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Transcript of Jianzhong Jiao, Ph.D.

Date: August 23, 2023

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

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Conducted on August 23, 2023

1 (1 to 4)

1 UNITED STATES PATENT AND TRADEMARK OFFICE 2 BEFORE THE PATENT TRIAL AND APPEAL BOARD 3 -----x 4 VOLKSWAGEN GROUP OF AMERICA, INC., : 5 Petitioner : 6 vs : 7 YECHZKAL EVAN SPERO, : 8 Patent Owner : 9 -----x 10 U.S. Patent No. 9,955,551 to Spero 11 Case Nos. IPR2023-00315, IPR2023-00318 12 13 Oral deposition of 14 JIANZHONG JIAO 15 16 VIA VIDEO/TELECONFERENCE 17 WEDNESDAY, AUGUST 23, 2023 18 12:04 p.m. EASTERN TIME 19 20 Job No.: 504162 21 Pages: 1 - 99 22 Reported by: Lisa V. Feissner, RDR, CRR, CLR	3 1 A P P E A R A N C E S: 2 ON BEHALF OF PETITIONER: 3 JASON A. FITZSIMMONS, ESQUIRE 4 IAN SOULE, ESQUIRE 5 TREVOR M. O'NEILL, ESQUIRE 6 STERNE, KESSLER, GOLDSTEIN & FOX PLLC 7 1101 K Street NW 8 10th Floor 9 Washington, DC 20005 10 202.772.8701 11 jfitzsimmons@sternekessler.com 12 isoule@sternekessler.com 13 toneill@sternekessler.com 14 15 ON BEHALF OF PATENT OWNER: 16 ANDREW B. TURNER, ESQUIRE 17 BROOKS KUSHMAN P.C. 18 1000 Town Center 19 22nd Floor 20 Southfield, MI 48075 21 (248) 226-2707 22 aturner@brookskushman.com
2 1 2 3 Oral deposition of JIANZHONG JIAO, held 4 REMOTELY, via Zoom, on Wednesday, August 23, 2023, 5 pursuant to Notice, before Lisa V. Feissner, RDR, 6 CRR, CLR, Notary Public. 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	4 1 A P P E A R A N C E S (cont'd): 2 ON BEHALF OF PORSCHE AG and PCNA: 3 ROBERT E. COLLETTI, ESQUIRE 4 HAUG PARTNERS 5 745 Fifth Avenue 6 10th Floor 7 New York, NY 10151 8 212.588.0800 9 rcolletti@haugpartners.com 10 11 A L S O P R E S E N T: 12 PEYTON ABRAMS, A/V Technician 13 14 15 16 17 18 19 20 21 22

5	7
1 C O N T E N T S	1 A Yes, I do.
2 EXAMINATION OF JIANZHONG JIAO PAGE	2 Q Okay. So we'll try to keep those
3 By Mr. Turner 6	3 separate, just for clarity.
4	4 So we'll start with the 315. Okay.
5 E X H I B I T S	5 And can you state your full name for the
6 EXHIBIT PAGE	6 record, please.
7 1003 Declaration of Jianzhong Jiao, Ph.D., 9	7 A Jianzhong Jiao. That's spelled
8 In Support of Petition For Inter Partes	8 J-I-A-N-Z-H-O-N-G, last name is J-I-A-O.
9 Review of U.S. Patent No. 9,955,551 (00315)	9 Q Thank you.
10 1003 Declaration of Jianzhong Jiao, Ph.D., 87	10 And is there anyone else in the room with
11 In Support of Petition For Inter Partes	11 you today?
12 Review of U.S. Patent No. 9,955,551 (00318)	12 A No.
13 1005 U.S. Patent No. 6,144,158 11	13 Q Okay. And do you have any other devices
14 1008 U.S. Patent No. 6,049,749 48	14 or are you communicating with anyone else outside of
15 1010 PCT International Publication 57	15 this Zoom link?
16 Number WO 98/54030	16 A I do not.
17 1012 U.S. Patent No. 5,588,733 79	17 Q Okay, great.
18 1013 Japanese Unexamined Patent Application 67	18 MR. TURNER: And also for the record, I'd
19 Publication Number H7-65603	19 like to just identify everyone who is on the call,
20 1014 Japanese Unexamined Patent Application 30	20 please. So if you don't mind, Jason.
21 Publication Number H7-101291	21 MR. FITZSIMMONS: Sure. This is Jason
22	22 Fitzsimmons with Sterne Kessler representing
6	8
1 P R O C E E D I N G S	1 petitioner Volkswagen.
2 JIANZHONG JIAO,	2 MR. TURNER: All right.
3 having been first duly sworn, was examined and	3 MR. SOULE: Ian Soule, also at Sterne
4 testified as follows:	4 Kessler.
5 EXAMINATION	5 MR. COLLETTI: This is Rob Colletti. I'm
6 BY MR. TURNER:	6 with Haug Partners, and I represent Porsche AG, and
7 Q Good morning, Dr. Jiao.	7 PCNA.
8 A Good morning, Andy. How are you?	8 MR. TURNER: Okay. Thank you.
9 Q Good. How are you?	9 Q So Dr. Jiao, how did you prepare for this
10 A I'm good. One minor technical note is, I	10 deposition?
11 don't see your face well. I mean, it's a little	11 A I start a telephone conference,
12 better. I don't know it's important. But -- this	12 videoconference with an attorney, the counsel. I
13 is terrible. Because the background lighting is	13 believe that was last week, late last week.
14 very bright. I don't think it's important, but for	14 Then I flew to D.C., and you're probably
15 me, it's better to see your face. Right now is	15 aware that I met the counsel team the first day.
16 everything -- it's a little better.	16 Then we transferred into the virtual, the remote
17 Q I think with the storm outside, it's dark	17 videoconference for the following date, namely
18 outside. So it looks a little dark in here.	18 yesterday.
19 Okay. All right. So Dr. Jiao, do you	19 That's our overall preparation for this
20 understand you're here today for deposition in two	20 deposition.
21 proceedings, IPR2022-00315 [sic] and	21 Q All right. And who did you meet with to
22 2022-00318 [sic]?	22 prepare for the deposition?

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9 1 A I met with Trevor, couldn't spell his 2 last name well, Trevor. 3 THE WITNESS: For the record, Jason, can 4 you help? 5 MR. FITZSIMMONS: Trevor O'Neill, an 6 attorney here at Sterne Kessler. 7 Q Okay. 8 A As well as Ian Soule. 9 Q Did you meet with anyone outside of 10 Sterne Kessler for your preparation? 11 A No. 12 Q Okay. And what documents did you review? 13 A I reviewed my two declarations. If this 14 is referring to 315, yes, I reviewed my declaration 15 for the petition 315. I also reviewed the reference 16 of prior art that are cited in my declaration. 17 Q Did you review any documents that are not 18 cited in your declaration? 19 A No. 20 (Previously marked Exhibit 1003 attached 21 to the transcript.) 22 BY MR. TURNER:	11 1 prepare your declaration? 2 A I worked with Trevor. 3 Q Did you work with anyone outside of 4 Sterne to prepare your declaration? 5 A I did not. 6 Q All right. And what did you rely on in 7 preparing your declaration? 8 A I relied on my knowledge, experience for 9 understanding the challenged patent as well as prior 10 arts. And I also relied on legal counsel's guidance 11 regarding the legal aspect of the declaration. 12 (Reporter interruption.) 13 A Challenged patent. 14 Q And did you rely on anything not cited in 15 your declaration during your preparation? 16 A No. 17 Q Do you have Exhibit 1005, which is the 18 Beam patent, U.S. 6,144,158? 19 A I do. Just let me look. I'm sorry. 20 1005. I got it. 21 (Previously marked Exhibit 1005 attached 22 to the transcript.)
10 1 Q First I'd like to start with your 2 declaration for this proceeding, which is marked -- 3 so it's for the IPR that ends in 315 and the Exhibit 4 Number 1003. 5 Do you have this document? 6 A Yes, I do. I have a clean hard copy in 7 front of me. 8 Q Excellent. And who drafted your 9 declaration? 10 A The drafting was done collaboratively 11 between the legal counsel and myself. 12 Q Do you know when you started working on 13 this declaration? 14 A If I recall, it's sometime late last 15 year, a month or so before they filed the petition. 16 Q Okay. And approximately how much time 17 did you spend working on your declaration? 18 A I would say 40-ish hours. 19 Q 40 hours on just the one declaration? 20 A The second declaration, I spent much less 21 time. It would have been half of time, maybe. 22 Q Okay. And who did you work with to	12 1 BY MR. TURNER: 2 Q Okay. So what type of headlight is 3 described in the Beam patent? 4 MR. FITZSIMMONS: Objection, form. 5 A As I stated in my declaration, this 6 reference is for adaptive headlights or headlamps. 7 Q What type of light source do they 8 describe in this patent? 9 A As I stated or referred in my 10 declaration, the light source that is disclosed by 11 this exhibit or prior art includes many kinds, such 12 as LEDs and others. 13 Q Do they illustrate these LEDs in any of 14 the figures? 15 A In my declaration, I used Figure 4 for 16 element 401. That's in this exhibit that's -- it 17 demonstrates the LED source -- or LED array as the 18 light source. 19 Q What type of light source is illustrated 20 in the Figure 2 embodiment? 21 A I believe I also stated in my 22 declaration, using the referenced patent language to

