIMMONS: Objection. Form. 6 Mischaracterizes the exhibit. 7 THE WITNESS: This -- 8 BY MS. SHAH: 9 Q Go ahead and answer. 10 A This paragraph described the narrow beams 11 to be controlled to avoid glare by utilizing the 12 detected data or information to conduct such clear 13 light control. 14 Q And does the detected data come from a 15 detector or an imaging system? 16 A The description -- the specification for 17 this particular paragraph stating: "Analysis 18 by...detector or imaging system of...oncoming 19 vehicle [sic] position," and the data being analyzed 20 are the data collected by detector or imaging 21 system. 22 Q So it's then accurate to say that the

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17 1 detected data comes from a detector or imaging 2 system? 3 A It is -- 4 MR. FITZSIMMONS: Objection. Form. 5 THE WITNESS: It is stated that the 6 analysis done is by detector -- detector or imaging 7 system. 8 BY MS. SHAH: 9 Q And that that analysis by a detector and 10 imaging system is used to determine the exact aiming 11 for a given traffic situation; is that accurate? 12 MR. FITZSIMMONS: Objection. Form. 13 Mischaracterizes the exhibit. 14 THE WITNESS: What the description is 15 stating is the analysis of detector imaging system 16 of the information can be used to determine which 17 exact aiming and the maximum allowed for a given 18 traffic situation and road layout can be used. 19 BY MS. SHAH: 20 Q Please turn to the claims of the '503 21 patent. 22 A Okay.	19 1 illumination requirements. 2 BY MS. SHAH: 3 Q So isn't it true that claim 1 calls for the 4 provision of sensor data that is pertinent to 5 illumination requirements for the field-of-view? 6 MR. FITZSIMMONS: Objection. Asked and 7 answered. 8 THE WITNESS: I don't think I understand 9 the phrase you're using, "provision of the data." 10 BY MS. SHAH: 11 Q Okay. Isn't it true that claim 1 of the 12 '503 patent calls for sensor data to be obtained and 13 sensor data to be provided that is pertinent to the 14 illumination requirements for the field-of-view? 15 MR. FITZSIMMONS: Objection. Form. Asked 16 and answered. 17 THE WITNESS: That is what this claim 18 element state. 19 BY MS. SHAH: 20 Q Okay. If you can turn to the -- the 21 limitation immediately after that one. 22 A "A logical controller" --
18 1 Q Claim one, read the limitation that begins: 2 "One or more sensors configured," up until the end 3 of that limitation, which is "field-of-view." 4 A "One or more sensors" configure rate -- 5 "configured to obtain and provide the sensor data 6 predefined as" -- predefined as "pertinent" of -- to 7 illuminate -- "to illumination requirements for the 8 field-of-view." 9 Want me to continue? 10 Q No. Is it accurate, then, that claim 1 of 11 the '503 patent specifically calls for the use of -- 12 I'm sorry -- collecting sensor -- I'm sorry. Strike 13 that. 14 Is it accurate that the '503 patent, claim 15 1, calls for the provision of sensor data pertinent 16 to obtaining illumination requirements for the 17 field-of-view? 18 MR. FITZSIMMONS: Objection. Form. 19 THE WITNESS: This claim element is really 20 stating -- is the sensor data configured to 21 obtain -- and provide the sensor data as to -- the 22 word I cannot pronounce, pertinent -- pertinent to	20 1 Q Oh, I'm sorry. You don't have to read it. 2 Just give me one second. 3 Okay. If you could read from the 4 limitation -- to that next limitation, but where it 5 begins: "Wherein the processor..." and then through 6 the end of that limitation, please. 7 A "...Wherein the processor is configured to 8 process the one or more algorithm [sic] and the 9 sensor data to determine...illumination for at least 10 the [sic] two of the subsections, that reduces 11 illumination to reduce glare in at least a first of 12 the...least two subsections and adapt the light 13 emitted from one or more of the light-clusters so 14 that [sic] to create the headlight beam that 15 provides...determined illuminations [sic]." 16 Q So is it accurate, from that limitation, 17 that claim 1 of the '503 patent is using the sensor 18 data to reduce illumination to reduce glare? 19 A It is accurate to say that limitation 20 describes multiple subsections in multiple light 21 clusters where the sensor data is to -- used and -- 22 for the determined illumination of at least two of

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21 1 the subsections that reduce illumination for glare. 2 Q Again, so -- is it accurate, if you can 3 answer yes or no, that claim 1 of the '503 patent is 4 using the sensor data to reduce illumination to 5 reduce glare? 6 A Yes. That's correct. 7 Q You can next turn to claim 20. 8 A Okay. 9 Q If you can turn to the limitation of claim 10 20 that begins: "One or more sensors 11 configured..." if you could read that limitation for 12 me, please. 13 A "One or more sensors configured to sense 14 information defined as pertinent to determining 15 illumination output from...one or more headlamps and 16 communicating the sensed information to a processor 17 as sensor data..." 18 Continue? 19 Q So is it accurate, then, claim 20 of the 20 '503 patent includes the use of sensors and sensor 21 data to collect sensed information that is pertinent 22 to determining illumination output?	23 1 language is stating to detect -- to utilize the 2 sensor data to control these subsections, to 3 distinguish between the subsection with vehicle and 4 subsection without vehicle. 5 BY MS. SHAH: 6 Q Can you read the -- the limitation 7 immediately after that begins: "...determine 8 optimal use," please? 9 A "Determine" optical -- "optimal use of the 10 differently aimed directional light sources to 11 maximize vehicle operator visibility in at least the 12 second subsection, while minimizing a disturbing 13 effect, resulting from...illuminating [sic] output, 14 on the vision of other traffic in at least the first 15 subsection..." 16 Continue? 17 Q Yeah, if you could read through the end of 18 that claim, please. 19 A "...and direct the control circuitry to 20 adjust the directional light sources to 21 achieve...determined optimal use." 22 Q Thank you.
22 1 MR. FITZSIMMONS: Objection. Form. 2 THE WITNESS: That is correct. 3 BY MS. SHAH: 4 Q If you can next turn to the same claim, the 5 limitation that begins: "The processor, in 6 communication with..." if you could read the 7 beginning of that through the end of "...the 8 detected vehicle." 9 A "The processor, in communication with at 10 least the sensors and the control circuitry, 11 configured to: Process...sensor data to determine 12 within a field-of-view, at least a first subsection 13 including a detected vehicle and at least a " 14 section -- "a second subsection not including" a 15 detected -- "the detected vehicle..." 16 Q Is it accurate, then, to say that claim 20 17 of the '503 patent processes the sensor data to 18 determine within a field-of-view how to aim the 19 directional light sources? 20 MR. FITZSIMMONS: Objection. Form. 21 Mischaracterizes the exhibit and claim language. 22 THE WITNESS: Oh, it is -- the claim	24 1 What is the role, then, of the sensors and 2 the sensor data in determining, quote, "optimal use 3 of the differently aimed directional light sources," 4 in claim 20? 5 A Claim 20, last few claim elements describe 6 using sensor data to distinguish between the 7 subsections with vehicle detected and subsections 8 without vehicles and to determine the illumination 9 level of these two different subsections; to avoid 10 glare for other vehicles, to optimize illumination 11 for the subsections without other vehicles. 12 Q Could the step of determining optimal use 13 of the differently aimed directional light sources 14 be achieved without sensor data to determine within 15 a field-of-view the first and second subsections? 16 MR. FITZSIMMONS: Objection. Form. 17 Objection. Incomplete hypothetical. 18 THE WITNESS: In order to determine the 19 subsection that -- with vehicle presence or without 20 vehicle presence, you need to have sensing data, 21 and if I can understand your question correctly, 22 without the sensing, which subsection has vehicle,

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25 1 which one doesn't, it is not clear to me how to 2 detect -- how to distinguish subsection with or 3 without vehicle without sensor data. 4 BY MS. SHAH: 5 Q So if you could answer, I'm going to repeat 6 the question. If you could answer yes or no to the 7 question that I asked you. 8 Could the step of determining optimal use 9 of the differently aimed directional light sources 10 be achieved without sensor data to determine within 11 a field-of-view the first and second subsections? 12 MR. FITZSIMMONS: Objection. Form. 13 Objection. Asked and answered. Objection. It's an 14 incomplete hypothetical. 15 THE WITNESS: To answer that question, you 16 need to determine the word "first and second 17 subsection" to begin with. If the first subsections 18 are identical without vehicle presence, your 19 hypothetical scenario is -- that's okay. You don't 20 have to use sensor data. If you don't distinguish 21 between first and second section with or without 22 vehicle presence -- and I don't know how to answer	27 1 including...adaptive headlight system to obtain and 2 provide data predefined as relevant to a 3 determination of illumination requirements for the 4 field-of-view, the data" includes -- "including data 5 indicative of at least of one" -- of one "or more 6 other vehicles or...pedestrians [sic]." 7 Q Then if you could read the next limitation 8 that begins: "Determining illumination 9 requirements..." please. 10 A "Determining illumination requirements for 11 the field-of-view based on...data sensed by the 12 sensors, including determining illumination for at 13 least a first subsection of the field-of-view 14 including...other vehicle or pedestrian, as 15 indicated by the sensor data, and for at least a 16 second subsection of the field-of-view not including 17 the other vehicle or pedestrian." 18 Q Based on the limitations that you just read 19 from claim 26, Dr. Jiao, can you explain to me what 20 the role is of the sensors and the sensor data in 21 determining illumination requirements for the 22 field-of-view?
26 1 your hypothetical question. 2 The disclosure here is to use the sensing 3 data to detect the differences between first and 4 second subsection with/without vehicle presence. 5 BY MS. SHAH: 6 Q So, then, isn't it the case that you 7 couldn't detect the differences between the first 8 and second subsections without sensor data? 9 MR. FITZSIMMONS: Objection. Form. 10 Objection. Asked and answered. Objection. 11 Incomplete hypothetical. 12 THE WITNESS: My response is that without 13 sensing data, you cannot distinguish with/without 14 presence of other vehicle. If subsections is 15 defined to determine with other vehicle, without 16 sensing data, you cannot distinguish it. 17 BY MS. SHAH: 18 Q If you could turn to claim 26, please. 19 A Okay. 20 Q If you could read the limitation that 21 begins: "Utilizing one or more sensors..." 22 A "Utilizing one or more sensors of...vehicle	28 1 A The role of sensing by detecting -- to 2 distinguish the subsection needed is to detect other 3 vehicle or pedestrian within the field-of-view. 4 Q Can a light detector detect a pedestrian 5 within the field-of-view? 6 MR. FITZSIMMONS: Objection. Form. 7 Incomplete hypothetical. 8 THE WITNESS: Detecting the pedestrian in 9 practice, it can be challenging, especially if the 10 pedestrians wear dark clothes at night, without any 11 reflection of visible light. A typical light sensor 12 will have a difficulty to detect such a scenario 13 pedestrian. 14 Yet, other detectors can. For instance, 15 maybe infrared detector, which can broaden the light 16 detectors definition, including infrared, that can 17 possibly detect a pedestrian with dark or black 18 clothes on side of road or across the street. 19 BY MS. SHAH: 20 Q Can a photodiode detect a pedestrian? 21 MR. FITZSIMMONS: Objection. Form. 22 Incomplete hypothetical.

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29 1 THE WITNESS: Hypothetically, again, the 2 photodiode can be defined as different detected with 3 light. Infrared photodiode detector can detect 4 pedestrian if you can detect a very long wavelength, 5 such as IR or far IR that come from pedestrian, the 6 photodiode or detectors which such longer wavelength 7 range can detect pedestrians well. 8 BY MS. SHAH: 9 Q Will other forms of photodiode detectors be 10 able to detect a pedestrian? 11 MR. FITZSIMMONS: Objection. Form. 12 THE WITNESS: Can you repeat your question? 13 I don't believe I heard first words. 14 BY MS. SHAH: 15 Q Will -- would other forms of photodiode 16 detectors be able to detect a pedestrian? 17 MR. FITZSIMMONS: Objection. Form. 18 THE WITNESS: What is definition 19 of "other"? 20 MS. SHAH: Photodiode detectors the only -- 21 THE COURT REPORTER: I'm sorry, Ms. Shah. 22 I missed the first couple words of your question.	31 1 THE WITNESS: I think I answered that 2 question. If that pedestrian happened to wear very 3 bright, reflective clothing at night and the 4 clothing reflect the lights from headlamps, yes, the 5 photodiode without infrared range of detectability 6 can detect that particular scenario of pedestrian. 7 BY MS. SHAH: 8 Q So in the industry, when pedestrian 9 detection is desired, are photodiodes used for that 10 purpose? 11 MR. FITZSIMMONS: Objection. Form. 12 THE WITNESS: In the industry, the 13 pedestrian detection is widely considered using both 14 concept, namely, visible photodetectors or near 15 infrared for the scenario I described that 16 pedestrians that does not wear dark or black 17 clothes. The industry also had a practice to use a 18 far infrared photodiode detector to detect these 19 pedestrians as no light emission, purely black 20 clothing, black everything, but the pedestrian 21 emitting far infrared radiation from pedestrian 22 itself.
30 1 BY MS. SHAH: 2 Q Are there other forms of photodiode 3 detectors apart from infrared photodiodes? 4 A If I can respond in such, detecting 5 pedestrians, it depends upon the light reflected or 6 generated from pedestrian. If the pedestrian wear 7 very bright, reflective clothing, most photodiodes 8 without infrared detecting range can also detect the 9 pedestrians. 10 However, if the pedestrian wear very dark 11 or black clothing and there's no reflective visible 12 light, in that case, the photodiode with the longer 13 wavelength range, including infrared, could detect 14 the pedestrian as well. So, generally speaking, the 15 photodiode detection of pedestrian depends upon the 16 photocell detectability or wavelength. 17 Q So if you don't have an infrared photodiode 18 detector, but you have a shorter wavelength in a 19 photodiode detector, would it be able to detect a 20 pedestrian? 21 MR. FITZSIMMONS: Objection. Form. 22 Incomplete hypothetical.	32 1 Yes, industry also had practice to use 2 photocell to detect these type of scenarios of 3 pedestrians. 4 BY MS. SHAH: 5 Q Does the industry use image processing -- 6 image sensing and image processing to determine the 7 existence of a pedestrian in the field-of-view? 8 A If it's only for pedestrian detection, the 9 object being detected, whether it's visible light, 10 infrared light, or far infrared lights, the typical 11 process is using the imaging process typically we 12 call CCD camera is detectability and process the 13 image. 14 Q So, then, if I understand correct- -- your 15 answer correctly, for pedestrian detection, the 16 typical process is using image processing through a 17 CCD camera; is that correct? 18 A What I said is in order to -- to detect a 19 pedestrian in the scenario that visible light is not 20 obtained based on pedestrian clothing, industry 21 practice, such pedestrian detection is using CCD 22 camera. That's what I said.

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33 1 Again, if the pedestrian's visible, you can 2 use regular photocell without go into the infrared 3 wavelength range. 4 Q Please turn to claim 37. 5 A Okay. 6 Q If you could read the limitation that 7 begins: "One or more sensors..." through the end of 8 that limitation, please. 9 A "One or more sensors configured to obtain 10 and provide sensor data, at least a portion of the 11 sensor data indicating a second vehicle within the 12 field-of-view; and at least one processor configured 13 to: Receive the sensor data; process the sensor 14 data to determine a light distribution pattern 15 for...adaptive headlight beam, such that a headlight 16 beam adapted to the pattern substantially 17 illuminated [sic] a first subsection 18 of...field-of-view including at least a portion of 19 the second vehicle with" illuminated -- 20 "illumination [sic] below predefined threshold 21 value," where -- "while the beam substantially 22 illuminated [sic] at least the one or more second	35 1 Q Oh, I'm sorry. No. No. I'm not done with 2 the question. 3 -- to differentially illuminate a first 4 subsection from a second subsection of the field of 5 view? 6 MR. FITZSIMMONS: Objection. Form. 7 Mischaracterizes the claim language. 8 THE WITNESS: Again, the sensor data is to 9 be used to adapt -- to generate adaptive beam 10 pattern, which in this claim and describe multiple 11 subsections with or without the vehicle presence and 12 corresponding illumination level. 13 BY MS. SHAH: 14 Q So, Dr. Jiao, with respect to claim 37, how 15 are the different subsections determined? 16 MR. FITZSIMMONS: Objection. Form. 17 THE WITNESS: Subsection throughout the 18 claim of -- in this patent typically is divided in 19 such subsection is determined is when the vehicle is 20 detected or pedestrian -- vehicle present -- vehicle 21 or pedestrian's presence, where other subsection is 22 without vehicle.
34 1 subsections of...field-of-view to either side of the 2 first subsection with...illuminance level 3 above...predefined threshold value; and instruct 4 operation of at least two of the light clusters to 5 create...adapted headlight beam." 6 Q All right. Dr. Jiao, in relationship to 7 claim 37 of the '503 patent, is sensor data obtained 8 and then processed to determine the light 9 distribution pattern? 10 A That is correct. 11 Q And, again, in relationship to claim 37, is 12 sensor data obtained and processed to adapt the 13 pattern so it substantially illuminates a first 14 subsection of the field-of-view? 15 A Yes. 16 Q In relationship to claim 37, is it also the 17 case that the sensor data is processed to determine 18 the one or more -- I'm sorry. Strike that. 19 Is it also the case with respect to claim 20 37 that the sensor data is obtained and processed -- 21 A That's the end of your question? I'm 22 sorry.	36 1 When you have more than one vehicle, the 2 subsection can be in a similar way to be sectional 3 divided in the beam pattern. That's what throughout 4 this '503 patent, the concept of subsection is 5 related to detection of other vehicle. 6 BY MS. SHAH: 7 Q Dr. Jiao, can you explain for me, in 8 relationship to claim 37, how the sensor data is 9 used to determine the first subsection from the 10 second subsection? 11 MR. FITZSIMMONS: Objection. Form. 12 THE WITNESS: The sensor data is to 13 gathering the -- is -- is sensing the data of 14 other vehicles' presence. When the sensor data 15 indicating there's another vehicle -- other vehicles 16 in the presence, at least one or two, the 17 corresponding subsection illumination level will be 18 adapted to what it's described in the claim. 19 BY MS. SHAH: 20 Q Is it accurate, then, that without the 21 sensor data, you wouldn't be able to determine the 22 first and second subsections to adapt the headlight

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37 1 beam? 2 MR. FITZSIMMONS: Objection. Form. 3 Incomplete hypothetical. 4 THE WITNESS: It is correct. The vehicle 5 presence -- other vehicles' presence, whether it's 6 one or two, is depend upon sensoring data. Without 7 sensoring data, you can't distinguish, and you 8 cannot detect other vehicles; therefore, you can't 9 distinguish subsections. 10 BY MS. SHAH: 11 Q What technical skills are involved in the 12 teachings of the '503 patent? 13 MR. FITZSIMMONS: Objection. Form. Vague. 14 THE WITNESS: The technical fields of '503 15 patent is automotive lighting, specifically as 16 adaptive headlight system in automotive -- 17 automotive light. 18 I can add, in the claim portion, '503 19 patent is largely focused automotive lighting, the 20 field of automotive lighting. The specification of 21 '503 may have extended to other general illumination 22 criteria, but by reading the claims, it is the field	39 1 of descriptions of other forms of task lighting that 2 are not related to automotive lighting? 3 A I -- it is very lengthy description. I can 4 go back to look. In my memory, it did touch base, 5 say, other illumination criteria beyond automotive 6 lighting, but I could not -- 7 Q Could you do that, please? Could you go 8 through the '503 patent -- 9 A Go through all 500 pages? 10 Q -- identify areas that cover -- if you can 11 give me a few examples of areas that cover just 12 lighting not related to automotive lighting. No, 13 you don't need to go through all 500 pages. If you 14 can give me a few examples, please. 15 A Sure. Take a look at figure 2A of '503 16 patent, that is not automotive lighting. If you'd 17 go through other configurations disclosed, figure 7 18 is another example, and figure 8. These are 19 described in figure 11, and these other examples are 20 some kind of adaptive lighting system that is not 21 for automotive lighting or automotive headlamp 22 purpose.
38 1 of automotive lighting; more specifically, it's the 2 field of adaptive headlighting system in automotive 3 lighting field. 4 BY MS. SHAH: 5 Q Does the '503 patent, as you mentioned, 6 cover how to illuminate field-of-views, apart from 7 those related to automotive headlight applications? 8 A Your question is apart from automotive 9 headlights, meaning, besides automotive headlights? 10 Q Yeah. 11 A I can go back to entire specification, 12 multiple pages. I believe in the statement of these 13 pages that describe beyond automotive lighting with 14 illumination of -- the description what is 15 illuminizd, the task of -- but different 16 illuminations of different tasks, and I believe 17 there is other descriptions beyond automotive 18 lighting in the specifications. I don't believe 19 it's stated in the -- in the claims. 20 Q No, I understand. 21 I'm asking you: In the '503 patent, 22 specifically in the specification, is there a series	40 1 Furthermore, I think in figure 12 is 2 another thing. This, in my memory -- I can go 3 through the paragraph by paragraph to tell you -- 4 Q No. No. That's fine. 5 A Okay. 6 Q So, again, it would be your testimony that 7 the '503 patent includes several embodiments that 8 relate to task lighting, but not automotive 9 headlamps specifically? 10 A No. What I said is there is specifications 11 described in '503 patent besides automotive 12 lighting, yet the claims in '503 patent is all for 13 automotive lighting. 14 Q Okay. When we -- when we went through the 15 certain of the paragraphs of the '503 patent that 16 talked about the goal of the '503 patent, is it 17 accurate to say that one of the goals of the '503 18 patent relate to optimal lighting solutions in real 19 time to avoid glare? 20 A Avoiding glare real time, everything is 21 sensed right, yet these claims are for automotive 22 lighting.

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41 1 Q I understand. I'm -- I'm going to ask you 2 the question again. 3 Is it accurate to say that one of the goals 4 of the '503 patent relates to optimal lighting 5 solutions in real time to avoid glare? 6 MR. FITZSIMMONS: Objection. Asked and 7 answered. Objection. Form. 8 THE WITNESS: Except you didn't use the 9 word "in automotive lighting." In everything else, 10 yes. It is correct in automotive lighting, avoiding 11 glare using real time scenario. 12 BY MS. SHAH: 13 Q But is -- the '503 patent specification, it 14 covers a series of task applications and how to 15 optimally create lighting solutions in real time for 16 all of those task lighting applications, including 17 automotive lighting; is that correct? 18 MR. FITZSIMMONS: Objection. Form. 19 THE WITNESS: Your question is related the 20 '503 patent specifications. Again, the patent 21 specifications is practically -- how many pages? 22 In my reading experience of memory, there	43 1 BY MS. SHAH: 2 Q Again, if you can answer the question yes 3 or no. 4 Regarding the '503 patent specification, is 5 it true that it covers a series of task applications 6 to optimally create lighting solutions in real time? 7 MR. FITZSIMMONS: Objection. Form. 8 Objection. Asked and answered. 9 THE WITNESS: The answer is I don't 10 understand what a "series" is. There's several 11 examples is optimized. The task illumination real 12 time, that answer part is yes. I don't know how to 13 describe a series. Several examples, yes. 14 BY MS. SHAH: 15 Q Okay. So, then, based on your preferred 16 terminology, it is true that the '503 patent covers 17 several task illumination applications to optimally 18 create lighting solutions in real time, yes or no? 19 MR. FITZSIMMONS: Objection. Form. 20 Objection. Asked and answered. 21 THE WITNESS: Yes. 22 BY MS. SHAH:
42 1 is a description of using adaptive feature for other 2 lighting optimized task in illumination included 3 beyond automotive lighting, but the patent's 4 description, I can specifically look into the 5 precise language that matches your question, but for 6 the claims, these real time optimized illumination 7 glare control is for automotive lighting. 8 BY MS. SHAH: 9 Q Yes, I understand. I'm going to read the 10 question back to you. If you could answer it yes or 11 no, please. If you don't understand the question, 12 then please let me know; otherwise, please answer a 13 yes or no, if you can. 14 Regarding the '503 patent specification, is 15 it true that it covers a series of task applications 16 to optimally create lighting solutions in real time? 17 MR. FITZSIMMONS: Objection. Form. 18 Objection. Asked and answered. 19 THE WITNESS: Can you repeat your question 20 a little slower? Because there's a few words I 21 needed to have a better understanding of your 22 question.	44 1 Q Is the field of optics relevant to the '503 2 patent? 3 MR. FITZSIMMONS: Objection. Form. Vague. 4 THE WITNESS: Yes. 5 BY MS. SHAH: 6 Q Is the field of image processing relevant 7 to the '503 patent? 8 MR. FITZSIMMONS: Objection. Form. Vague. 9 THE WITNESS: '503 patent disclosed 10 automotive lighting adaptive system, including 11 lighting control. When you conduct a lighting 12 control and there is a possibility of using 13 sensing technology, cameras, devices, and these 14 devices' usage is included in automotive lighting 15 control, that's relevancy. But it essentially is 16 for lighting control. 17 BY MS. SHAH: 18 Q So, then, to effectuate lighting control 19 for automotive adaptive systems, sensing 20 technology is relevant; is that accurate? 21 MR. FITZSIMMONS: Objection. Form. Vague. 22 THE WITNESS: In '503 patent, in that it