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13 1 describe the light source 202 in Figure 2. The 2 precise words should be in the patent is non-LED. 3 Q Does Beam describe what specific type of 4 light source light source 202 is? 5 A I can look at my declaration, but I'm 6 pretty sure that I referred to his -- I mean, the 7 reference description regarding 202. If you want me 8 to look, I can take a look. 9 And I note that it's not LED source. 10 Q That's fine. 11 Does the Beam reference describe a power 12 supply for the light source? 13 A The overall configuration of the Beam 14 system is also described in my declaration. I have 15 to look what's the terminology they use for power 16 supply. 17 I don't recall if there's such term, 18 what's used in his -- in this patent or my 19 reference -- or my declaration. 20 Q So in the Beam reference itself, you 21 don't recall the type of power supply described in 22 there?	15 1 author used number 203 to indicate it is light 2 modulator. 3 Q So what is a light modulator? 4 A I cited in my declaration using patent 5 author's -- patent owner's description in his claim 6 language that including anything that can modulate 7 light, and if you want to modulate. 8 Modulator selected from the group 9 consisting of digital mirrors, liquid crystal 10 devices, and grating light valves for selectively 11 controlling the intensity of individual microbeam 12 sources in said array. 13 Q I'm sorry. Were you reading from the 14 patent? 15 A I'm reading the patent which is cited in 16 my declaration. That is at patent column 8 for 17 claim number 4. 18 Q Okay. So you said the spatial light 19 modulator selectively controls the intensity of 20 individual microbeam source array. 21 Can you explain what that means? 22 A My understanding, the slight modulator to
14 1 A As I stated in my declaration, this 2 system is used for automotive lighting, and whether 3 it's specifically defined the power supply, I do not 4 recall yet. And as a person of ordinary skill in 5 the art knows, automotive lighting is powered by the 6 power source provided by the automobile, such as 7 battery. 8 Q Okay. Does the Beam reference describe 9 any optics for the assembly? 10 MR. FITZSIMMONS: Objection, form. 11 A The description of optics is cited also 12 in my declaration, without knowing the paragraph 13 number. And it is clearly stated, there is optics 14 in this system. 15 Q So with reference to the Figure 2 16 embodiment in Beam, is element 203 an example of an 17 optical system or optics? 18 A I have to take a look at my declaration. 19 I believe for whatever the description 203 which is 20 cited in my declaration, the description he provided 21 is "modulator." He's using "light modulator." I'm 22 assuming it's he. The patent -- the referenced	16 1 modulate light, and using his word of changing the 2 intensity and others is to use the optical power, 3 namely, refractive, reflective, and these two nature 4 of optical power to change the light, generally 5 speaking, to change the light in three different 6 matters, intensity, angle or distribution, and 7 color. All three are part of light modulation 8 functions. 9 Q Does Beam describe using the spatial 10 light modulator with reference to the LED 11 embodiment? 12 MR. FITZSIMMONS: Objection, form. 13 A I used in my declaration with this 14 particular description for his microbeam definition, 15 that microbeam includes source and modulator, and 16 source includes LED. 17 Q Okay. When you refer to the light 18 source, that does not include the modulator. 19 Is that correct? 20 A I use the reference described language in 21 both patent specifications as well as the claims. 22 And in his claim language as well as the

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17 1 specification, he used the terminology of microbeam. 2 And the microbeam is a beam consisting of emitting 3 device, namely, source; and optical device, namely, 4 modulator. 5 So any beam is these two things, source 6 plus modulator. 7 Q Okay. So you said when you refer to the 8 term "microbeam" with reference to the Beam patent, 9 microbeam includes a light source, an optical device 10 such as the spatial modulator. 11 Is that correct? 12 A That is what this reference Beam patent 13 introduced, disclosed. 14 Q When you refer to the term "light 15 source," does that include anything besides the 16 emitter? 17 MR. FITZSIMMONS: Objection, form. 18 A I used in my declaration with the same 19 language cited by this reference, and that listed 20 example of light sources. The patent doesn't use 21 the word "emitter." But light source for person of 22 ordinary skill in the art understands this is	19 1 Q Yes, please. 2 A Okay. In column 5, this is what I base 3 off the description. Array of light sources 401 4 which are individually controlled. This array could 5 be implemented a number of ways; it could be 6 addressable matrix of lasers; it could be an array 7 of incandescent filaments; or it could be some other 8 similar arrangement of emitters. 9 I'm sorry, he did use the word "emitter." 10 Q And this section of column 5, you're 11 reading between lines 5 and 15? 12 A Correct. 13 Q Okay. And this is with reference to 14 Figure 4 of Beam? 15 A Correct. 16 Q So in the Figure 4 embodiment of Beam, 17 what is element 201? 18 A If I recall, that should be beam 19 splitter. 20 Q Is a beam splitter -- sorry, strike that. 21 What is a beam splitter? 22 A Beam splitter is an optical device that
18 1 something emitting a light. 2 Q Okay. You said the patent doesn't use 3 the word "emitter." 4 Is that correct? 5 A I don't recall he's using the word 6 "emitter." 7 Q So does the Beam reference describe using 8 the spatial light modulator with the LED light 9 source? 10 MR. FITZSIMMONS: Objection, form. 11 A In my declaration, I believe I referred 12 to, and the patent description for LED array. And 13 you asked earlier is Figure 4, 401, and I think I 14 also referred to the description of LED array. 15 Do you allow me to look at the patent 16 language -- disclosure language to describe what is 17 401, the array of light sources, as in the 18 specification. 19 Q I'm sorry. You can look in the Beam 20 patent if that helps. 21 A Okay. Sure. I know where that -- I'm 22 just saying if it's okay for me to read it to you.	20 1 function as to split into two directional light. 2 When light comes to a splitter, splitter splits two 3 directional lights. That's the definition of beam 4 splitter. 5 Q So how does the Beam reference use the 6 beam splitter 201 in the Figure 4 embodiment? 7 A You want me to describe it using my -- 8 words in my understanding? 9 Q Yes. 10 A Because the patent described it. 11 So as I cited in my declaration, when the 12 lights come through the beam splitter, meaning when 13 lights come from oncoming vehicles' headlights or 14 preceding or following vehicles' taillights, in 15 Beam's case, even could come from the internal 16 reflected headlamp lights, maybe due to dirt, due to 17 other reasons, these lights come to the beam 18 splitter, and portion will go through to the 401, 19 another portion will be reflected perpendicularly 20 downward to his sensing camera system. 21 Q And element 401 is the LED array. 22 Is that correct?

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21 1 A It's array of light sources including 2 laser diodes. I think that's the word he's using, 3 laser diode, matrix of lasers. 4 (Reporter interruption.) 5 (A discussion was held off the record.) 6 BY MR. TURNER: 7 Q Dr. Jiao, how does the beam splitter 8 element 201 affect light emitted by the light 9 source? 10 MR. FITZSIMMONS: Objection, form. 11 A For my understanding, in general, utilize 12 beam splitter is generally one way. Another way to 13 say, the beam splitter typically are processed with 14 specific reflective coating so the emitting lights 15 will be minimally affected. It is receiving light 16 being split. It's like one-way mirror. 17 Does that make sense? I think if you go 18 to the, whatever, interrogation room and other 19 people see you, you don't see them. And the beam 20 splitter can be processed such, the lights come 21 through outside split, but go through this way, you 22 go through it. And not a hundred percent, but	23 1 the beam splitter and reflect onto the sensors or 2 camera. 3 Q Okay. Were you reading from the patent, 4 Dr. Jiao? 5 A I didn't read it. This is -- he 6 described optical system, how it works, throughout 7 the patent. It's cited in my declaration. I can go 8 to the paragraph if you want. 9 Q Okay. So you were just summarizing in 10 your prior response, summarizing the Beam reference? 11 A Correct. 12 Q Does the optical system 106 in the 13 Figure 4 embodiment include a spatial light 14 modulator? 15 A Beam's language in the Figure 4 -- in the 16 description in Figure 4, 106 does not include 17 spatial modulator. 18 Q Does Beam describe any sensors with 19 reference to the Figure 4 embodiment? 20 MR. FITZSIMMONS: Objection, form. 21 A Beam's disclosure includes sensors which 22 I cited in my declaration. 107 is the sensor.
22 1 that's typical the way we form the beam splitter. 2 Q Okay. So do you agree that the beam 3 splitter has minimal affect on light emitted by the 4 light source? 5 A It's not whether I agree. I don't 6 believe my declaration or reference talk about how 7 the beam splitter works. I didn't opine on this, 8 because it's not extremely relevant. 9 Q Okay. And what is element 106 in the 10 Figure 4 embodiment? 11 A Optical system. 12 Q So what type of optical system is 13 described in Beam for element 106 in the Figure 4 14 embodiment? 15 A Well, optical system in this disclosure 16 is provided the Beam patent on the road with 17 whatever source modulator and formed such beam 18 pattern, including anti-glare, glare control, as one 19 way. 20 The optical system 106 also serves 21 receiving elements to see the oncoming and preceding 22 vehicles' light go through optical system and with	24 1 Q What type of sensor is element 107? 2 A It is sensing the light to transfer to 3 electrical signal, such as used in a camera, digital 4 camera, not classic camera. Classic camera is using 5 film, as you remember. 6 Q So element 107 is a light sensor in the 7 Beam reference? 8 A That's what Beam described. 9 Q And where is this sensor located in the 10 Beam reference? 11 MR. FITZSIMMONS: Objection, form. 12 A Within the headlight. 13 Q So the sensor 107 is located within the 14 headlamp assembly, correct? 15 A Beam disclosed the sensors are within the 16 headlamp assembly, or the word he says 17 probably mounted to a headlamp. Somewhere in his 18 description, I cited in my declaration, too, is the 19 whole assembly. 20 Q Can you turn to Figure 6 of the Beam 21 reference. 22 A Yes.