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45 1 disclose sensing data gathering, data obtaining, 2 data processing that is used in lighting control, 3 the answer is, yes. The sensing technology or 4 sensing devices used knowledge is relevant. 5 BY MS. SHAH: 6 Q Would you consider the technology of the 7 '503 patent claims to be complex? 8 MR. FITZSIMMONS: Objection. Form. Vague. 9 THE WITNESS: Do I consider the disclosure 10 of '503 patent as complex? That's -- that's 11 relative, yet all the prior arts that I provided is 12 equivalently complex. 13 BY MS. SHAH: 14 Q I'm asking you with respect to the '503 15 patent claims. Do you consider that technology to 16 be complex? 17 A My answer is -- 18 MR. FITZSIMMONS: Object. Objection. 19 Form. Vague again. And objection. Asked and 20 answered. 21 THE WITNESS: My answer is: The complex is 22 relative.	47 1 comparison. 2 BY MS. SHAH: 3 Q So as compared to the prior art that you're 4 aware of, is the '503 patent technology complex? 5 MR. FITZSIMMONS: Objection. Form. Vague. 6 THE WITNESS: Compared to the prior arts, 7 especially my few primary few prior arts, no. 8 There's much more sophisticated disclosures in the 9 prior arts than '503 patent. 10 BY MS. SHAH: 11 Q Can you point me to a disclosure that is 12 much more sophisticated than the '503 patent 13 disclosure? 14 A I can go back to my first declaration. I 15 can -- I introduced the prior arts, especially the 16 arts Beam, Karlsson, and a combination Beam, 17 Thominet, Karlsson, Harbers. All these relative, 18 very close, similar disclosures of '503 patent 19 disclose even more features than '503 patent 20 disclose. 21 Q In July 2002, was it relatively complex to 22 adapt headlight beams based on sensor data?
46 1 BY MS. SHAH: 2 Q I'm sorry. I didn't understand your 3 answer. 4 A My answer is: The complexity is a relative 5 term. 6 Q So you can't answer the question? 7 MR. FITZSIMMONS: Objection. 8 Mischaracterizes the witness's testimony. 9 THE WITNESS: I answered the question 10 exactly what I think the answer should be. The 11 complexity is relative. Is relatively complex? 12 Yeah. Relatively, yes. I could say relatively it's 13 not too complex. 14 BY MS. SHAH: 15 Q I'm sorry. Is it relatively complex or not 16 too complex? 17 MR. FITZSIMMONS: Objection. Form. Vague. 18 THE WITNESS: My answer, again, is: 19 Complexity is relative. You're asking me whether 20 '503 patent disclosed the technology is complex. My 21 answer is: It's relative. It's relatively complex 22 or relatively not too complex, and depends upon the	48 1 MR. FITZSIMMONS: Objection. Form. Vague. 2 THE WITNESS: In July -- 3 BY MS. SHAH: 4 Q I'm sorry. I'm sorry. Let me -- let me 5 rephrase the question. 6 In July 2002, was it relatively -- 7 relatively complex to adapt LED headlight beams 8 based on sensor data? 9 MR. FITZSIMMONS: Objection. Form. 10 Objection. Scope. 11 THE COURT REPORTER: Objection, what? 12 MR. FITZSIMMONS: Scope. 13 THE WITNESS: In July two thousand -- by 14 the time frame of July 2002, the automotive lighting 15 field and industry has long history of develop -- 16 developing adaptive headlighting system using sensor 17 as sensing data and the LED light source 18 application. 19 BY MS. SHAH: 20 Q What legal principles governed your 21 opinions regarding the qualifications of a person of 22 ordinary skill in the art?

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49 1 MR. FITZSIMMONS: Objection. Form. 2 THE WITNESS: I'm not a legal expert. 3 MR. FITZSIMMONS: And objection to the -- 4 objection to the extent that calls for a legal 5 conclusion. 6 THE WITNESS: Right. I think that I need 7 to -- 8 MS. SHAH: I'm asking about what he 9 understood in relationship to the opinions he 10 proffered. 11 MR. FITZSIMMONS: Same objections. 12 THE WITNESS: My -- my understanding is 13 described in my declaration, and certainly I'm not a 14 lawyer. I described my understanding in my 15 declaration -- both declarations in terms of POSA. 16 BY MS. SHAH: 17 Q Did you consider the teachings of the '503 18 patent in determining the qualifications of the 19 person of ordinary skill in the art? 20 Yes or no, please. 21 A I'm sorry. I didn't understand your 22 question.	51 1 qualification in my declaration. It is my 2 understanding, and that is the qualification needed 3 including the sensor data detection usage and is -- 4 the individual who's qualified as POSA needs to have 5 two years' automotive lighting and the lighting 6 control experience. 7 BY MS. SHAH: 8 Q Does the lighting control experience need 9 to include the usage of sensor data? 10 MR. FITZSIMMONS: Objection. Form. Vague. 11 THE WITNESS: In analysis of the 12 patentability '503 patent, I considered the person 13 of ordinary skill in the art, the qualifications in 14 my declaration, including listed -- I use the word 15 at least two years' automotive lighting 16 experience -- automotive lighting and lighting 17 control experience. The sensing detectability, 18 sensing data use is included. 19 BY MS. SHAH: 20 Q Where is that included? 21 MR. FITZSIMMONS: Objection. Form. 22 THE WITNESS: It's part of the lighting
50 1 Q So I'm asking: When you determined the 2 qualifications of the person of ordinary skill in 3 the art, did you consider the teachings of the '503 4 patent? 5 A Yes. 6 Q And did you specifically consider the 7 teachings of the '503 patent related to the desire 8 to adapt lighting based on real time needs? 9 MR. FITZSIMMONS: Objection. Form. 10 THE WITNESS: My consideration for person 11 of ordinary skill in the arts in July 2002, when the 12 '503 patent being filed, my consideration's all 13 descriptions or elements that disclosed in this '503 14 patent. 15 BY MS. SHAH: 16 Q Would a person of ordinary skill in the art 17 have to have experience with obtaining sensor data 18 to determine how to adapt lighting for real time 19 solutions? 20 MR. FITZSIMMONS: Objection. Form. 21 Compound question. Vague. 22 THE WITNESS: I described the POSA's	52 1 control. 2 BY MS. SHAH: 3 Q Okay. So it's accurate to say, then, that 4 the person of ordinary skill in the art and 5 specifically the lighting control experience aspect 6 of their qualifications requires the ability to 7 understand how to use sensor data? 8 MR. FITZSIMMONS: Objection. Form. 9 Objection. Mischaracterizes. 10 BY MS. SHAH: 11 Q Is that correct? 12 MR. FITZSIMMONS: Objection. Form. 13 Objection. Mischaracterizes testimony. 14 THE WITNESS: Yeah, you truncated my 15 statement. The two years' experience -- experience 16 required as POSA has to have two years' automotive 17 lighting experience, including lighting control, 18 where sensor data usage is part of this requirement, 19 two years' automotive lighting and lighting control. 20 BY MS. SHAH: 21 Q Do all the teachings of the '503 patent 22 relate to automotive lighting applications?

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53 1 MR. FITZSIMMONS: Objection. Form. 2 THE WITNESS: '503 patent claims, all the 3 claims that -- in my declaration that I challenged 4 the patentability with the petition, they all relate 5 to automotive lighting. 6 BY MS. SHAH: 7 Q Can you answer my question, please? 8 Do all the teachings of the '503 patent 9 relate to automotive lighting applications? 10 MR. FITZSIMMONS: Objection. Form. 11 Objection. Asked and answered. 12 THE WITNESS: My answer again: The claims 13 in automotive lighting is all related to automotive 14 lighting. There is other examples in the 15 description specification of '503 patent of using 16 other lighting -- adaptive lighting examples, but 17 not in the claims. 18 BY MS. SHAH: 19 Q So, then, it's accurate that the teachings 20 of the '503 patent include adaptive lighting 21 examples other than automotive lighting examples? 22 MR. FITZSIMMONS: Objection. Asked and	55 1 into the record, can you point to me where that 2 focuses on automotive lighting applications? 3 MR. FITZSIMMONS: Objection. Form. Asked 4 and answered. 5 THE WITNESS: Did I say that this paragraph 6 is focused on automotive lighting in my answer? 7 BY MS. SHAH: 8 Q No. I'm asking you. Does that paragraph, 9 which talks about the goal of this disclosure, does 10 that discuss automotive lighting applications? 11 A Can you go back to what -- column 5, what 12 line did I start at before? 13 Q The first paragraph. The first full 14 paragraph of column 5. 15 A "...the goal of this disclosure is to teach 16 how to construct a luminaire which will radiate 17 photons where needed..." 18 Q I'm sorry. Dr. Jiao, you don't have to 19 read the whole paragraph again. I'm asking you 20 about a question about that paragraph. If you'd 21 like to read it to yourself, feel free to go ahead 22 and do that, but the question is with respect to the
54 1 answered. 2 THE WITNESS: My understanding, the 3 teachings are related to the claims that we're 4 having a patentability dispute. Again, these claims 5 are all related to automotive lighting. 6 BY MS. SHAH: 7 Q The question at hand is about the '503 8 patent. Would you like me to repeat the question? 9 A I answered the question. 10 Q No. You asked -- answered about the 11 claims. The question was about the teachings of the 12 '503 patent. I can repeat the question if you'd 13 like. 14 A I can repeat my answer because I said the 15 teachings in the claims all relate to automotive 16 lighting. The descriptions in the specifications, 17 they do have examples of non-automotive lighting. 18 Q Can you turn back to column 5 of the '503 19 patent, please. 20 A Okay. 21 Q The paragraph that we read, that first 22 paragraph of column 5, which you previously read	56 1 paragraph that you've already read into the record. 2 A And what was your question? 3 Q I'm asking you if that paragraph, the first 4 paragraph of column 5, if that discusses the goal of 5 the '503 disclosure in the context of automotive 6 lighting applications. 7 MR. FITZSIMMONS: Objection. Form. 8 Objection. Mischaracterizes the exhibit. 9 THE WITNESS: This paragraph is describe 10 the goal of adaptive lighting in any atmosphere that 11 include automotive lighting. 12 BY MS. SHAH: 13 Q Where do you see the words "automotive 14 lighting" in the first paragraph of column 5? 15 A "...how to construct a luminaire which will 16 radiate photons where needed." The definition of a 17 luminaire is the device that provides illumination 18 in terms of utilized light sources, utilized control 19 systems, and project lights to where needed. The 20 definition of luminaire, including any type, such as 21 automotive lamp is a type of luminaire. 22 Q So the goal of the disclosure is broadly to

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57 1 construct a luminaire that will radiate photons 2 exactly where needed to accomplish a visual task. 3 One of the types of luminaires would be an 4 automotive lamp. 5 Do you agree with that sentence? 6 MR. FITZSIMMONS: Objection. Form. 7 Compound question I think. Sorry. Objection. 8 Vague too. 9 THE WITNESS: Your first question is does 10 that anywhere says automotive lighting. I responded 11 to that. The POSA, the lighting industry, the 12 person of ordinary skill ought to know the words 13 "luminaire" is a description for any illumination 14 devices, including automotive lighting. Therefore, 15 the disclosure in this paragraph describes, yes, the 16 desired photon radiation for where a task is -- when 17 a task illumination is needed from a luminaire, that 18 include automotive lighting. 19 BY MS. SHAH: 20 Q Can you answer my question yes or no, 21 please? 22 So the goal of the '503 patent disclosure	59 1 whole, the patent specification, not the claims, 2 but -- or including the claims, the patent, the 3 patent claims, the specification, is it necessary to 4 have two years' automotive lighting experience? 5 MR. FITZSIMMONS: Objection. Form. 6 Compound question. Asked and answered. 7 THE WITNESS: Yes. 8 BY MS. SHAH: 9 Q Do you think the inventor is a person of 10 ordinary skill in the art? 11 MR. FITZSIMMONS: Objection. Form. 12 Objection. Scope. Objection. Calls for 13 speculation. Objection. Calls for a legal 14 conclusion as well. 15 THE WITNESS: I do not know legally how to 16 answer that question. 17 BY MS. SHAH: 18 Q I'm asking you in general. 19 Do you think that the person who invented 20 any given patent is a person of ordinary skill? 21 MR. FITZSIMMONS: Objection. Scope. 22 Objection. Vague. Object to form. Objection.
58 1 is to construct a luminaire that will radiate 2 photons exactly where needed to accomplish a visual 3 task, and then one type of luminaire would be an 4 automotive lamp, yes or no, please? 5 A Yes. 6 MR. FITZSIMMONS: Objection. Same 7 objections. 8 THE WITNESS: Yes. 9 BY MS. SHAH: 10 Q Thank you. 11 So then looking at the '503 patent 12 teachings as a whole, is automotive lighting 13 experience necessary to understand -- to understand 14 the teachings of the '503 patent? 15 MR. FITZSIMMONS: Objection. Form. 16 THE WITNESS: The teaching in '503 patent 17 is described in the claims. In order to understand 18 every claim's element, yes, you do. You have to 19 have auto- -- two years' automotive lighting 20 experience. 21 BY MS. SHAH: 22 Q And to understand the '503 patent as a	60 1 Incomplete hypothetical. 2 THE WITNESS: I think it should be. The 3 inventor should be a POSA. 4 BY MS. SHAH: 5 Q Would you be surprised to learn, then, that 6 Mr. Spero, the inventor of this patent, has no 7 automotive lighting experience? 8 MR. FITZSIMMONS: Objection. Form. 9 Objection. Scope. Objection. Foundation. 10 Objection. Calls for speculation. 11 THE WITNESS: I'm sorry. Your question is 12 would I be surprised to hear this inventor did not 13 have automotive lighting experience? 14 BY MS. SHAH: 15 Q Yes. 16 A What do you mean that he didn't have 17 automotive lighting? I know this person. 18 Q I'm sorry? 19 A What do you mean he didn't have automotive 20 lighting experience? 21 Q You know Mr. Spero? 22 A I know him -- know of him, yes.

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61 1 Q And what do you know about Mr. Spero? 2 A The limited information that I interface, 3 he has pretty sufficient understanding of automotive 4 lighting. I don't know how many years he worked in 5 the field, but he has a very sufficient 6 understanding as a POSA. 7 Q I'm sorry. What's the basis of your 8 understanding of Mr. Spero's knowledge? 9 MR. FITZSIMMONS: Objection. Scope. 10 THE WITNESS: Well, through the limited 11 interface in giving a speech at a conference and 12 lectures, whatever you describe. From my 13 observation, that's certainly a POSA. 14 BY MS. SHAH: 15 Q So have you met Mr. Spero? 16 MR. FITZSIMMONS: Objection. Scope. 17 THE WITNESS: Yes. 18 BY MS. SHAH: 19 Q Where did you meet Mr. Spero? 20 MR. FITZSIMMONS: Objection. Scope. 21 THE WITNESS: At one of the lighting 22 conventions, if I recall.	63 1 in terms of education, skills, and experience of a 2 POSA. 3 Q Do you think the patent's purpose is 4 relevant to determining this person of ordinary 5 skill standard? 6 MR. FITZSIMMONS: Objection. Vague. 7 THE WITNESS: I think in order to 8 understand the disclosure in specifically the 9 patent -- patent claims and to challenge the 10 patentability of these claims, yes, you do need to 11 be a POSA. 12 BY MS. SHAH: 13 Q Well, let me ask you the question again. 14 Do you think the patent purpose is relevant 15 to determining the person of ordinary skill 16 standard? 17 MR. FITZSIMMONS: Objection. 18 BY MS. SHAH: 19 Q Yes or no? 20 MR. FITZSIMMONS: Objection. Vague. 21 THE WITNESS: You're asking the purpose of 22 filing a patent? I don't know if that's a legal
62 1 BY MS. SHAH: 2 Q And based on that meeting, it's your 3 understanding he had automotive lighting experience? 4 MR. FITZSIMMONS: Objection. Scope. 5 THE WITNESS: Based on my understanding is 6 that he did lecture, speech, or presentation, 7 whatever he was giving, that demonstrate he's very 8 knowledgeable for automotive lighting. I don't know 9 how many years, but certainly he appears -- the 10 impression that I had, he appears to be very 11 knowledgeable. 12 BY MS. SHAH: 13 Q Why do you think -- well, strike that. 14 Do you think you're qualified to determine 15 whether someone is a person of ordinary skill in the 16 art? 17 MR. FITZSIMMONS: Objection. Form. Vague. 18 THE WITNESS: The answer is yes, I am 19 qualified to determine. 20 BY MS. SHAH: 21 Q And why is that? 22 A Because I possess the qualification needed	64 1 question or that's technical question. 2 BY MS. SHAH: 3 Q I'm asking whether the purpose of a given 4 patent is relevant in determining the standard that 5 is used to determine the person of ordinary skill. 6 MR. FITZSIMMONS: Objection. Vague. 7 THE WITNESS: Yes. 8 BY MS. SHAH: 9 Q Are the teachings of the patent as a whole 10 relevant in determining the standard that is used to 11 determine the person of ordinary skill? 12 MR. FITZSIMMONS: Objection. Form. Vague. 13 THE WITNESS: As you previously described 14 the teaching as whole including the claims, yes. 15 BY MS. SHAH: 16 Q Has the field of LED lighting advanced 17 since July 2002? 18 A Yes. 19 Q Has the field -- I'm sorry. 20 How has the field of LED lighting advanced 21 since July 2002? 22 MR. FITZSIMMONS: Objection.

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65 1 BY MS. SHAH: 2 Q In what ways? 3 MR. FITZSIMMONS: Objection. Form. Vague. 4 THE WITNESS: The way is LED sources very 5 obviously become more economically obtainable, and 6 there's more products being made, despite 7 significant reductions since 2000 -- is that 2002 or 8 2001, 2000? Since early 2000s, the significant 9 changes is price reduction of LED sources. 10 BY MS. SHAH: 11 Q Since July 2002, were there any advances 12 regarding energy efficiency of LED lighting? 13 A The projection of energy efficiency 14 improvement was long before 2002 that we have a 15 roadmap -- the industry had a roadmap. The roadmap 16 also had a theory called concept -- you know, what's 17 called efficacy for LEDs. I think in the time frame 18 of 2002, the industry was pretty clear in terms of 19 efficacy or efficiency projection of -- of 20 improvement. 21 Ever since 2002, yes, there's some 22 improvement from efficiency point of view, efficacy	67 1 lighting, white LED lighting particularly. 2 Q Was there anything else, in terms of 3 improvements, associated with providing white LED 4 lighting? 5 A I think, essentially, in my observation 6 since 2002, the growth of LED lighting, white LED 7 lighting particularly, is largely based on the 8 technology implementation for the light source cost 9 reduction. But there's improvement efficiency as 10 well, but that's largely associated with ability to 11 utilize the lower cost, you know, process of 12 manufacturing. 13 And, again, theoretically, long before 14 2002, the POSA or the industry understand what LED 15 could do. 16 MS. SHAH: We can take a break. Let's -- 17 I'm going to need slightly longer breaks. I have 18 this sort of throat issue. So if we can actually 19 take maybe a half hour break, if that's fine, and 20 then we'll take a shorter -- we may have to chunk up 21 the day a little bit because my throat's only going 22 to go so long.
66 1 point of view. More importantly is the price 2 reduction. 3 You probably understand that in order to 4 produce very efficient or high efficacy light 5 sources, even we couldn't do it in 2002. It would 6 be too costly. So theoretically we knew, industry 7 knew what a projection is for efficacy. It's 8 practical hard work, making the product, that is the 9 main improvement since 2002. 10 Q Since July 2002, were there any advances 11 regarding the provision of white LED lighting? 12 A I didn't understand the word you used, 13 "provision of white LED lighting." What does that 14 mean? Can you -- 15 Q Let me repeat the question -- or let me 16 rephrase the question. 17 Since July 2002, were there any advances 18 regarding the ability to provide white LED lighting? 19 A Yeah, there's improvement. 20 Q How so? 21 A The product -- the product -- the cost 22 reduction in -- that help the -- populate LED	68 1 If that's fine for you guys, then -- if a 2 half hour works, then a half-hour break. 3 MR. FITZSIMMONS: Half hour works. 4 MS. SHAH: Thank you. 5 (Recessed at 11:11 a.m.) 6 (Reconvened at 11:48 a.m.) 7 BY MS. SHAH: 8 Q Can you pull your declaration -- your reply 9 declaration in the 111 -- I'm sorry. Give me one 10 second -- your reply declaration, Exhibit 1051, from 11 IPR 2023-00197? 12 A Yes. 13 --- 14 (Exhibit 1051 was presented to the 15 witness.) 16 --- 17 BY MS. SHAH: 18 Q And if you could turn to paragraph 65. 19 A I'm here. 20 Q Can you look at the last sentence of 21 paragraph 65, please, and if you could read that 22 last sentence out loud?

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69 1 A "Both Dr. Turk and the Board did not take 2 into account that 'directional light sources,' as 3 cited [sic] in claim [sic]...and as to any light 4 sources [sic] having directionality, need an optical 5 element to provide light beams aimed at particular a 6 [sic] angles, as explained below." 7 Q Can you point to where in the Beam 8 reference there is support for the notion that all 9 of the light sources have directionality? 10 A Claim 97. Claim 97, 61, 62 -- 11 THE COURT REPORTER: I'm sorry. I can't 12 hear you. 13 THE WITNESS: It was in the -- the citation 14 Exhibit 1001, which is patent -- '503 patent. What 15 I've cited here is column 97 and 61 to 66. For 16 whatever reason, I'm missing one page -- oh, here. 17 I'm sorry. 61 to 66. 18 Well, this claim is -- what I really should 19 start at is: "A vehicle lighting [sic] system 20 comprising: One or more headlamps affixed to a 21 vehicle, each headlamp including at least a [sic] 22 three directional light sources aimed at different	71 1 to" -- "incoming radiation, employing a sensor to 2 determine the location of light sources forward to 3 [sic] the apparatus and using that information to 4 control intensity, and/or...angular positions [sic], 5 of one or more narrow-angle microbeams..." 6 This is an indication -- narrow angle 7 certainly is directional, and position is -- angular 8 position means specific position. 9 BY MS. SHAH: 10 Q So based on your reading of the abstract in 11 Beam, are light sources different than microbeams? 12 MR. FITZSIMMONS: Objection. Form. 13 THE WITNESS: Beam disclosed micro- -- 14 microbeam sources, which is the light source, 15 consist of the meter and spatial light modulator 16 that forms the narrow-angle directional light beams, 17 function as directional light source as claimed in 18 '503 patent. 19 BY MS. SHAH: 20 Q Yeah, I'm asking you in regards to the Beam 21 reference alone and specifically the abstract that 22 you just read from.
70 1 angles relative to the vehicle..." 2 BY MS. SHAH: 3 Q Yes, I understand that. 4 Where in the Beam reference can you provide 5 support for the idea that all of the light sources 6 in Beam are directional light sources? 7 A Oh, I thought your question is you want me 8 to read 65, paragraph 65, which what I read is the 9 directional light sources is what is cited in the 10 claim. 11 Now your following question is you want me 12 to point out where in Beam the light source 13 disclosure is directional; am I correct? 14 Q Yes. 15 A Okay. May I pull out my Beam reference? 16 Q Yes. Absolutely. 17 --- 18 (Exhibit 1005 was presented to the 19 witness.) 20 --- 21 THE WITNESS: Okay. In abstract of the 22 Beam patent, if I can read it to you, is: "A sensor	72 1 In the abstract of the Beam patent, there 2 is a description of microbeams and then the usage of 3 light sources. Are those two different -- are they 4 different in your mind, a light source and a 5 microbeam? 6 A Micro- -- 7 MR. FITZSIMMONS: Objection. Form. 8 THE WITNESS: Microbeams disclosed by Beam 9 is the result of microbeam sources. Microbeam 10 sources is a type of a directional, narrow-angle, 11 aimable light sources. 12 BY MS. SHAH: 13 Q What are microbeam sources? 14 A Beam disclosed the microbeam sources 15 consist of emitters, including various of emitter 16 sources, such as incandescent, HID, and LED, et 17 cetera, and the optical elements, namely, spatial 18 light modulator, to be able to control 19 directionality and angular spread. That is 20 microbeam sources. 21 Q Can you point to where in Beam there is the 22 description of a microbeam source as the combination

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73 1 of emitter and an optical element? 2 A Beam column 4 -- or column 8, line 6: 3 "Light sources [sic] include [sic]...array of 4 individual" -- individual -- "independently 5 controllable microbeam sources selected from...group 6 consisting of light-emitting diodes, lasers, 7 incandescent lamps, arc lamps and electroluminescent 8 lamps, and spatial light modulator selected from the 9 group consisting of digital mirror devices, liquid 10 crystal devices, and grating light valves for 11 selectively controlling the intensity of individual 12 microbeam source [sic] in said array." 13 Q Is it your understanding that all of the 14 embodiments of the Beam reference require the light 15 source to include a spatial light modulator? 16 MR. FITZSIMMONS: Objection. Form. 17 THE WITNESS: It is my understanding the 18 Beam's disclosed the embodiment that include -- in 19 all embodiment include microbeams sources. The 20 Beam's disclosure microbeam sources are these 21 narrow-angle individually or grouply controlled 22 aimable light sources that include the emitter	75 1 would understand reading Beam's and 401 cannot be 2 only emitters because emitter has no directionality 3 and micro -- microbeam sources as directional is 4 narrow-angle direction; therefore, the 401 is the 5 combination of the emitter and spatial light 6 modulator. 7 BY MS. SHAH: 8 Q And where in the Beam description regarding 9 the figure 4 embodiment is there a discussion 10 regarding directionality of the light source? 11 A Directionality is the essential disclosure 12 invention for this patent, and in order to produce 13 microbeam, you have to have a directionality as 14 described in the abstract as well as the column 8, 15 when I read it, and figure 4 just simply says you 16 replace two of them by one. 17 In my opinion, that's combined, these two 18 elements, emitters and spatial modulators, into one, 19 namely, 401. 20 Q Is there something you can point to in the 21 description of the figure 4 embodiment that support 22 your understanding that --
74 1 device -- emitting device and optical device. That 2 is my understanding. 3 BY MS. SHAH: 4 Q Can you explain where, with respect to the 5 figure 4 embodiment, there is a description of the 6 inclusion of a spatial light modulator in the Beam 7 reference? 8 MR. FITZSIMMONS: Objection. Form. Vague. 9 THE WITNESS: The figure 4 is embodiment 10 that is disclosed -- same concept using microbeam 11 sources, which, different from the previous 12 embodiment, figure 2, when the light sources is a 13 separate device -- light emitting device is separate 14 as 202 and spatial light modulator is 204, and the 15 purpose of either embodiment is to be able to, 16 according to Beam, to generate narrow-angle 17 individually or grouply controlled directional, 18 aimable sources, namely, microbeam sources. 19 Therefore, my understanding of figure 4 20 is -- is the same illustration for Beam's disclosure 21 where 401 is replaced of 202 in figure 2 and 203 22 function as micro- -- microbeam sources. The POSA	76 1 A Yes. 2 MR. FITZSIMMONS: Objection. Asked and 3 answered. Objection. Form. 4 THE WITNESS: Column 5, start from line 3, 5 and it describe the light source 401 as replacement 6 of other two, and it is also my understanding of 7 reading entire specifications and the claims, this 8 invention is to describe directional, aimable, 9 narrow-angle microbeams that can be individually 10 group controlled, and this disclosure is to disclose 11 a type of light sources, namely, microbeam sources, 12 that has that functionality. 13 Therefore, when I read column 5, the 14 description of figure 4 is a description of this 15 invention, that they replace two elements in figure 16 2 into one. 17 BY MS. SHAH: 18 Q Did you interpret the figure 4 embodiment 19 based on the claims of the Beam patent? 20 MR. FITZSIMMONS: Objection. Vague. 21 THE WITNESS: I interpret all the figures 22 based on the entire patent specifications, including