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25 1 Q Does Figure 6 include the LED light 2 source? 3 A 401. 4 Q And does this embodiment illustrated in 5 Figure 6 include the sensor? 6 A The embodiment 2 is only replacing 7 embodiment 1, the light source. My understanding, 8 the description in embodiment 2 includes others, and 9 the sensor is part of that, too. Because Figure 4 10 is part of Figure 6. It is different view of 11 Figure 6. 12 Q So you're saying Figure 4 and Figure 6 13 are both illustrating the same embodiment, which 14 you're calling embodiment 2. 15 Is that correct? 16 A If I read precisely in column 5 -- 17 Figure 4 -- Figure 6 is top view of automatic beam 18 control module. They include sources for all that. 19 And sensor 107, by the way. 20 Q Okay. 21 A That's in column 5. 22 Q Does the Beam reference describe a	27 1 headlamp beam pattern that is adaptive for glare 2 control by reduced intensity to the detective area 3 or positions, including an oncoming vehicle and 4 preceding vehicle, and to avoid glare. 5 The controllability is such by using 6 individually controllable microbeam to put a light, 7 different intensity or not, in a desired area in the 8 headlamp field of view. 9 Q So how does Beam describe providing glare 10 control? 11 A I cited the patent disclosed information 12 in my declaration by using the sensing or camera 13 system to detect the position of other vehicles that 14 appears to be in the headlamp field of view, and to 15 reduce that other vehicle's portion of the light 16 contributed by microbeams to avoid glare. 17 Q Does the Beam reference describe a 18 mechanism for swivelling or adjusting the position 19 of the entire headlamp assembly? 20 A I mentioned in my declaration, by using 21 the concept introduced by this reference, that each 22 individual beam microbeam -- each microbeam is
26 1 controller for controlling the headlamp assembly? 2 MR. FITZSIMMONS: Objection, form. 3 A I don't think I understand your question. 4 Controlling what? 5 Q So how does Beam describe controlling the 6 light source? 7 A I cited in my declaration, and I can 8 point each paragraph, is, Beam's controlling is to 9 take the receiving signal through beam splitter, 10 through optical system -- I mean, through optical 11 system, beam splitter, to the sensor camera, in turn 12 transferred to electrical signal to control the 13 light source emissions, including intensity and 14 direction. That's overall control theme. 15 Q Does the Beam reference describe any 16 specific type of adaptive headlamp control 17 functionality, such as high beams, low beams, 18 cornering, et cetera? 19 MR. FITZSIMMONS: Objection, form. 20 Objection, compound question. 21 A Beam's system provides -- in my 22 declaration, I cited his overall description is a	28 1 individually controllable for angular distribution, 2 meaning direction. There's no physical swivel. 3 Optically, yes, they can aim any angle. 4 Q What inputs or information does the Beam 5 system consider when providing the glare control? 6 MR. FITZSIMMONS: Objection, form. 7 A Using sensor camera to detect the light 8 received by optical system 106. The lights in my 9 declaration referred to the reference lights come 10 from, either headlights from oncoming vehicle or 11 taillights for preceding vehicle, those lights 12 trigger the sensor or camera in turn and trigger the 13 control for dim the specific light's microbeams to 14 avoid glare. 15 Q Does the Beam system consider any other 16 inputs besides the light sensor signal when 17 controlling the glare? 18 MR. FITZSIMMONS: Objection, form. 19 A Can you be more specific, "other." Other 20 than light? 21 Q Correct. 22 A Not as I'm aware of.

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29 1 Q Does the Beam system consider steering 2 angle when providing glare control? 3 A Beam's illustration Figure 1 shows the 4 headlamp field of view that can include curve or 5 bending road. And whether the steering sensor 6 signal input to change such view, Beam didn't 7 disclose. 8 But the light from -- as illustrated in 9 Figure 1, I believe it's Figure 1, light from any 10 shape of a road being detected by the sensor 11 cameras, you can avoid glare by dimming the light -- 12 by dimming some microbeams. 13 Q Does the Beam system consider map data 14 when providing glare control? 15 A Beam system does not disclose the GPS map 16 information. I think I opine on this for combining 17 other arts to get map GPS information so that the 18 control can be there, just the data. Beam does not 19 disclose map information. 20 Q So what is map data? 21 A Map data -- 22 MR. FITZSIMMONS: Objection, form.	31 1 Q The first named inventor of this one is 2 Satonaka. 3 Is that correct? 4 A It is. 5 Q All right. So you're okay if we refer to 6 this reference as the Satonaka reference? 7 A Yes. 8 Q Okay. So what type of headlamp is 9 described in the Satonaka reference? 10 MR. FITZSIMMONS: Objection, form. 11 A Satonaka reference describe adaptive 12 headlamp. 13 Q And what type of light source is 14 described in the Satonaka reference? 15 A It is not LED source. Looking at 16 Figure 10, it is conventional light source, whether 17 these are filament or arc. 18 Q Does the Satonaka reference describe a 19 power supply for this headlamp? 20 A I'm pretty sure I mentioned in my 21 declaration, it described battery as power input. 22 Yeah, BT, battery.
30 1 A -- in my declaration, per my 2 understanding, is a positional information. For the 3 control purpose, is largely is the road structure 4 information. And that information can be translated 5 into control demand to control individually 6 controllable microbeam to aim where the light -- 7 wherever the light should be aimed. 8 Q And what type of sensors or systems 9 typically provide map data? 10 MR. FITZSIMMONS: Objection, form. 11 A I think I described in my declaration 12 when I proposed to, by other arts, I have a 13 reference that both have -- have disclosed how the 14 map data being captured through GPS or camera. 15 Q Dr. Jiao, do you have Exhibit 1014? 16 A Yes. 17 (Previously marked Exhibit 1014 attached 18 to the transcript.) 19 BY MR. TURNER: 20 Q What is Exhibit 1014? 21 A 1014 -- Exhibit 1014 is Japanese 22 Unexamined Patent Application Publication.	32 1 Q And what type of battery is described in 2 Satonaka? 3 A It's battery installed on a vehicle, on 4 the vehicle. 5 Q And what type of batteries are typically 6 installed in a vehicle? 7 A Chemically, I can't describe the chemical 8 content. When you use the word "type," you mean the 9 chemical content, or you mean the voltage character? 10 What did you define "type"? 11 Q How would you describe the battery 12 disclosed in the Satonaka reference? 13 A It's a battery used on a vehicle, any 14 battery used on a vehicle. 15 Q Okay. Does the Satonaka reference 16 describe any optics or optical systems in the 17 headlamp assembly? 18 A Satonaka describes headlamp overall. Any 19 headlamp would have optical system in it. 20 Q Are there any optics illustrated in the 21 Figure 10 embodiment of Satonaka? 22 A Yes.

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33 1 Q What optics are illustrated in the 2 Figure 10 embodiment? 3 A Figure 10 illustrates optical 4 elements 33. That is projector lens. I think it's 5 numbered 38 that is reflector. More precisely, that 6 is most likely elliptical reflector. And 43 is 7 shutter, is optical shutter. 8 Q What is an optical shutter? 9 A It's a shade to block portion of the 10 light being projected on the road, primarily is for 11 the low beam purpose, to avoid glare from low beam. 12 Q Is the headlamp illustrated in Figure 10 13 of Satonaka a low-beam headlamp? 14 MR. FITZSIMMONS: Objection, form. 15 A I may have to read through the -- my 16 declaration reference to, but for common sense, 17 engineering common sense, that lamp simply can be 18 either and both high beam and low beam. 19 MR. FITZSIMMONS: Dr. Jiao, did you say 20 that lamp simply can -- 21 A The lamp assembly Figure 10 can 22 illustrate for either low beam or high beam or both.	35 1 not? And it certainly can detect a curvature. 2 It's okay if I go look at -- 3 Q Sure, if that helps. 4 A Yeah. I just need to look at my 5 introduction for motivation. 6 All right. (Reading to self.) 7 My declaration cited this disclosure for 8 the process of the detection of the objects, how the 9 process of changing the coordinates -- recording the 10 coordinate system. I do not recall if I 11 specifically saying how the lamp being swivelled, do 12 or do not. I need to go back to look. 13 Q Okay. 14 A Again, that's not part of my opinion 15 regarding the motivations to combine -- to introduce 16 Satonaka was not -- I don't recall for any reason 17 for swivel mechanism as part of my motivation to 18 combine. 19 Q So when preparing the declaration, did 20 you review the references in their entirety? 21 A You mean read the patent word by word? I 22 reviewed patent in general, but I -- I don't recall
34 1 Q So for the Figure 10 embodiment, if this 2 headlamp is used for a high beam functionality, 3 would the shutter change, the position of the 4 shutter change? 5 MR. FITZSIMMONS: Objection, form. 6 Objection, incomplete hypothetical. 7 A In the common practice, this type of 8 configuration, in order to perform both low beam and 9 high beam, the optical shade, the shutter position, 10 they're different. High beam doesn't need a 11 shutter, or lower the shutter. Low beam, you do. 12 High beam, you can either lower it or remove it. 13 Q Does the Satonaka reference describe a 14 mechanism for swivelling or adjusting the position 15 of the headlamp? 16 A I don't think I provide an opinion for 17 that. And I need to look at my declaration. This 18 disclosure is the concept adaptive headlamp. 19 Whether specifically mentions swivelling -- let me 20 see. 21 Can I go back to my declaration to find 22 out whether swivel was provided by my opinion or	36 1 if I specifically looked into the swivel function. 2 I can -- I don't recall I specifically reviewed the 3 swivel function, if Satonaka disclosed or not. 4 Q That's okay. 5 What type of control strategy is 6 described in the Satonaka reference? 7 MR. FITZSIMMONS: Objection, form. 8 Q I can rephrase that. 9 Does the Satonaka reference describe an 10 adaptive headlamp control strategy? 11 A Satonaka disclosure is adaptive headlamp. 12 Q What type of control strategy is 13 described in the Satonaka reference? 14 MR. FITZSIMMONS: Objection, form. 15 A Satonaka detect the oncoming or preceding 16 vehicle, and that portion of the lights needed to be 17 avoid -- reduced to avoid glare. 18 Q How does Satonaka detect oncoming or 19 preceding vehicles? 20 A Satonaka, as I disclosed in my 21 declaration, uses camera system. 22 Q And how does Satonaka reduce the lighting

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37 1 or control the lighting to avoid glare? 2 MR. FITZSIMMONS: Objection, form. 3 A Did I express an opinion in my 4 declaration for that headlamp -- beam pattern change 5 in my declaration? 6 Q You can look in your declaration if that 7 helps. 8 A Well, again, when I look at -- the 9 purpose to introduce is to -- their adaptive lamp, 10 Satonaka's work that I introduced is to determine 11 the coordinate system of a detected imaging such as 12 oncoming or preceding vehicle. I did not reference 13 to the mechanism of changing his beam pattern into 14 my primary reference to Beam. 15 Q Can you take a look at the Satonaka 16 reference to see how it describes adjusting the beam 17 pattern? 18 A Is to change light amount, right. 19 There's Figure 15 described distribution control and 20 light amount control. So by changing the pattern 21 distribution and amount of the light, meaning 22 brightness. He's using the word "brightness."	39 1 sensors for the headlamp assembly? 2 A In my declaration, I introduced 3 Satonaka's camera system, which serve as a sensor. 4 Q And how does Satonaka use the camera 5 system? 6 MR. FITZSIMMONS: Objection, form. 7 A In my declaration, the section that I 8 cited Satonaka's camera is to make a determination 9 using the camera-detected signal or image to come 10 back with coordinate-based calculations and provide 11 a step-by-step algorithm to determine the location 12 or position where the preceding and oncoming 13 vehicles are. 14 (Reporter interruption.) 15 A Coordinate system calculation to 16 determine the position of oncoming or preceding 17 vehicle. 18 Q Does the Satonaka reference describe a 19 specific type of camera? 20 A I think as cited in my declaration, 21 Satonaka introduced whatever the light-sensitive 22 device to form such image. I'm pretty sure he even
38 1 I thought I answered the question. Did 2 I? 3 Q Okay. So you're saying, with reference 4 to Figure 15 -- okay. Sorry, strike that. 5 So what type of mechanism does Satonaka 6 use for adjusting the light pattern? 7 MR. FITZSIMMONS: Objection, form. 8 A So again, I don't think I describe in my 9 declaration in terms of the changing mechanism. But 10 I can look. He's changing the light, the amount of 11 light. When the detection of oncoming or preceding 12 vehicle, he can -- his system can change the amount 13 of the light. Yeah, by changing the brightness. 14 MR. TURNER: Okay. So I think we've been 15 going for about an hour and 20 minutes. Do you guys 16 want to take a five-, ten-minute break? 17 MR. FITZSIMMONS: A break would be fine, 18 yeah. 19 (Recess from 1:24 p.m. until 1:34 p.m.) 20 BY MR. TURNER: 21 Q Dr. Jiao, we were talking about the 22 Satonaka reference. And does Satonaka describe any	40 1 said something about infrared. Whatever that is is 2 light-sensitive sensor-based camera. 3 Q Does the Satonaka reference describe 4 where the camera is mounted relative to the headlamp 5 assembly? 6 A I don't know whether it's cited in my 7 declaration. As I recall, it is on the vehicle. 8 It's not in the headlamp assembly. Maybe 9 position 22, Figure 1. 10 Q So in Figure 1 of Satonaka, element 22 11 refers to the camera. 12 Is that correct? 13 A Let me double-check that. I think it is. 14 Correct. 15 Q So in your experience for adaptive 16 headlamps that use cameras, where are the cameras 17 typically located? 18 MR. FITZSIMMONS: Objection, form. 19 A In my personal experience that I 20 observed? 21 Q Correct. 22 A Well, preferably anywhere, in my personal

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41 1 experience, while the camera is used for an adaptive 2 headlamp purpose is almost always facing forward in 3 similar -- coincide with headlamp beam pattern. 4 Personal experience? I think I've seen 5 both. I've seen camera mounted such as Satonaka 6 position -- indication number 22. I also seen the 7 camera mounted inside the headlamp assembly. 8 Q So Satonaka's position 22, that's within 9 the windshield. 10 Is that correct? 11 A Satonaka disclosed the position as -- 12 yes, 22 is camera, according to the Figure 1, is 13 near rearview mirror. 14 Q Okay. So when you referred to in your 15 personal experience, are you referring to adaptive 16 headlamp assemblies that have been commercialized, 17 or is that more R&D type of work? 18 MR. FITZSIMMONS: Objection, form. 19 A You asked my general personal experience 20 that includes prior to this patent publication 2002 21 and afterwards. In the whole -- I cannot precisely 22 remember which year we're doing. Certainly we have	43 1 driver's eye movement in reaction for road 2 condition. 3 So to answer your question, this is 4 pretty extensive period of time of my personal 5 experience, including after 2002, the patent being 6 published. I do not recall when we used what. But 7 certainly in R&D phase -- certainly in R&D phase, I 8 had experienced for the camera being positioned in 9 various locations on the vehicle. On the dashboard, 10 too. We also had experience on the dashboard. 11 Q In your prior answer, you referred to -- 12 was it eye gaze or eye glaze? 13 A Glaze, like the eye change. The 14 terminology is eye fixation point movement. Like 15 how your eye pupil moves when you follow the light. 16 Q But the gaze is G-A-Z-E? 17 A I think the Japanese like to use the word 18 gaze. Is that a word, gaze or glaze? I'm sorry. 19 It's a term that you look quickly. Is that gaze or 20 glaze? 21 Q I think it's gaze. But it's okay. 22 A Yeah.
42 1 done R&D work regarding adaptive headlamp ever since 2 mid-'90s. 3 Adaptability, I think the last 4 deposition, I described what adaptability is based 5 on is the road condition, the driving condition, and 6 the weather condition. 7 So in the process of R&D to develop 8 adaptive headlamp, monitoring road conditions using 9 camera sensors, et cetera, had been a practice in 10 R&D in the industry. 11 At the time, where the camera should be, 12 a sensor should be, we have a different practice. 13 And the purpose, sometimes we put camera inside a 14 vehicle besides detecting the road condition for 15 adaptability. We also had need to monitor eye 16 fixation point movement, or eye glaze, eye change. 17 That's also monitored by camera. 18 So the way, in R&D work, we put a camera 19 inside a vehicle, such as Satonaka disclosed. That 20 camera could have two different orientations, facing 21 forward to detect road condition, including traffic, 22 and facing toward the driver's eye to monitor	44 1 Q Now, have you seen adaptive headlamp 2 systems, headlamps for vehicles that used cameras 3 mounted in multiple locations? 4 MR. FITZSIMMONS: Objection, form. 5 A More than one camera? 6 Q Correct. 7 A I can't recall. It's possible. If you 8 hut on headlamps, there's two, one on each side. 9 Q Okay. But haven't -- in your experience, 10 you haven't seen cameras mounted both in the 11 windshield and in the headlamp assemblies. 12 Is that correct? 13 A You're referring to my personal 14 experience, so certainly I didn't put it in my 15 declaration. 16 My response to that is, location for 17 camera to serve as ADB/AFS function also has other 18 engineering/commercial considerations and put into a 19 headlamp assembly is -- can be preferenceable [sic] 20 for headlamp manufacturer because to increase the 21 components for commercial purpose, put not inside 22 headlamp assembly could be also beneficial for other