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77 1 claims. The abstract just highlight the invention 2 is directional, narrow-angle, aimable microbeams. 3 In order to do so, this patent disclose in the 4 specification and the claims how to form these 5 directional, individually controllable, narrow-angle 6 microbeams, and figure 4 is an illustration to show 7 that when the LEDs used without separate light 8 sources, these things can become one device. 9 BY MS. SHAH: 10 Q And you read the figure 4 embodiment to 11 include a spatial light modulator? 12 A Yes. A POSA would understand. My 13 understanding is this invention is about microbeam 14 source to form microbeams, and directionality and 15 individual controllability is essential feature 16 disclosed by this patent, and practically speaking, 17 the POSA would understand that emitters, such as 18 LEDs, can combine with spatial modulator to form one 19 device, namely, 401. 20 Q Is a microbeam the same as a microbeam 21 source in the Beam patent? 22 MR. FITZSIMMONS: Objection. Form.	79 1 These type of light sources are 2 directional. In addition, an abstract described how 3 the microbeam is formed. It's formed into -- it's 4 formed from a microbeam source, which is directional 5 sources. 6 BY MS. SHAH: 7 Q So you're interpreting the specification 8 based on the claim? 9 MR. FITZSIMMONS: Objection. Form. 10 THE WITNESS: I interpreted these -- the 11 statement I just made throughout the entire patent. 12 The whole patent disclose the concept of microbeams 13 and describe how the microbeam source is formed, 14 consist of what, emitting devices and optical 15 devices, in order to form narrow-angle, aimable, 16 independently controllable microbeams. The entire 17 patent is a description for such a feature. 18 BY MS. SHAH: 19 Q Can you explain to me your analysis as to 20 why in the figure 4 LED embodiment a person of 21 ordinary skill in the art would add a spatial light 22 modulator?
78 1 Objection. Asked and answered. 2 THE WITNESS: Microbeam is a description of 3 a light emission characteristics; namely, the 4 description is provided in Beam in abstract is a 5 narrow-angle position intensity controllable where 6 the microbeam is produced by a hardware, microbeam 7 source that include emission, emitting device, and 8 optical elements. 9 BY MS. SHAH: 10 Q Is the light source in Beam directional? 11 A Yes. 12 Q Please provide the support for that answer 13 within the Beam reference. 14 A Column -- 15 MR. FITZSIMMONS: Objection. Form. I 16 don't think there's actually a question pending. 17 THE WITNESS: Column 8, light source is 18 array of individual, independently controllable 19 microbeam sources selected from the group consisting 20 of emission devices and spatial light modulators, 21 and by reading this description in the claim, the 22 POSA would understand it.	80 1 MR. FITZSIMMONS: Objection. Form. 2 Objection. Mischaracterizes testimony. And 3 objection. Asked and answered. 4 THE WITNESS: As a person of skill of art, 5 reading the entire teaching of the patent, including 6 abstract, specification, and the claims, the 7 teaching of this disclosure is to produce 8 microbeams. In order to produce microbeams -- and 9 this disclosure describe a term "a microbeam 10 source," a microbeam source throughout reading the 11 entire patent, it's very clear to a POSA that the 12 concept of microbeam is a narrow angle to begin 13 with. 14 The light source without optical elements, 15 such as spatial light modulator disclosed in this 16 patent, is not narrow angle. It's not directional. 17 As such, figure 4 is indication that microbeam is 18 still formed by this disclosure or a microbeam 19 source is formed, for one. 20 BY MS. SHAH: 21 Q Why does -- what supports your 22 understanding -- strike that.

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81 1 What within the figure 4 embodiment itself 2 supports your understanding that that embodiment 3 teaches a directional light source? 4 MR. FITZSIMMONS: Objection. Asked and 5 answered. Objection. Form. 6 THE WITNESS: Figure 4 illustrate one of 7 the embodiments of this disclosure. Figure 4 forms 8 microbeams that is narrow-angle, directional, 9 individually controllable. As such, microbeam 10 source for me is clearly indicated in figure 4, 11 namely, 401. 12 BY MS. SHAH: 13 Q In the Beam reference, how is the 14 term "intensity" described -- I'm sorry. Strike 15 that. 16 In the Beam patent, please explain the use 17 of the term "intensity." 18 MR. FITZSIMMONS: Objection. Form. Vague. 19 THE WITNESS: In abstract, Beam stated: 20 Use the information to control the intensity, and/or 21 the angular position, of one or more narrow-angle 22 microbeams.	83 1 POSA would understand the light intensity is defined 2 as luminous flux per solid angle. It is common 3 measured unit. 4 Q I'm sorry. I asked you the question, 5 Dr. Jiao -- it's really a yes-or-no question -- does 6 the term "luminous flux" appear in the Beam patent? 7 MR. FITZSIMMONS: Objection. Asked and 8 answered. 9 THE WITNESS: The answer to that, the 10 intensity is defined as luminous flux per solid 11 angle. The words may not show, but intensity is 12 default of luminous flux per solid angle. 13 BY MS. SHAH: 14 Q Where is that intensity definition provided 15 in the Beam patent? 16 A This terminology is commonly known by POSA, 17 and, similarly, if I pick up any common metrics, you 18 don't need it to provide a definition. This is 19 description of the feature of this invention of a 20 light distribution; therefore, intensity is known. 21 It is plain, simple language. It's well-defined. 22 Q Does the Beam patent provide a specific
82 1 By reading this, it's microbeams is 2 controllable A, in its intensity; and, B, is for 3 angular or angular position. 4 BY MS. SHAH: 5 Q So intensity and angular position are two 6 different things, as described in the Beam patent? 7 A Intensity and angular position are two 8 parameters or characteristic of microbeams. 9 Intensity described luminous flux in that particular 10 angle, and in this case, it's very narrow angle, the 11 intensity in that narrow-angle range. Angular 12 position is where this narrow-angle beam is aimed 13 to, this directionality: One is the level of light 14 output; one is direction of light output. 15 Q Does the term "luminous flux" appear in the 16 Beam patent? 17 A The luminous flux -- the intensity is 18 interpretation or is definition of luminous flux per 19 solid angle. A POSA would know what intensity means 20 for description in this patent as well as 401 21 patent -- as well as the '503 patent. It's metrics 22 that we commonly use in the lighting field. Any	84 1 definition of intensity? 2 A Does Beam patent describe -- provide a 3 definition of intensity? It is provided the 4 terminology that's well-known. There's -- plain, 5 simple language need not to be defined. There's no 6 written definition what is intensity in this patent, 7 but a POSA would know what is intensity. 8 Q Is there only one universal definition for 9 the term "intensity" in the field of optics? 10 MR. FITZSIMMONS: Objection. Form. 11 THE WITNESS: That question is not clear. 12 In the field of lighting or field of optical -- of 13 optics? which one? 14 BY MS. SHAH: 15 Q Let's start out in the field of lighting. 16 Is there only one universal definition for 17 the term "intensity"? 18 MR. FITZSIMMONS: Objection. Form. 19 THE WITNESS: In the field of lighting or 20 illumination, illuminating field, there's only one 21 term, intensity, that is defined in the 22 international standards, and any POSA would know

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85 1 what is definition of intensity as associated with 2 unit how to measure intensity. 3 BY MS. SHAH: 4 Q I understand. I'm not asking you 5 associated in the context of measuring intensity. 6 I'm talking about the word, the term "intensity." 7 Is there only one universal definition for 8 the term "intensity" in the field of lighting? 9 MR. FITZSIMMONS: Objection. Form. 10 Objection. Asked and answered. 11 THE WITNESS: Yes. 12 BY MS. SHAH: 13 Q And what is that definition for the 14 term "intensity"? 15 A In the lighting field, intensity is defined 16 as the luminous flux per solid angle. 17 Q And in the field of optics, is there one 18 universal definition for the term "intensity"? 19 MR. FITZSIMMONS: Objection. Form. 20 THE WITNESS: If in the field of optics 21 that optics -- optic is devices. Optic is the study 22 of light. In field optics, if the -- if the field	87 1 (Whereupon, at 12:28 p.m., the 2 proceedings in the above-entitled matter were 3 recessed, to reconvene at 1:14 p.m., this same day.) 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
86 1 of optics is related to or study of the lighting, 2 that intensity definition is equally universal and 3 unique. 4 BY MS. SHAH: 5 Q So is it your answer that in the field of 6 optics, there is only one universal definition of 7 intensity? 8 MR. FITZSIMMONS: Objection. Form. 9 Objection. Asked and answered. 10 THE WITNESS: When you use optics in the 11 application for lighting -- the optics has many 12 different aspect. Optics could mean politically an 13 image, what optics look like. And in the lighting 14 field, when optical elements or optics used for the 15 application of a lighting, yes, the intensity is 16 universally defined unique terminology. 17 MS. SHAH: Perhaps we can take a break. 18 Shall we break for lunch? What would you like? 30 19 minutes, or how long would you like for that break? 20 MR. FITZSIMMONS: Can we do 40 minutes? 21 MS. SHAH: Sure. That will take us to 22 1:10.	88 1 2 AFTERNOON SESSION 3 (1:14 p.m.) 4 CONTINUED EXAMINATION BY COUNSEL FOR 5 THE PATENT OWNER 6 BY MS. SHAH: 7 Q Dr. Jiao, if you could turn to claim 42 of 8 the '503 patent. 9 A Okay. I'm here. 10 Q Can you read the limitation that starts -- 11 actually: "One or more light modifying..." till the 12 end of the claim? 13 A "One or more light modifying elements 14 provides [sic] in the path of the [sic] light 15 emitted from at least one of the light [sic] 16 sources, further controlling" -- at least one of the 17 light characteristics of -- "at least one of the 18 light [sic] sources" -- "light [sic] source; 19 wherein...control" -- continue? 20 Wherein...control of the light sources and 21 light modifying elements results in -- a specified 22 emitting light-source light characteristic, where

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89 1 said -- emitted light-source light characteristics 2 include at least one of the direction, intensity, 3 beam spread, spatial light distribution or spectral 4 light distribution. 5 Q So based on the claim limitation that you 6 just read, would it be your understanding that 7 there's a difference between intensity and spatial 8 light distribution in claim 42? 9 MR. FITZSIMMONS: Objection. Form. 10 Sangeeta, you also cut out there a little 11 bit. I don't think we picked up the whole question. 12 MS. SHAH: Okay. I can repeat it. 13 BY MS. SHAH: 14 Q Based on the limitations you read of claim 15 42, would it be your understanding that there is a 16 difference between intensity and spatial light 17 distribution in claim 42? 18 A It is my understanding these are a list of 19 characteristics of light source that include 20 intensity and the spatial light distribution. It is 21 two different characteristics, yes. 22 Q Do you see anything in claim 42 that talks	91 1 Q I'm sorry. I wasn't able to pick that up. 2 I don't know if the court reporter was able to pick 3 it up, but you sort of faded at the end. 4 MR. FITZSIMMONS: The real time did pick it 5 up, so the court reporter can read back if you need. 6 MS. SHAH: Okay. All right. 7 BY MS. SHAH: 8 Q So your understanding of intensity isn't 9 modified by the form in which claim 42 describes 10 intensity; is that correct? 11 MR. FITZSIMMONS: Objection. Form. 12 Mischaracterizes the claim. 13 THE WITNESS: I don't think I understand 14 your question. 15 BY MS. SHAH: 16 Q Is it true that you apply the same 17 definition of intensity to all claims of the '503 18 patent? 19 A It is true. 20 Q Is there something within the claims of the 21 '503 patent you can point to that relates to 22 measuring intensity as opposed to controlling
90 1 about measuring intensity -- 2 A Claim -- 3 Q -- as opposed to -- I'm sorry -- as opposed 4 to controlling intensity? 5 MR. FITZSIMMONS: Objection. Form. 6 THE WITNESS: What I read here is claim 42 7 stated "control a light source," and the light to 8 modify elements results in the specified light -- 9 emitted light source light characteristics, 10 including the list of what I just read: intensity, 11 spatial light modulation. 12 There's a control to the -- to do these -- 13 to do the light source and light modifying elements 14 results in specified emitted light source light 15 characteristics. 16 BY MS. SHAH: 17 Q So in the context of claim 42, what is the 18 meaning of intensity? 19 A It is meaning of intensity itself. I 20 described it multiple times. Intensity is luminous 21 flux per solid angle. So it's the strength of the 22 light output in that particular angle.	92 1 intensity? 2 MR. FITZSIMMONS: Objection. Form. 3 Compound. 4 THE WITNESS: The claims -- the one I just 5 read is modifying the -- light -- light-source 6 emitting the light -- characteristics. All these 7 characteristics, including intensity, direction, 8 imposes -- in my mind, they all measure -- they're 9 all measurables. All of them are objectively 10 measured characteristics. 11 BY MS. SHAH: 12 Q The limitations you read, are they about 13 controlling the light source? 14 MR. FITZSIMMONS: Objection. Vague. 15 THE WITNESS: The limitation I read is the 16 result of a -- controlling the light source in terms 17 of their characteristics listed here being a 18 modifier. 19 BY MS. SHAH: 20 Q If you can pull your reply declaration in 21 the 119 -- I'm sorry -- in the 197 IPR. 22 A Okay.