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45 1 components suppliers to the vehicle. 2 So usually in practice, the camera is a 3 separate vendor, not lighting supplier. And camera 4 technology, including all the different sensorings 5 are existing -- long existing technology. 6 Implement camera for ADB/AFS purpose 7 usually is OEM's call. OEM decided what camera 8 vendor to work with. 9 Then the location of a camera often 10 becomes system optimizational engineering call, 11 where you put it in the headlamp, where you put it 12 in the windshields depends on the logistics -- lots 13 of them depends on logistics reasons, which one is 14 easier for OEM to manage that system. 15 Q Okay. When you say it's used as a 16 system, that means that the camera could be used for 17 other vehicle functionality. 18 Is that correct? 19 A I thought your question is if the camera 20 is used for ADB/AFS function. On the vehicle, 21 certainly we have camera to use not for AFS/ADB 22 function. For instance, when you back up the	47 1 include high beam. ADB is largely for high beam. 2 Q Can you turn back to your declaration, 3 which is Exhibit 1003, paragraph 104, please. 4 MR. FITZSIMMONS: Andy, for the record, 5 that's the 315 proceeding? 6 MR. TURNER: Correct. 7 A Yes. 8 Q Okay. So in this section, you're 9 describing the motivation for combining the Beam 10 reference with the Satonaka reference. 11 Can you explain, for your combination, 12 which reference are you relying on for teaching the 13 light source limitation? 14 A Beam. 15 Q Okay. So Beam's light source. 16 And which reference are you relying on 17 for the controller or processor limitations? 18 A Beam. 19 Q And for this combination, which reference 20 are you relying on for any optics or optical system 21 limitation? 22 MR. FITZSIMMONS: Objection, form.
46 1 vehicle, you have camera there to see what's in the 2 back. Actually, that became a law in 2008. That's 3 also camera system. 4 So ADB/AFS-related camera system 5 preferably is always for the headlamp use only. 6 Q Okay. And so we just -- you referenced 7 some different acronyms. So if you don't mind, 8 could you define ADB and AFS for us, please. 9 A Sure. ADB, adaptive driving beam. 10 Driving beam is European terminology. In U.S., we 11 call it high beam or arc beam. We use the global 12 ADB. 13 AFS is adaptive forward lighting -- 14 forward lighting is one word -- system. Again, 15 that's European terminology. But we use it globally 16 for the reason we want to use common terminology. 17 AFS includes any function that adaptive to 18 compensate road/driving condition change. 19 Q Is AFS limited to low beam lighting 20 applications? 21 A In the term of regulation standards for 22 that purpose of industry, we commonly used AFS not	48 1 A Beam. 2 Q Okay. And for the sensors or camera 3 limitations in this ground, which reference are you 4 relying on for the camera limitations? 5 A Beam. 6 MR. FITZSIMMONS: Objection, form. 7 Q Do you have Exhibit 1008? 8 A Yes. 9 (Previously marked Exhibit 1008 attached 10 to the transcript.) 11 BY MR. TURNER: 12 Q What is Exhibit 1008? 13 A It's U.S. Patent assigned to Shoji 14 Kobayashi, Shoji Kobayashi. 15 Q All right. So what type of headlamp is 16 described in the Kobayashi reference? 17 MR. FITZSIMMONS: Objection, form. 18 A Kobayashi disclose adaptive headlamp. 19 Q What type of light source is described in 20 the Kobayashi reference? 21 A Kobayashi disclosed non-LED light source. 22 Q Does Kobayashi describe any optics or

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49 1 optical system for the headlamp assembly? 2 MR. FITZSIMMONS: Objection, form. 3 A Kobayashi introduce Figure 7 that shows 4 the optical elements of the light source and 5 assembled into a headlamp that includes lens and 6 reflector. 7 Q Does Kobayashi label these optics with 8 any element numbers in Figure 7? 9 A 22 is reflector, 23 is the lens. Let me 10 double-check. 11 Reflecting mirror is 22, and front lens, 12 22 23. 13 Q Does Kobayashi describe a control 14 strategy? 15 MR. FITZSIMMONS: Objection, form. 16 A Control in terms -- can you clarify? 17 Q Does Kobayashi describe any type of 18 specific adaptive headlamp control functionality? 19 MR. FITZSIMMONS: Objection, form. 20 A Yes. 21 Q What type of control functionality is 22 described in Kobayashi?	51 1 changes of the beam pattern in terms of changing the 2 aiming angle of the lights. And I think it's using 3 the word "radiation direction." 4 Q Can you turn to Figure 1 of Kobayashi. 5 A Yes. 6 Q What does Kobayashi describe with 7 reference to Figure 1? 8 MR. FITZSIMMONS: Objection, form, vague. 9 A It's description of taking the input 10 information and, through controller, to control the 11 light beam change according to the road condition. 12 Q So what is the road profile calculating 13 means that is labeled as number 2? 14 A Kobayashi's road profile calculation is 15 to take the information -- mapped information, GPS, 16 et cetera, so that you can calculate the road 17 geometry such as bending, curve, intersection, 18 et cetera. 19 Q So this road profile calculation, this is 20 referring to hardware or software? 21 MR. FITZSIMMONS: Objection, form. 22 A This is schematic for the function
50 1 A Kobayashi disclose -- I cited in my 2 declaration that Kobayashi take input data -- road 3 conditions such as map, GPS -- and project -- 4 predict the upcoming curvature or other bending, 5 intersections, et cetera, for road condition change, 6 then, in turn, controls the headlamp beam 7 distribution to compensate for road geometry change. 8 Q How does Kobayashi control the headlamp 9 beam distribution? 10 A By change the beam pattern direction of 11 the light. And intensity, of course. 12 Q How does Kobayashi change the beam 13 pattern direction? 14 MR. FITZSIMMONS: Objection, form. 15 A In terms of how, you mean -- they form a 16 new beam pattern when you have a bending road, a 17 curved road, and the beam pattern will be directed 18 toward a curve or bending portion of a road. 19 Q Does Kobayashi describe a mechanism for 20 swivelling the headlamp assembly? 21 A I think -- I believe I cited in my 22 declaration that Kobayashi described, yes, the	52 1 change, functionality of the system, and this 2 calculation is a software function. 3 Q And what is box 3, the vehicle advancing 4 direction prediction [sic] means? 5 A When a road profile is calculated, 6 Kobayashi also disclosed the calculation is where 7 you're going to be. There is road in front of you. 8 A is how far is your next curve or bending, or 9 versus how long it takes you to get there, 10 intersection included. 11 So advanced predicting means is predict 12 what you're going to encounter, as a driver, in 13 front of you. 14 Q So is this predicting means referring to 15 different sensors that collect information? 16 MR. FITZSIMMONS: Objection, form. 17 A I don't know this disclosure -- I mean, 18 this art described which calculations based on what 19 sensor. My understanding is, the information that 20 comes from either GPS or map, could be both, and it 21 could be stored map information, and based on 22 vehicle location, you can make predictive

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53 1 calculation in the direction you are driving to say, 2 there is curve in front of you or intersection in 3 front of you. This is -- disclosure described the 4 software capability for doing that. 5 Q Okay. So the software is based on GPS or 6 map data. 7 Is that correct? 8 A Yes. 9 MR. FITZSIMMONS: Objection, form. 10 A Yeah. The road profile calculate means 11 this profile has been there, whether it's map or 12 GPS. Then the calculation, directional, means that 13 knowing where the vehicle is heading to, what is in 14 front of you, and that calculation is direction -- 15 advanced direction predicting means. You have to 16 predict where you're going to be. 17 Q And how about block number 7, what does 18 that refer to? 19 MR. FITZSIMMONS: Objection, form. 20 A That's the information is in their 21 overall process, the input is how fast you are 22 driving so that a projection -- a prediction means,	55 1 lights is steered to the right, or directed to the 2 direction. He disclosed the light to do it. 3 Q Does Kobayashi disclose steering light 4 using a swivel mechanism? 5 MR. FITZSIMMONS: Objection, form. 6 A I do not recall if I cited to that 7 particular feature in my declaration because my 8 motivation combine is to taking this GPS data. You 9 want me to look whether I opine on his swivel 10 mechanism or -- I can look. 11 Q Well, that's okay. That's not necessary. 12 Dr. Jiao, can you return to your 13 declaration, Exhibit 1003, at paragraph 201. And 14 again, we're still referring to the 315 proceeding. 15 A Yes. 16 Q All right. So in this section, this is 17 your Ground 2 combination, Beam, Satonaka, and 18 Kobayashi. 19 For this combination, can you explain 20 which reference you're relying on for the light 21 source limitations? 22 A Beam.
54 1 and the speed means counting by how fast you go, how 2 long it takes you to get to that bending or 3 intersection. 4 Q And what does block 4 refer to? 5 MR. FITZSIMMONS: Objection, form. 6 A That's overall control unit by taking 7 signal, whether stored or -- whatever the signal 8 input, and start processor, there's a processor, and 9 generate command to execute the command. So it's a 10 processor. 11 Q What does block 6 refer to in this 12 figure? 13 A It reference to execution. The signal 14 comes in and decided you need to have lights toward 15 the right because there's curvature there. Then 16 there is function needed to physically let the 17 lights change to the right. 18 Q So does Kobayashi describe how it changes 19 the lights to the left and to the right with 20 reference to this drive means, block 6? 21 A Kobayashi's disclosure discloses when the 22 curve is being projected, and he disclosed the	56 1 Q All right. And which reference are you 2 relying on for the controller or processor 3 limitations? 4 A My declaration relied on the combination 5 of Kobayashi's ECU, which has map data, and 6 implement with Beam's control to include the 7 curvatures or other road conditions. 8 (Reporter interruption.) 9 Q So in your combination, you're referring 10 to -- you're relying on both Beam's controller and 11 Kobayashi's ECU in your combination? 12 A As I stated in my declaration, is to 13 implement Kobayashi's ECU, which has map data, into 14 the control of Beam system. 15 Q So would that combination include two 16 processors? 17 A The combination include the processor 18 that's capable to take map data. It can be same 19 processor, just expanded to process map data and 20 make projecting of the road curve, intersections. 21 And Beam didn't explicitly disclose the road 22 detection in conjunction with the curvature comes

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57 1 in. And Kobayashi's processor has the capability to 2 integrate the map data, GPS data. 3 So that processor can be same processor, 4 just the information gathered from Kobayashi's 5 processor included map data. That's all. 6 Q So for your Ground 2 combination, which 7 reference are you relying on for teaching the optics 8 limitations of these claims? 9 A Beam. 10 Q For the same Ground 2 combination, which 11 reference are you relying on for teaching the 12 sensors or camera limitations? 13 MR. FITZSIMMONS: Objection, form. 14 A Beam. 15 Q Dr. Jiao, do you have Exhibit Number 16 1010? 17 A Yes. 18 (Previously marked Exhibit 1010 attached 19 to the transcript.) 20 BY MR. TURNER: 21 Q What is Exhibit 1010? 22 A It is International Application	59 1 instance -- like, number 2 is the light source, 2 including LEDs. (Reading to self.) Such as LEDs. 3 That is page 4, line 35. 4 Q So that was page 4 of the Karlsson 5 reference you're reading? 6 A Right. In 35 mentioned such as LED as a 7 light source. And Figure, I believe, 2 is a light 8 source. Yes, light source 2. 9 Q Does the Karlsson reference describe any 10 type of optics or optical system for his headlamp 11 assembly? 12 MR. FITZSIMMONS: Objection, form. 13 A I cited in my declaration Karlsson 14 disclosed optical system including lens number 6 in 15 Figure 1. And I think 3, he's named 3 as 16 modulator -- light modulator, number 3. 17 Q So what does the light modulator do? 18 MR. FITZSIMMONS: Objection, form. 19 A Light modulator modulate light. In 20 general, it change -- it can change the intensity, 21 direction, or maybe color. 22 Q Does Karlsson describe multiple light
58 1 Published -- International Application Published 2 Under the Patent Cooperation Treaty. That 3 applicant's name is -- 4 MR. FITZSIMMONS: Andy, did you say 1010 5 or 1001? 6 MR. TURNER: 1010. So this is Karlsson, 7 the Karlsson reference. 8 Q So Dr. Jiao, what type of lighting device 9 is described in the Karlsson reference? 10 A This reference describes adaptive 11 headlamp. 12 Q And what type of light source is 13 described in the Karlsson reference? 14 A If I go back to my declaration, I recall 15 is multiple examples, any discrete light source, 16 including LEDs. 17 Q Does Karlsson illustrate the LEDs in any 18 of the figures? 19 MR. FITZSIMMONS: Objection, form. 20 A As I cited in my declaration, all 21 figures, including the light source -- light source 22 is number 2 in his description. Figure 1, for	60 1 modulators or a single light modulator? 2 A Let me go back to my declaration. Okay. 3 Just give me a second because -- the way I recall 4 the modulation is it results in Figure 6. Figure 6. 5 What his description in page 13 is 6 describe a term "spotlight beam." Page 13, line 7 29 -- I'm sorry -- 28 is the term "spotlight beam." 8 Q So what is a spotlight beam? 9 A My understanding is that individual beam 10 contributor to the headlamp beam pattern that 11 contributes light in the control map fashion in 12 terms of direction and intensity. 13 Q So the light modulator provides the 14 spotlight beam that's shown in Figure 6. 15 Is that correct? 16 A The result from the light source and 17 modulator is formed spots beam -- is that word spots 18 beam? -- spotlight beam is a group of individual 19 like, controllable beam contributors. 20 Q So if we refer back to Figure 1, what 21 does the lens 6 do to the microbeam? 22 MR. FITZSIMMONS: Objection, form.

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61 1 A Lens 6 provides the projection of all the 2 individual spotlight beams, group them together to 3 project into a headlamp beam pattern. 4 Q Does the Karlsson reference describe any 5 sensors? 6 A Yes. 7 Q What type of sensors are described in the 8 Karlsson reference? 9 MR. FITZSIMMONS: Objection, vague. 10 A Sensors senses light in a pixel manner, 11 like a camera. 12 Q Are these sensors illustrated in any of 13 the figures? 14 MR. FITZSIMMONS: Objection, form. 15 A I think number 9. Number 9 in Figure 1. 16 Q And what type of sensor is element 9 in 17 Figure 1? 18 A It is light sensitive sensor. 19 Q And where is sensor number 9 mounted 20 relative to the headlamp assembly? 21 A Light sensitive sensor 9 is in the 22 headlamp assembly. If I recall, in my declaration,	63 1 objects, such as oncoming or preceding vehicle -- I 2 think it may use the word "area" or "direction." It 3 means where they located. 4 Then the signal, in turn, being 5 controlled by the controller to individually change 6 the light source into, and also individually change 7 the modulator. 8 As you can see, Figure 1 illustrates that 9 signal comes from 9, the camera sensor, and in the 10 control signal to operate source and modulator in a 11 way so that you can avoid glare once the vehicle has 12 been detected in front of you. 13 Q Does the light source illustrated in 14 Figure 1 refer to one light source or one LED or 15 multiple LEDs? 16 MR. FITZSIMMONS: Objection, form. 17 A Figure 2 is indication of the light 18 source, and it probably makes sense is a group of 19 LEDs. 20 Q So how does Karlsson describe avoiding 21 glare once the vehicle has been detected? 22 MR. FITZSIMMONS: Objection, form.
62 1 I referred to this. He disclosed the headlamp 2 assembly includes sensor 9. 3 Q So sensor number 9 is mounted internally 4 to the headlamp assembly? 5 A Unless -- I don't -- I don't recall if he 6 said it can be mounted outside. Otherwise, it 7 should be -- in my declaration, is in the headlamp 8 assembly. 9 Q Does Karlsson disclose a controller or 10 processor for controlling the light source? 11 MR. FITZSIMMONS: Objection, form. 12 A Yes. 13 Q Is the controller illustrated in any of 14 the figures of Karlsson? 15 MR. FITZSIMMONS: Objection, form. 16 A Figure 1, 14. Figure 1, 14. 17 Q Does Karlsson disclose a control strategy 18 for controlling the light emitted from the light 19 source? 20 MR. FITZSIMMONS: Objection, form, vague. 21 A In my declaration, I cited this reference 22 in -- the reference described the detection of other	64 1 A Karlsson demonstrated his disclosure by 2 individually change each spotlight beam in terms of 3 intensity, could be directions, could it turn off to 4 zero, in Figure 14. For the selected area where the 5 vehicle presents, that area will be reduced 6 intensity or shut off. 7 Q So you referenced Figure 14. So what is 8 illustrated in Figure 14 of Karlsson? 9 A Figure 14 is illustration of these 10 individual spotlight beam, group them together, and 11 individually, each beam spotlights, meaning the beam 12 contributors, can change direction and intensity 13 selectively. 14 If the vehicle presence is detected, 15 group of these LEDs can be selected -- beam 16 contributors can be selected to provide the reduced 17 intensity or no intensity for the area where vehicle 18 is present. 19 Q Does Figure 14 illustrate the light beams 20 or the LED light sources? 21 A Figure 14 is -- 22 MR. FITZSIMMONS: Objection, form.