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93 1 Q Let me know when you have that. 2 A I have it. 3 Q If you can turn to page 44 of that 4 declaration. 5 A Okay. 6 Q There's a heading that says: 7 "Beam-Thominet's" -- 8 THE COURT REPORTER: I'm sorry. You broke 9 up. 10 BY MS. SHAH: 11 Q There is a heading B on page 44 that starts 12 off with: "Beam-Thominet's automotive adaptive 13 headlight system..." 14 Do you see that? 15 A I do. 16 Q Can you describe for me the hardware and/or 17 software of Beam-Thominet that is being described in 18 Section B on page 44. 19 A The description of a combined arts 20 Beam-Thominet in the perspectives of hardware and 21 software, I provide a detailed explanation in my 22 first declaration. I can go through the paragraph,	95 1 The software combination, Beam disclosed 2 all these individual microbeams can be individually 3 or group controlled. Similarly, Thominet disclosed 4 these narrow-angle aimed LED light sources can be 5 divided into sectional, or sectional, and which is 6 where the similar of -- idea of group control. So 7 the combination software is to make the combined 8 system with adaptations of individual, a group, or 9 sectional disclosed by both arts -- both art, both 10 references. 11 BY MS. SHAH: 12 Q So with reference to the Section B that 13 begins on page 44, you're referring to the 14 combination of all the hardware and all the software 15 from Beam-Thominet or some specific aspects of the 16 hardware and software from those two references? 17 MR. FITZSIMMONS: Objection. Form. 18 Mischaracterizes testimony. 19 THE WITNESS: Your last question is asking 20 me to describe, in the context of combination, would 21 a POSA see the hardware combination as well as 22 software combination. That's how I respond to your
94 1 find the word citation in my first paragraph, 2 describe such combination. 3 Q And I'm trying to understand, in the 4 context of this reply, what specific combination of 5 hardware and/or software for Beam-Thominet is being 6 discussed here. 7 MR. FITZSIMMONS: Objection. Form. Vague. 8 THE WITNESS: The context of this 9 combination is both references, both arts disclose 10 adaptive headlighting system, and in my declaration, 11 I provide -- first declaration I provide explanation 12 how the POSA would combine these two arts in the 13 aspect of hardware, as well as the software. 14 In the highlight of the combination of the 15 hardware is such that Thominet has these more 16 explicitly described, narrow-angle, directional, 17 aimable light sources on the curved substrate. And 18 the combination is to use this -- this curved 19 substrate in the combined system to form, again, 20 narrow-angle, directional -- more than three aimable 21 light sources to form adaptive light beam pattern as 22 essential hardware combination.	96 1 last question. Again, I also said in my first 2 declaration I provide explanation of such 3 combination. 4 BY MS. SHAH: 5 Q Did you only provide one combination for 6 Beam-Thominet in your original declaration? 7 MR. FITZSIMMONS: Objection. Form. 8 THE WITNESS: What does a one combination 9 mean? 10 BY MS. SHAH: 11 Q Is there one singular combination of the 12 Beam teachings coupled with the Thominet teachings 13 in your original declaration? 14 MR. FITZSIMMONS: Objection. Form. 15 THE WITNESS: I still don't think I 16 understand your question. Do you want to point out 17 to me where in my first declaration I described such 18 combination? I don't remember ever using the 19 word "one combination," or "singular combination." 20 Just point to me, where did I describe Beam-Thominet 21 combination? 22 BY MS. SHAH:

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97 1 Q Why don't you go ahead and pull your 2 original declaration. 3 --- 4 (Exhibit 1003 was presented to the 5 witness.) 6 --- 7 MR. FITZSIMMONS: Sangeeta, just for the 8 record, this is Exhibit 1003 in the 197 proceeding 9 that Dr. Jiao now has. 10 MS. SHAH: Thank you. 11 THE WITNESS: In this declaration, I have 12 Section X that describe the combination of a Beam 13 and Thominet that I, in my description, renders 14 obviousness of a claim in this particular proceeding 15 is 20, 24, 25th. Yet your previous question was 16 claim 43, isn't it? 17 So was the previous question regarding the 18 combination -- what claim elements are you referring 19 to? Because -- 20 BY MS. SHAH: 21 Q No, I'm not asking with respect to a 22 specific claim.	99 1 that page. That will be page 100. 100. 2 All right. In page 100, my first 3 declaration, paragraph 184, with the subtitle is 4 what I described of my declaration of claim elements 5 20.9: "The processor, in communication with at 6 least the sensors and the control circuitry, 7 configured to: Process the sensor data to 8 determine, within a field-of-view, at least a first 9 subsection including a detected vehicle." 10 And in this subsection, I provide the 11 explanation of such combination. 12 Q And the combination you're referring to in 13 that subsection includes what specific hardware and 14 software from the Beam and Thominet references? 15 MR. FITZSIMMONS: Objection. Form. Vague. 16 THE WITNESS: This subsection is to argue 17 the obviousness of the claim elements 20.9. What I 18 state in my declaration is stating how the processor 19 work in the combined system, and I was pretty 20 clearly stated in paragraph 184. 21 The next element is also described in 22 paragraph 186, and the next one -- next element
98 1 A Okay. 2 Q I'm asking sort of more generally with 3 respect to that -- I mean, you can talk about the 4 section that I was talking about with respect to the 5 reply declaration. I'm trying to understand, with 6 respect to the reply declaration, that Section B on 7 page 44, which Beam-Thominet combination is that in 8 reference to? 9 MR. FITZSIMMONS: Objection. Form. Vague. 10 THE WITNESS: 29 -- well, this -- page 44 11 on my reply declaration, Section B is titled -- and 12 this particular combination is reference to the 13 claim 20 -- claim elements 20.9 till 20.13. So I 14 can go back to my first declaration, where I 15 provided the combination how these two -- two 16 referenced combination rendered obviousness claims 17 in 20.9 to 20.13. 18 BY MS. SHAH: 19 Q If you could do that, that would be 20 helpful. Thank you. 21 A Sure. That will be, in my first 22 declaration, Section X, subsection B-X. I can go to	100 1 is -- claim elements 20.11, which I described in my 2 paragraph 188, and claim elements 20.12 I explain it 3 in my paragraph 190, such combination. Lastly, 4 element 20.13, I also provided description in my 5 paragraph 192. 6 Overall, these description provide in the 7 combined system how the processor is used. The 8 claim -- 9 BY MS. SHAH: 10 Q Will you turn to paragraph 164 of your 11 declaration, your original declaration, 12 Exhibit 1003. 13 A 164? 14 Q Yes. 15 A Okay. 16 Q Does the section of your reply that we 17 looked at on page 44, Section B of your reply, does 18 that cover what is originally discussed in paragraph 19 164 of your reply -- I'm sorry -- of your original 20 declaration? 21 MR. FITZSIMMONS: Objection. Form. 22 THE WITNESS: My original declaration,

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101 1 paragraph 164, as you can read, is the description 2 of hardware implementation. 3 My reply declaration, page 44, Section B, 4 is specifically addressing these claim elements I 5 labeled 20.9 to 20.13 is the control portion of the 6 claims, which I pointed to you earlier. That was in 7 my declaration in various of paragraph to disclose 8 how each claim elements were disclosed by Beam or a 9 combination Beam and Thominet. 10 BY MS. SHAH: 11 Q So are you relying on -- for purposes of 12 Section B of the reply declaration, are you relying 13 on the software of the Beam reference or the 14 software of the Thominet reference? 15 A The description that I prescribe -- 16 provided in my first declaration, I think 17 elements -- the elements I disclosed, I described 18 what software disclose -- software portion of 19 control capability disclosed by these references. 20 And in my declaration, these elements were disclosed 21 by Beam. 22 So in the combined system, these	103 1 Q In the section that you're describing on 2 page 44, under the heading B, does that include any 3 hardware from Thominet? 4 MR. FITZSIMMONS: Objection. Form. Vague. 5 THE WITNESS: What I described in page 44, 6 this subsection is further clarification that I 7 provide in my first declaration, Section X, 8 regarding this combined art. To address the 9 specific elements that listed in my second applied 10 declaration is to provide further clarification 11 regarding Dr. Turk's argument in terms of how these 12 control elements of combined arts work, and in terms 13 of control, in this combined art, in the -- in the 14 combined references, as I explained it to -- in 15 detail in my first declaration, and these claim 16 elements were covered by Beam. 17 So if I could simplify the answer, to 18 achieve these controlled element result to render 19 the obviousness for these claim elements, these are 20 mainly software combination or software work. 21 BY MS. SHAH: 22 Q So, then, under the heading B on page 44 of
102 1 control-related elements covers claims 20.9 to 2 20.13, they're disclosed by Beam. 3 Q So, then, why does the heading: 4 Beam-Thominet's automotive adaptive headlight 5 system," why does it refer to Thominet also? What 6 aspects of the Thominet reference are being included 7 in that heading? 8 MR. FITZSIMMONS: Objection. Form. 9 Objection. Multiple compound questions. 10 THE WITNESS: It is -- 11 MR. FITZSIMMONS: Objection. Also 12 mischaracterizes the testimony and the exhibit or -- 13 excuse me -- yeah, the declaration. 14 THE WITNESS: This page 44, Section B is 15 the reply declaration that is for clarification what 16 I provided in my first declaration, Section X, and 17 which is titled: "The combination of Beam and 18 Thominet renders" these claims, including claim 19 20 -- where consistently used my second declaration, 20 I used the same heading and made further 21 clarification. 22 BY MS. SHAH:	104 1 your reply declaration, you're relying on software 2 teachings from Thominet? 3 MR. FITZSIMMONS: Objection. Form. 4 Mischaracterizes witness's testimony. 5 THE WITNESS: My heading is to describe a 6 combined reference that was provided in my first 7 declaration, and each element of the claim 20 listed 8 in this subsection, the description in the combined 9 art were provided in my first declaration, and each 10 of them -- I just went back. I showed you. Each of 11 them were based on Beam's disclosure, related these 12 specific elements. 13 BY MS. SHAH: 14 Q So, then, why does the heading say, 15 "Beam-Thominet"? 16 MR. FITZSIMMONS: Objection. Asked and 17 answered. Objection. Form. 18 THE WITNESS: I answered that for the 19 reason that this is a combined art argument in my 20 first declaration, Section X. 21 BY MS. SHAH: 22 Q So I still don't understand.

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105 1 What aspects of the Thominet reference are 2 being -- are part of the analysis of Section B on 3 page 44? 4 MR. FITZSIMMONS: Objection. Form. 5 Objection. Asked and answered. And objection. 6 Mischaracterizes previous testimony. 7 THE WITNESS: My answer, one more time, is 8 the heading is to further clarify what I provided in 9 my first declaration, Section X, which is combined 10 art. And this further clarification specifically 11 point out several claim elements that Dr. Turk has 12 arguments regarding my first declaration. I made a 13 further clarification, and these clarification is 14 consistent with my first declaration, and these 15 elements of disclosure come from Beam. 16 The heading is consistent from my first 17 declaration. That's the reason it's 18 "Beam-Thominet." 19 BY MS. SHAH: 20 Q So while the heading B is: 21 "Beam-Thominet's automotive adaptive headlight 22 system," you're relying exclusively on Beam -- on	107 1 said Exhibit 1003, but then you also said his reply 2 declaration? 3 MS. SHAH: Yeah. I want to him to 4 basically compare. 5 BY MS. SHAH: 6 Q So the question is in reference to the 7 hardware implementation that's referred to in 8 paragraph 164 of the original declaration and trying 9 to locate in the reply declaration the aspects of 10 that declaration that cover this hardware 11 implementation described in paragraph 164. 12 A To answer your question, that further 13 clarification for what I described in my first 14 declaration regarding this combined references, 15 specifically hardware portion, I made a further 16 clarification in my second declaration -- or reply 17 declaration -- at page 38 that Section A is to 18 describe this combined art -- combined references. 19 Which is -- is consistent with I provided in my 20 first declaration for the combination. 21 Q So where in your reply declaration do you 22 describe the hardware implementation referred to in
106 1 the teachings of the Beam patent? 2 MR. FITZSIMMONS: Objection. Form. 3 Mischaracterizes testimony. 4 THE WITNESS: The heading B on page 44 is 5 specific clarification for several '503 claim 6 elements, which are listed here, claim 20.9 to 20.13 7 and 59.7. And I also provide my response to you 8 that these claims -- the description how these claim 9 elements being covered or disclosed were provided in 10 my first declaration. I went through each of them, 11 and I explained to you how each of claim elements 12 was disclosed by this combined art. 13 In this particular case, these elements 14 were covered by Beam. 15 BY MS. SHAH: 16 Q Turning back to the paragraph 164 of your 17 original declaration, Exhibit 1003, do you address 18 this hardware implementation in your reply and, if 19 so, where? In your reply declaration. Sorry. 20 MR. FITZSIMMONS: Objection. Form. 21 Compound. 22 Sangeeta, I just want to be clear. You	108 1 paragraph 164 of your original declaration? 2 A It's starting from page 38, Section A, 3 paragraph 62, and throughout the whole section, I 4 prescribe [sic] the further clarification how the 5 hardware combination occurred. 6 Q But the hardware combination doesn't apply 7 to Section B on page 44? 8 MR. FITZSIMMONS: Objection. Form. 9 Mischaracterizes testimony. 10 THE WITNESS: What I said, Section B is -- 11 is part of the ground that we argued as Section X, 12 the first declaration. The first declaration 13 combining these two references covers these claim 14 elements that I listed in first declaration, where 15 my second, or reply declaration, further clarified 16 any further argument regarding my first declaration, 17 which I group in a way, A or B, on page 44. It 18 happened to be B. It happened to specifically point 19 out these claim elements 20.9 to 20.13. These are 20 controlled elements related arguments. 21 As I stated, my first declaration provide 22 the description how these control elements works in