65 1 A Figure 14 is the illustration of these 2 light beam spotlight beams, group them together. In 3 the conceptual matter, they're organized in, like, 4 array. 5 In addition, Figure 14 also illustrates 6 there's also individual light sensors in this group 7 of beam contributors. And they're arranged in the 8 way that each beam -- is example the way they 9 arrange these beam contributors and sensors in the 10 way that you can assemble it into a headlamp. 11 Q So which elements represent the sensors 12 in Figure 14? 13 A I think the illustrator used "S," if I'm 14 not -- if they mark it as "S," I'm pretty 15 sure (inaudible). We can double-check Figure 14. 16 Q So Dr. Jiao, approximately how many 17 sensors are illustrated in the Figure 14 embodiment? 18 A I did not count. Many. It's just 19 illustration. 20 Q Do you think there's more than ten 21 sensors? 22 MR. FITZSIMMONS: Objection, form.	67 1 of sensors, 9 is within the headlamp assembly. 2 (Reporter interruption.) 3 A What I said is, according to the 4 disclosure in Figure 1, which I answered that 5 question earlier, number 9, array of sensors are 6 within a headlamp assembly, or inside a headlamp 7 assembly. 8 MR. FITZSIMMONS: Dr. Jiao, did you say 9 sensors or array of sensors are within a headlamp 10 assembly? 11 THE WITNESS: I said array of sensors, 12 group of sensors, many sensors. 13 Q Dr. Jiao, do you have Exhibit 1013? 14 A Yes. 15 (Previously marked Exhibit 1013 attached 16 to the transcript.) 17 BY MR. TURNER: 18 Q What is Exhibit 1013? 19 A 1013 is -- the exhibit at 1013 is the 20 Japanese Unexamined Patent Application Publication. 21 The inventor is Nakamura, Takashi Nakamura. 22 Q What type of headlamp assembly is
66 1 Objection, calls for speculation. 2 A I did not count. Many sensors. 3 Q Why does the Karlsson headlamp require so 4 many sensors? 5 MR. FITZSIMMONS: Objection, calls for 6 speculation. Objection, scope. 7 A Karlsson disclosed the camera. These 8 sensors combine to function as camera. 9 Q So is each sensor a camera, or 10 collectively, all the sensors are a camera? 11 MR. FITZSIMMONS: Objection, form. 12 A Karlsson disclosed S as sensor, one. And 13 a group of sensors together (inaudible) can function 14 as a camera. 15 (Reporter interruption.) 16 A S indicated in Figure 4 is sensor, one 17 sensor. Yet many sensors together form a camera 18 detection capability -- imaging capability. 19 Q So are these sensors mounted internally 20 to the headlamp assembly? 21 A I think I responded to that question. 22 According to Figure 1, the sensor (inaudible) array	68 1 described in the Nakamura reference? 2 MR. FITZSIMMONS: Objection, form. 3 A Nakamura disclose adaptive headlamp. 4 Q What type of light source is described in 5 the Nakamura reference? 6 MR. FITZSIMMONS: Objection, form. 7 A The light source disclosed is not LED. 8 It's number 40 (inaudible) is filament-like light 9 source. Then we have specific (inaudible) not LED. 10 (Reporter interruption.) 11 MR. FITZSIMMONS: Can we go back to that 12 question? It might just be helpful here. 13 MR. TURNER: You want me to repeat the 14 question? 15 MR. FITZSIMMONS: I think that would be 16 helpful so we can all be on the same page of where 17 we are. 18 Q Dr. Jiao, what type of light source is 19 described in the Nakamura reference? 20 MR. FITZSIMMONS: Maintain a form 21 objection. 22 A He describes non-LED light source.

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69 1 Number 40. I'll try to clarify. It is incandescent 2 light source. 3 Q Is this light source illustrated in one 4 of the figures of Nakamura? 5 A Figure 3. 40S and C. They are light 6 sources. 7 Q Is there a difference between light 8 source 40S and 40C? 9 MR. FITZSIMMONS: Objection, form. 10 A I don't understand the question. You 11 mean differences in terms of what? 12 Q Does light source 40S refer to a specific 13 type of light source? 14 A They're same light source with different 15 locations. 16 Q Do these light sources provide different 17 functionality? 18 MR. FITZSIMMONS: Objection, form, vague. 19 A Both provide function for headlamps. 20 Q Are both of these light sources high beam 21 lamps? 22 A At least one of them is.	71 1 A This exhibit disclose elements within a 2 headlamp assembly, it's subcomponents of the 3 assembly relative whether it's light source itself 4 or assembled, the light source being shift so that 5 beam pattern can change, actually moved, physically 6 moved. 7 Q Okay. So this actuator moves a 8 subcomponent of the headlamp assembly. 9 So which subcomponents are moved and 10 which ones are not moved by this actuator? 11 A This figure demonstrate the optics, for 12 instance, the lens 46S. Are you with me at 13 Figure 3? 46. 14 Q 46S? 15 A Yeah. That's projection lens, projector 16 lens. 17 Are you with me? 18 Q Yes. 19 A That is fixed. 20 And light source may or may not include 21 the reflector can move, both horizontally and 22 axially, so that you can have the beam pattern
70 1 Q Do you know which one is the high beam? 2 A Without going through the entire exhibit, 3 just from my engineering knowledge and background, 4 the high beam in the regulatory requirement should 5 be -- Figure 3, should be the right one, namely, 6 40C. Purely based on the regulatory requirements. 7 Q What is the mechanism identified by 8 element 86 in Figure 3? 9 A Actuator. 10 Q So what is the function of actuator 86 in 11 the Nakamura reference? 12 A Actuator in Nakamura's disclosure is a 13 device that actually move the devices for the beam 14 pattern changes. 15 Q By moving the devices, are you referring 16 to swivelling the headlamp assembly? 17 MR. FITZSIMMONS: Objection, form. 18 Objection, mischaracterizes testimony. 19 A When I said "move" means physical move, 20 including the location change. 21 Q So what devices does actuator 86 move? 22 MR. FITZSIMMONS: Objection, form.	72 1 change to one direction or change the shape of beam 2 pattern indicated in Figure 6. 3 Q So that actuator moves the light source 4 and potentially the reflector, but not the lens, 5 which is 46S, in this embodiment. 6 Is that correct? 7 A What I said is, actuator is a device and 8 moves something, moves subcomponents. And without 9 going through word by word, my understanding is the 10 concept for this disclosure is, move that light 11 source may or may not include a reflector in 12 relationship to the lens 46S. 13 If you move axially, meaning on the 14 paper, go around FR direction, then beam pattern 15 will become broader or narrower. 16 Or you may move in the lateral direction, 17 the beam pattern may change to the left or right. 18 The actuator is a device that actually conduct -- 19 actually move the parts. 20 Q Okay. And when -- you mentioned the beam 21 pattern will become broader or narrower. 22 Is that correct?