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109 1 combined. In these element -- I'm sorry. In this 2 claim elements, Beam's disclosed it, each of them as 3 stated in my first declaration. 4 BY MS. SHAH: 5 Q So based on your looking at your reply 6 declaration, where do you separately discuss 7 additionally or alternatively incorporating known 8 components? 9 MR. FITZSIMMONS: Objection. Form. 10 Objection. Mischaracterizes testimony. 11 THE WITNESS: I do not think I understand 12 your question, and my first declaration provide 13 description for the combination of the two 14 references. I further described the combination 15 including the software aspect and hardware aspect in 16 my declaration. Therefore, I didn't quite 17 understand what your question is. 18 BY MS. SHAH: 19 Q So I'm trying to understand, in your reply 20 declaration, is there a section that talks about the 21 hardware implementation that is first laid out in 22 paragraph 164 of your original declaration?	111 1 disclosed by these arts. 2 I also have a subsection on page 51. 3 That's reply declaration, paragraph 84. That is 4 further clarification for the combined references in 5 the hardware aspect. 6 Q And in that combination of the hardware 7 implementation, are you adding the Thominet 8 semiconductor light sources or substituting the 9 Thominet semiconductor light sources? 10 MR. FITZSIMMONS: Objection. Form. 11 Objection. Mischaracterizes testimony. 12 THE WITNESS: Can you repeat your question 13 again? Because I only heard one word, "substitute." 14 What was the word? Replacing, or can you repeat? 15 BY MS. SHAH: 16 Q So let's go back to your original 17 declaration. Paragraph 164 specifically talks about 18 "Additionally or alternatively." I won't read the 19 whole paragraph. 20 A Okay. 21 Q Actually, can you read paragraph 164 of 22 your -- first sentence of your original declaration?
110 1 MR. FITZSIMMONS: Objection. Form. 2 There's no question pending. 3 THE WITNESS: As I respond to that 4 question, start from page 38, Section A, paragraph 5 32 [sic]. These are the further clarifications the 6 combinations specifically related to the hardware 7 portion. 8 BY MS. SHAH: 9 Q This is in your reply declaration? 10 A Correct. 11 Q And, again, we're talking about 12 Exhibit 1051 of the 00197 IPR? 13 A Correct. 14 Q Okay. Can you point to specifically what 15 aspects of paragraph 32 relate back to the hardware 16 implementation? 17 A Paragraph 62 is to describe these 18 directional light sources of each art, which is 19 further clarification what I've provided in my first 20 declaration and all the way till page 43. And I 21 specifically talk about how these -- more than -- 22 three or more directional sources are provided or	112 1 A "Second, additionally or alternatively, a 2 POSA would have sought to incorporate known 3 components (hardware implementation)...Thominet's 4 semiconductor light sources 10 on the curved" -- 5 curved "surface 12 (with" -- a directional -- 6 directionally -- "differently angled/aimed 7 semiconductor light sources 10 relative to the 8 vehicle...) into Beam's system...of light sources 9 401.)" 10 Q So with respect to the hardware 11 implementation that's being discussed in the reply 12 declaration, is it the addition of Thominet's 13 semiconductor light sources, or is it the 14 alternative of Thominet's semiconductor light 15 sources into Beam's system? 16 MR. FITZSIMMONS: Objection. Form. Vague. 17 Mischaracterizes testimony. 18 THE WITNESS: Both references disclosed 19 semiconductor light source that are narrow-angle, 20 directional, aimable. Thominet uses these aimable, 21 narrow-angle LED packages, per se, on a curved 22 substrate. Beam using these narrow-angle LED

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113 1 sources, directional sources on a flat substrate. 2 So person of ordinary skill in the arts 3 will understand that -- both LED, narrow-angle, 4 directional light sources. The only difference is 5 one is on a curved substrate by Thominet. One is 6 the flat substrate by Beam. So the combination, 7 relatively, is easy. It just make the directional 8 LED narrow-angle sources curved. 9 So the combined hardware is just curved 10 substrate, whether it's using LEDs that disclose 11 from figure point of view looks like a Thominet or 12 401 with LED with spatial light modulators on Beam. 13 A POSA will figure it out. Just make it a curve. A 14 POSA will figure it out easily. Just make the 15 substrate curved. 16 BY MS. SHAH: 17 Q So if you could go to paragraph 163 of the 18 original declaration. Does paragraph 163 refer to 19 what you describe as a software implementation? 20 A Yes. 21 Q And does paragraph 164 refer to what you 22 describe as the hardware implementation?	115 1 disclose similar things, but in case the patent 2 owner's not clear that Beam's disclosure covers 3 these elements, the Thominet's make it even clearer. 4 Therefore, I used the word "additionally/ 5 alternately," just make that narrow-angle light 6 sources curved to address the clarity these combined 7 arts covers these claim elements. 8 BY MS. SHAH: 9 Q So in paragraph 164 -- is the description 10 in paragraph 164 meant to be the combination of the 11 software implementation of paragraph 163 and the 12 hardware implementation of paragraph 164? 13 MR. FITZSIMMONS: Objection. Form. 14 Objection. Asked and answered. 15 THE WITNESS: Paragraph 164 is description 16 for the combination from the hardware aspect, and 17 the hardware aspect is such these directional, 18 individually aimable light sources disclosed by Beam 19 on a flat substrate, disclosed by Thominet on a 20 curved substrate, the combined references, they're 21 similar light sources, narrow-angle directional 22 light sources, but on the curved substrate.
114 1 A Yes. 2 Q And the beginning of paragraph 164, when it 3 says: "...additionally or alternatively..." is that 4 to be understood to be, in one instance, the 5 addition of the software implementation, but 6 not hardware implementation and, in another 7 instance, the substitution or the alternative of the 8 hardware implementation for the software 9 implementation? 10 MR. FITZSIMMONS: Objection. Form. 11 Unclear question. Objection. Compound. 12 THE WITNESS: In my first declaration, I 13 stated Beam disclosed three or more directional, 14 aimable light sources to begin with. Just in case 15 the patent owner's argument is not clear, I 16 introduce another art, Thominet, which shows the 17 curved substrate with narrow beam directional light 18 sources. Just more clearly to show that in 19 Thominet's art -- Thominet reference, that aimable, 20 directional is more clearly indicated. 21 Therefore, my argument here is person of -- 22 skilled for arts will understand these two arts	116 1 The paragraph 164 described the motivation 2 to combine this is curved substrate have benefit, 3 but I used the word, "improving visibility," which I 4 further clarify in my second declaration, page 51, 5 Section A, 84. And there is a benefit to curve the 6 substrate in terms of improving the visibility, the 7 reason I stated in my second declaration -- further 8 explanation, not second declaration. 9 BY MS. SHAH: 10 Q Did that further explanation exist in the 11 original declaration? 12 MR. FITZSIMMONS: Objection. Form. 13 THE WITNESS: Yes. If I read paragraph 14 164, my original declaration says, clearly: The 15 combined result for different driving situations 16 improving visibility, thereby, safety. And I also 17 said that's a simple hardware combination. 18 And my second declaration, because I 19 believe there is argument from Dr. Turk that says I 20 did not describe how the curve substrate's 21 improving. To respond to this argument, I provide 22 my paragraph 64 -- 84 through 87 and to further

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117 1 clarify what I state in the first -- first 2 declaration. 3 BY MS. SHAH: 4 Q If you can turn to your reply declaration, 5 page 96. 6 A Yes, I'm here. 7 Q Is that section -- which implementation 8 does that section refer to? The hardware 9 implementation or the software implementation which 10 you describe in your original declaration? 11 MR. FITZSIMMONS: Objection. Form. 12 THE WITNESS: On page 96, the heading of 13 the Section 3, it's stating it's software and 14 hardware with -- the combination is Harbers's 15 software and hardware controls with Karlsson's 16 adaptive lighting system. So this is further 17 clarification what I described such combination in 18 my first declaration, again, both hardware and 19 software. 20 BY MS. SHAH: 21 Q If you can turn to paragraph 167 of your 22 reply declaration.	119 1 where I start subsection of a combination of 2 Karlsson and Harbers. Where these paragraphs, I had 3 explanation in terms of both aspect of software and 4 hardware. 5 BY MS. SHAH: 6 Q So the reply declaration, specifically this 7 paragraph 167, is referring to -- referring back to 8 teachings in all the paragraphs spanning 343 to 430 9 that deal with both software and hardware 10 modifications; is that right? 11 MR. FITZSIMMONS: Objection. Form. 12 Objection. Mischaracterizes testimony. 13 THE WITNESS: Well, in my reply 14 declaration, I provided the clarification what I 15 stated in my first declaration, and that was the 16 paragraph I cited in my page 97 of second 17 declaration. These paragraphs provides explanation 18 for the combination of software and hardware for 19 Karlsson and Harbers. 20 BY MS. SHAH: 21 Q I'm sorry. I'll repeat the question. So 22 the question, I'll repeat again, is: Paragraph 167
118 1 A Okay. 2 Q The last sentence there, would you read 3 that last sentence -- well, actually, I wanted to 4 ask you questions in reference to that last 5 sentence. 6 A On that paragraph, the last sentence is 7 starting from -- actually: "As explained in my 8 first declaration..."? 9 Q Yeah. 10 A Okay. "As explained in my First 11 Declaration, over the course of paragraph" -- 12 whatever that paragraph number is, 0343-0430, "the 13 teachings of Harbers's multiple-direction beam 14 segments may be implemented in Karlsson's systems 15 through either software or hardware modification 16 [sic]." 17 Q So paragraph 167 is in reference to almost 18 80 paragraphs that deal with both software and 19 hardware modifications? 20 THE COURT REPORTER: I can't hear you. 21 THE WITNESS: Yeah, I'm talking -- okay. 22 343 -- in my first declaration, page 182, that's	120 1 of the reply declaration is referring back to the 2 teachings in all the paragraphs spanning 343 to 430 3 that deal with both the software and hardware 4 modifications; is that correct? 5 MR. FITZSIMMONS: Objection. Form. 6 Objection. Mischaracterizes testimony. 7 THE WITNESS: What I responded to that is 8 that the second declaration, that paragraph that 9 you're pointing to -- section, actually, is provided 10 clarification reference to what I provide in first 11 declaration. Yes, there is multiple paragraphs. I 12 put the numbers in my second declaration. 13 BY MS. SHAH: 14 Q If you could answer the question yes or no. 15 I'll ask it one more time. 16 Is paragraph 167 of the reply declaration 17 referring back to the teachings in all the 18 paragraphs spanning 343 to 430 that deal with both 19 the software and hardware implementations? 20 A My answer -- 21 MR. FITZSIMMONS: Same objection. Asked 22 and answered. Objection. Form. Objection.

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121 1 Mischaracterizes testimony. 2 THE WITNESS: My answer, again, is with 3 further clarification referring to back my first 4 declaration. 5 BY MS. SHAH: 6 Q It's a yes-or-no question. 7 Do you have a yes-or-no answer? 8 MR. FITZSIMMONS: Objection. Form. 9 Objection. Asked and answered. 10 THE WITNESS: You pick up specific words 11 that cannot be just yes. You said referring to all 12 of them. I said it's referring with clarification. 13 So you want to take as a yes, take as a no, I do not 14 know how to respond. Because it's not completely 15 just go back. Instead, I provided further 16 clarification. 17 BY MS. SHAH: 18 Q And the clarifications you provided relate 19 to the software and hardware modifications described 20 in the paragraphs 343 to 430? 21 A Yes. 22 MR. FITZSIMMONS: Objection.	123 1 marked here as Exhibit 1011, and specifically column 2 5, lines 27 to 29; is that right? 3 MR. FITZSIMMONS: Objection. Form. 4 THE WITNESS: I have a reference in my 5 paragraph. The number is correct, Exhibit 1011, 6 column 5, 27 to 29. 7 BY MS. SHAH: 8 Q Can you explain to me how that section 9 supports your opinion that you've stated here in 10 paragraph 164? 11 A Let me see Harbers reference. 12 --- 13 (Exhibit 1011 was presented to the 14 witness.) 15 --- 16 THE WITNESS: Exhibit 1011. 17 MR. FITZSIMMONS: Dr. Jiao, now has 18 Exhibit 1011, Harbers reference. 19 MS. SHAH: Thank you. 20 THE WITNESS: Okay. What Harbers disclose 21 in column 5, stating: "...in practice, also 22 photopic and scotopic light beams preferably have a
122 1 THE WITNESS: That's correct. Yes. 2 BY MS. SHAH: 3 Q Can you turn to paragraph 164 of your 4 declaration -- your reply declaration, Exhibit 1051? 5 A Yes, I'm here. 6 Q If you can read that paragraph 164, please, 7 into the record. 8 A "Second, a POSA would have understood that 9 forward illumination of Karlsson's/Harbers's 10 headlights would be within a range of white color -- 11 a highly standardized and regulated parameter for 12 automotive lighting -- that would not result 13 in...'undesirable color shifts' purported by 14 Dr. Turk. While Harbers teaches to provide 15 different colored-LEDs, the light beams generated 16 from each colored light source have a 'more or less 17 'white' appearance. Thus, the rainbow color 18 spectrum shown in Dr. Turk's schematic of Karlsson's 19 modified light beam...is inaccurate." 20 Q So if you can -- strike that. 21 Paragraph 164 and your opinion in paragraph 22 164 relies on the Harbers reference which you have	124 1 broad spectrum, which light beams both have a more 2 or less 'white' appearance. The appearances [sic] 3 between photopic and scotopic light beams 4 corresponds, as it were, to a differences [sic] 5 between light beams having high and low color 6 temperature." 7 BY MS. SHAH: 8 Q So how do the lines that you've just read 9 from the Harbers reference, Exhibit 1011, address a 10 light beam: "Generated from each colored light 11 source"? 12 A A POSA would understand this statement is a 13 description of white light, and Harbers disclosure 14 is for headlights. A POSA would understand the 15 headlights is white, with a white color. 16 Specifically -- and Harbers disclosed this -- 17 white-colored light for headlamps can be formed by 18 colored LEDs. Yet, by reading this paragraph, a 19 POSA would understand low and high color temperature 20 meant the different shades of white. 21 For that reason, I've cited this paragraph 22 into my second declaration because this is very

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125 1 simple idea of you have a white light. You use the 2 combination for different-colored LEDs, you may form 3 different shades of white light: yellowish white or 4 bluish white. 5 In POSA's understanding in the lighting 6 industry and field, we understand these yellowish 7 light -- white, bluish white are measured or 8 described by color temperature. That's exactly what 9 Harbers says here: Higher or low -- high or low 10 color temperature. POSA would understand high color 11 temperature means the bluish and white; low color 12 temperature means the yellowish white. 13 Q I'm sorry. Are you saying, "yellowish 14 light"? 15 A White. Everything's white. White. 16 Q Just to clarify. Okay. Yellowish white. 17 A That's the lower color temperature or 18 actually it's lower correlated color temperature, 19 CCT. To simplify, people use the word color 20 temperature. 21 Q Is there a difference from a beam generated 22 from a colored light source in arranging the	127 1 well -- very well-standardized and regulated. 2 Regardless what kind of light sources you use, the 3 light being generated used, in automotive lighting 4 headlamps specifically, must be white, and a POSA 5 would understand. 6 Within the range of white, there is 7 different shades of white, more specifically 8 described by Harbers, such as lower color 9 temperature white, namely, yellowish white; or high 10 color temperature white, namely, bluish white. 11 Whatever the LEDs you use, you are generating white 12 light. There is no differences in term of defined 13 white light used for automotive lighting that must 14 be within the definition or regulation allowed white 15 range. 16 Q Can you turn to your reply declaration, 17 paragraph 132? 18 A Okay. I'm here. 19 Q Actually, let me shift your attention to 20 the Karlsson reference. If you can pull the 21 Karlsson reference, I have a question about that. 22 MR. FITZSIMMONS: Sangeeta, we've been
126 1 different-colored LEDs to reduce possible color 2 effects? 3 MR. FITZSIMMONS: Objection. Form. 4 Incomplete hypothetical. 5 THE WITNESS: I do not understand your 6 terminology of color effects. 7 BY MS. SHAH: 8 Q If you take a look at your paragraph 164. 9 A Yes. 10 Q Okay. Let me clarify the question then. 11 Is there a difference between a beam 12 generated from a colored light source in arranging 13 the different-colored LEDs? 14 MR. FITZSIMMONS: Objection. Form. 15 Incomplete hypothetical. 16 THE WITNESS: Well, you used the 17 word "beam." You use the inventor Beam or light 18 beam, when you use the word "beam"? 19 BY MS. SHAH: 20 Q Light beam. 21 A Oh. If it's white, the definition of 22 white, especially in automotive lighting, is a	128 1 going about an hour and 20. Maybe there's a good 2 stopping point sometime soon for a break? 3 MS. SHAH: Yeah. Let's just finish this 4 one line of questioning and then we can take a 5 break. 6 --- 7 (Exhibit 1010 was presented to the 8 witness.) 9 --- 10 MR. FITZSIMMONS: Dr. Jiao now has 11 Exhibit 1010 in front him, the Karlsson. 12 BY MS. SHAH: 13 Q Can you turn to column 14? 14 A I'm sorry. Page 14? 15 Q No. Column 14. 16 A Okay. 17 MR. FITZSIMMONS: In the Karlsson 18 reference? 19 MS. SHAH: The Karlsson, yes. 20 MR. FITZSIMMONS: Page 14, right? 21 MS. SHAH: Maybe it is page 14. Yeah. 22 Yes, page 14.

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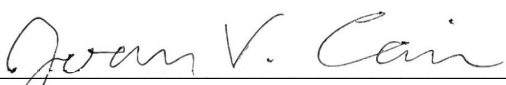
129 1 BY MS. SHAH: 2 Q Can you read lines 10-15 of page 14? 3 A Starting with: "It is possible..."? 4 Q Yes -- let's just start with: "In the 5 simplest embodiment," so it's one sentence. 6 A One more time. I didn't hear. 7 Q Just prior to that, starting with: "In the 8 simplest embodiment." 9 A "In the simplest embodiment, it is possible 10 to use light modulators which can be controlled in 11 two univocal positions, for example fully 12 light-transmitting or fully light-blocking. In a 13 more sophisticated embodiment it may be considered 14 to use light modulator [sic] which can be controlled 15 to transmit light to a specified degree, so that a 16 desired light intensity can be adjusted for each 17 individual spotlight beam 34 or for a group of 18 spotlight beams." 19 Continue? 20 Q No. 21 Can you explain to me how the -- the lines 22 that you've just read, how they -- sorry. Strike	131 1 beams disclosed by Karlsson can be individually or 2 group controlled in two parameters. You can control 3 the light level passthrough produced by the 4 spotlight beams by using attenuation approach or 5 turn it off, or you can also -- aimed in a different 6 direction. 7 MS. SHAH: Okay. Let's go ahead and take a 8 break. Can we take -- I don't know -- maybe a 9 20-minute break -- or 15 is fine. Is that 10 sufficient? 11 MR. FITZSIMMONS: 15 sounds good. 12 THE WITNESS: Sure. Thank you. 13 MS. SHAH: Thanks. 14 (Recessed at 2:36 p.m.) 15 (Reconvened at 2:57 p.m.) 16 BY MS. SHAH: 17 Q If you can turn to paragraph 87 of 18 Exhibit 1051. 19 A 87, right? 20 Q Yes. 21 A Yeah, I'm here. 22 Q Does paragraph 87 address distortions?
130 1 that. 2 With respect to the sentences that you just 3 read, the use of the word "degree," in your opinion, 4 does that term "degree" refer to amount or angle? 5 MR. FITZSIMMONS: Objection. Form. Scope. 6 THE WITNESS: It is continuation of the 7 phrase above that "to transmit light to a specified 8 degree." My understanding is the transmission 9 degree, level of the transmission. 10 BY MS. SHAH: 11 Q So, then, these sentences address light 12 transmission and not angular control? 13 A This particular parameter as disclosed by 14 Karlsson, which all these microbeam -- I'm sorry -- 15 those spotlight beams can be individually controlled 16 in both spatial distribution, which is angular, and 17 the emitted -- intense light emitted in testing, 18 namely, attenuation. You can attenuate them to 19 become weaker. 20 Q Could you repeat the last part of your 21 answer? I'm not sure the record is clear. 22 A What I believe I said is the spotlight	132 1 A I'm sorry. You used the word "distortion"? 2 Q Yes. 3 A Paragraph 87 that I further clarified the 4 hardware combination of Beam-Thominet, point to me, 5 where did I use the word "distortion"? 6 Q I don't know that you used the 7 word "distortion." This paragraph 87 relates to 8 distortion? 9 MR. FITZSIMMONS: Is that a question? 10 MS. SHAH: That is a question. 11 MR. FITZSIMMONS: Can you please rephrase 12 or restate? 13 BY MS. SHAH: 14 Q Does paragraph 87 of your reply 15 declaration, Exhibit 1051, discuss the idea of 16 minimizing distortion? 17 MR. FITZSIMMONS: Objection. Form. 18 THE WITNESS: Can you clarify? What did 19 you mean here, "distortion"? 20 BY MS. SHAH: 21 Q What does the term "distortion" mean to 22 you?

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133 1 A Distortion -- 2 Q In terms of optical performance, what does 3 the term "distortion" mean to you? 4 A Oh, in optical design term, distortion is 5 type of aberration, and this paragraph further 6 clarify what I said in the first declaration, is by 7 using combined hardware, namely, curved substrate, 8 will improve visibility because it makes optical 9 design easier, which I used -- the word here is 10 reducing aberration. I didn't specifically point to 11 what specific aberration. The POSA would know. 12 Q When you're analyzing what a POSA would 13 know, are you considering it from your perspective 14 back in July 2002? 15 MR. FITZSIMMONS: Objection. Form. Asked 16 and answered. 17 THE WITNESS: I did. The optical design of 18 lens design was textbook knowledge a POSA would know 19 in 2002, July 2002. 20 BY MS. SHAH: 21 Q So in reference to paragraph 87, when 22 you're talking about a -- that a POSA would have	135 1 disclose different variation of Beam patent for 2 desired driving or road condition, per se. 3 Q So do you know whether the Beam patent has 4 sensors to detect snow or fog? 5 MR. FITZSIMMONS: Objection. Asked and 6 answered. 7 THE WITNESS: I need to take a look. I do 8 not recall this specifically describe -- Beam -- I 9 do not recall Beam specifically described such 10 sensors specifically detecting the fog. I can take 11 a look. I do not recall. 12 BY MS. SHAH: 13 Q So following your review, were you able to 14 determine whether the Beam patent describes sensors 15 for detecting fog or snow? 16 A What I said is I don't recall there's a 17 sensing detect disclosure in Beam's patent. Beam 18 did describe in different weather conditions in 19 terms of providing desirable lights for fog, rain. 20 I don't recall there's a fog sensor. What I believe 21 is the sensing technology or information to detect 22 the fog is in the background information that I
134 1 understood using angular-sectional beam contributors 2 to improve optical performance, that's in relation 3 to your perspective as a POSA back in July 2002? 4 A What I described here is the hardware 5 combination with Thominet's curved substrate, and 6 the benefit to have a curved substrate in optical 7 design I further clarified, besides my first 8 declaration as stated, reducing aberration. That 9 was textbook information a POSA would know in 2002. 10 Q Can you switch over to the Beam reference, 11 the Beam patent reference? 12 A Okay. 13 Q Does the Beam patent have any sensors to 14 detect snow or fog? 15 A Beam has a sensing system to detect 16 different -- different light from entering the 17 sensing system. Specifically, I have to look 18 whether they specifically detect fog. I need to 19 take a look. I don't recall it specifically 20 mentioned fog. But the detection fog, I believe, is 21 pretty common background information. I cited it in 22 one of the background references, but Beam did	136 1 provide in my declaration, first declaration. 2 MS. SHAH: I don't have any other 3 questions. 4 MR. FITZSIMMONS: Well, let's take a 5 five-minute break. 6 (Recessed at 3:17 p.m.) 7 (Reconvened at 3:35 p.m.) 8 MR. FITZSIMMONS: No further questions. 9 You can close the transcript. 10 THE COURT REPORTER: Can I get your orders, 11 though? They do like your orders on the record. 12 MR. FITZSIMMONS: I think they should have 13 ours. 14 THE COURT REPORTER: We have a rough and 15 regular for the final. 16 MS. SHAH: Yeah, we'll want the same. We 17 want a rough and then we'll also want the final. 18 We'd probably prefer -- when is the earliest you 19 could get us a final? 20 THE COURT REPORTER: Tomorrow. 21 MS. SHAH: That's very easy. Thank you 22 very much.

Transcript of Jianzhong Jiao, Ph.D.
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35 (137 to 140)

137 1 MR. FITZSIMMONS: We'll take the same then. 2 (Signature having not been discussed, 3 the deposition of Jianzhong Jiao, Ph.D. was 4 concluded at 3:36 p.m. EST.) 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	139 1 I further certify that I am not related to 2 any of the parties to this action by blood or 3 marriage, I am not employed by or an attorney to any 4 of the parties to this action, and that I am in no 5 way interested, financially or otherwise, in the 6 outcome of this matter. 7 8 IN WITNESS WHEREOF, I have hereunto set 9 my hand and affixed my notarial seal this 29th day 10 of January 2024. 11 12 My Commission Expires: July 31, 2024 13 14 15  16 17 NOTARY PUBLIC IN AND FOR 18 THE DISTRICT OF COLUMBIA 19 20 21 22
138 1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC 2 I, JOAN V. CAIN, court reporter and Notary 3 Public within and for the District of Columbia do 4 hereby certify: 5 6 That Jianzhong Jiao, Ph.D., the 7 witness whose deposition is hereinbefore set forth, 8 was duly sworn by me before the commencement of such 9 deposition and that such deposition was taken before 10 me and is a true record of the testimony given by 11 such witness. 12 13 I further certify that the adverse 14 party, VOLKSWAGEN GROUP OF AMERICA, INC., was 15 represented by counsel at the deposition. 16 17 I further certify that the deposition of 18 Jianzhong Jiao, Ph.D., occurred at the offices of 19 Sterne Kessler Goldstein & Fox, P.L.L.C., 1101 K 20 Street, Northwest, Washington, D.C. 20005 on MONDAY, 21 January 29, 2024, commencing at 9:33 a.m. to 3:36 22 p.m.	

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