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73 1 A It indicate in Figure 6, you can see. 2 Q Okay. 3 MR. FITZSIMMONS: Andy, we've been going 4 almost an hour and a half now, I think, so maybe a 5 break soon. 6 MR. TURNER: Okay. Is this -- are we at 7 Dr. Jiao's lunchtime? 8 THE WITNESS: I don't care. I'm very 9 flexible. I don't even typically eat lunch. So do 10 whatever is best for you, especially you have 11 weather conditions. 12 MR. TURNER: It cleared up now. So now 13 it's sunny in Detroit. 14 We can take a break. You want to do ten 15 minutes, or if you want to take longer to eat, if 16 this is your normal lunch hour. 17 THE WITNESS: It's up to you. 18 MR. FITZSIMMONS: Let's go off the 19 record. 20 (Recess from 3:02 p.m. until 3:32 p.m.) 21 BY MR. TURNER: 22 Q Dr. Jiao, we were discussing the Nakamura	75 1 location or position, based on coordinate system, 2 that the lights should be changed to avoid these 3 detected objects, such as oncoming or preceding 4 vehicles, to avoid glare, by changing the beam 5 pattern to avoid glare. 6 Q And does Nakamura disclose how it changes 7 the beam pattern? 8 A Nakamura disclosed the imaging 9 information that the oncoming or preceding vehicle 10 or multiple vehicles being detected, the beam needs 11 to be shifted or changed to be pattern to minimize 12 or reduce glare. 13 Q Does Nakamura disclose shifting the 14 pattern using the actuator? 15 MR. FITZSIMMONS: Objection, form. 16 A It does. It did. 17 Q How is the Nakamura reference different 18 from the Satonaka reference that we discussed 19 earlier today? 20 MR. FITZSIMMONS: Objection, form. 21 Objection, vague. 22 A I didn't opine on the differences in my
74 1 reference. 2 Does Nakamura describe any sensors 3 relative to the headlamp assembly? 4 MR. FITZSIMMONS: Objection, form. 5 A Nakamura disclosed a camera, but -- 6 (Reporter interruption.) 7 A Nakamura disclosed camera, which is type 8 of light sensors. 9 Q Does Nakamura disclose the location of 10 this camera? 11 MR. FITZSIMMONS: Objection, form. 12 A In Figure 1, camera is number 22. 13 Q And where is the camera located in 14 Figure 1? 15 A On the front windshield. 16 Q Okay. And how does Nakamura disclose 17 controlling the headlamp based on the camera? 18 MR. FITZSIMMONS: Objection, form, vague. 19 A I cited Nakamura's approach in my 20 declaration that camera 22 is a sensing or imaging 21 device, take a signal and provide input to control 22 system, and the imaging system determine where the	76 1 declaration. Do you want me to highlight the 2 differences for entire disclosure? Or my motivation 3 to combine to use either of these arts is only for 4 the elements that I provide opinion for the 5 motivation to combine. 6 (Cross-talk.) 7 A So do you want me to -- 8 Q That's not necessary. 9 I guess, do both references disclose the 10 same control strategy? 11 MR. FITZSIMMONS: Objection, form. 12 A When you use the word "control strategy," 13 meaning to control what? What did you mean, to 14 control what? 15 Q Does the Nakamura reference and the 16 Satonaka reference disclose controlling the light 17 sources based on the same inputs? 18 MR. FITZSIMMONS: Objection, form. 19 A Nakamura disclose additional 20 consideration for driver's eyes movement -- I have 21 trouble to pronounce the word "gaze" -- gazing 22 point. And you give me a little better

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77 1 pronunciation. Gazing, right? Yeah. 2 This reference described that the eye 3 movement, the gazing movement, is related to the 4 speed by having predicted time difference, how when 5 you see the curve, the bending, whatever the object, 6 and there is -- time is related to how our eye 7 move -- the time related eye move to the target is 8 also related to vehicle speed, if you talk about a 9 little bit of difference. 10 But if you talk about a difference in 11 disclosure, that's what I notice, which I did not 12 put in my declaration. 13 Two, Nakamura also used information 14 gathered, the coordinates based on imaging system. 15 Nakamura also introduced a concept that, because the 16 low beam pattern has a cutoff, meaning between 17 bright and dark area, that line, in the automotive 18 lighting industry, we name that as cutoff. 19 In the headlamp specifically, in certain 20 regulation, there is a horizontal cutoff, there is 21 also vertical cutoff. You may understand in the 22 vertical cutoff is also try to avoid glare for	79 1 A Karlsson, just for -- in case it's not 2 clear, for coordinate-based calculation, I 3 introduced a combination of Karlsson and Nakamura. 4 (Reporter interruption.) 5 Q And for the same combination, which 6 reference are you relying on for the optics 7 limitations? 8 MR. FITZSIMMONS: Objection, form. 9 A Karlsson. 10 Q And which reference are you relying on 11 for the camera limitations? 12 A Karlsson. 13 MR. FITZSIMMONS: Objection, form. 14 Q All right, Dr. Jiao. Do you have 15 Exhibit 1012? 16 A Yes. 17 (Previously marked Exhibit 1012 attached 18 to the transcript.) 19 BY MR. TURNER: 20 Q What is Exhibit 1012? 21 A That is U.S. Patent assigned to 22 Kobayashi, Kogyo Kobayashi [sic]. I'm sorry. Is
78 1 oncoming vehicle if you drive at low beam. 2 In United States, our vertical cutoff is 3 slightly toward right from vertical line. In Japan, 4 it's slightly toward the left from vertical line as 5 they're driving on the other side of road. 6 Nakamura disclosed that cutoff can also 7 be used by shift to certain direction in order to 8 avoid glare. That's another difference. 9 Q Dr. Jiao, these two differences in the 10 references that you just mentioned, did you 11 reference these in your declaration? 12 A I did not. 13 Q Can you go back to your declaration, 14 Exhibit 1003, paragraph 237, please. 15 A Yes. 16 Q Okay. So now we're talking about the 17 Ground 3 combination of Karlsson and Nakamura. 18 Which reference are you relying on for 19 the light source limitations? 20 A Karlsson. 21 Q And which reference are you relying on 22 for the controller limitations?	80 1 that Gotou? I'm sorry, Gotou. Assignee is 2 Kobayashi [sic]. Yeah. 3 Q And is this Patent Number 5,588,733? 4 A Correct. 5 Q Okay. So we're talking about the same 6 reference. 7 A Yes. 8 Q Okay. All right. So what type of 9 headlamp device is described in the Gotou reference? 10 MR. FITZSIMMONS: Objection, form. 11 A Gotou reference is adaptive headlamp. 12 Q Okay. And what is adaptive about this 13 headlamp? 14 MR. FITZSIMMONS: Objection, form, vague. 15 A In my declaration, I cited this reference 16 that is able to take map or GPS information to 17 project or determine road curvature or other road 18 conditions in turn. This information can be used to 19 change the beam distribution to compensate road 20 curvature -- to compensate road curvature 21 illumination. 22 Q Okay. How does the Gotou reference

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81 1 determine road curvature? 2 MR. FITZSIMMONS: Objection, form, vague. 3 A Gotou uses map information. 4 Q Does the Gotou reference disclose any 5 sensors? 6 A Yes. 7 Q What type of sensors are disclosed in the 8 Gotou reference? 9 MR. FITZSIMMONS: Objection, form. 10 A Gotou have multiple sensors, including 11 the GPS sensor, location sensor; gyro sensor, that's 12 for the vehicle steering wheel turning. Gotou also 13 uses -- beside gyro, they also have a steering angle 14 sensor as well as a vehicle speed sensor. 15 Q What type of light source is described in 16 the Gotou reference? 17 A Gotou reference does not have LED light 18 source. Most likely, it's incandescent light 19 source. It's not LED. 20 Q Does the Gotou reference disclose any 21 optics? 22 MR. FITZSIMMONS: Objection, form.	83 1 moveable, including swivel from left to right, using 2 gears. For instance, they also -- I'm pretty sure 3 they use the word "actuator." 4 Q Is that actuator illustrated in Figure 2 5 of the Gotou reference? 6 A Do not use the same words in the same 7 order, 8, step 8, step order 8, Figure 2, 8. 8 Q What does element 8 in Figure 2 refer to? 9 A The language in the patent column 4 use 10 the word "motor" and word "step." And in this 11 instance, it's a device -- it is a motor, but it's a 12 step motor, in general. 13 Q So what is a step motor? 14 A Usually, step motor take the signal that 15 change or rotate in an incremental way, step, step, 16 step. 17 Q So does the step motor in the Gotou 18 reference adjust the entire headlamp assembly or a 19 component -- a subcomponent of the headlamp 20 assembly? 21 MR. FITZSIMMONS: Objection, form. 22 A Gotou disclose the way to control the
82 1 A Gotou disclose a headlamp module that 2 includes optics in Figure 2, number 2. They include 3 optics. 4 Q What type of optics are included in the 5 headlamp module? 6 MR. FITZSIMMONS: Objection, form. 7 A Gotou used the term headlights 2, and 8 headlights 2 is a device that include light source 9 and the optical devices that collect the lights, 10 project lights on the road. So the disclosure is 11 headlights 2; by default, it includes the optical 12 elements in the headlights. 13 Q Are you reading from Gotou right there? 14 A I'm reading in Gotou's column 3, in 15 line 31 is referring headlights 2. Figure 2 also 16 used the word lamp module 4 -- or lamp unit 4. Lamp 17 or light is a definition of light source with optics 18 to project the lights on the road. 19 Q Does Gotou describe adjusting the beam 20 pattern from the headlamp assembly? 21 A Gotou describe a method to change the 22 headlamp particular lamp module in a way that is	84 1 beam pattern by using motor and gears, et cetera, to 2 rotate the lamp module 4 in a horizontal way. 3 Q So a horizontal way, you mean like left 4 and right relative to the front of the vehicle, 5 correct? 6 A Correct. Left or right corresponding to 7 the curve signal. 8 Q So what is the curve signal? 9 A Curve signal, it comes from the GPS or 10 map information to project there's a curve or 11 bending in front of the vehicle. 12 In turn, the ECU, the navigation system, 13 namely, 11 -- 31, will provide such signal to the 14 control unit number 10. In turn, the signal says, 15 there's a curve, and the motor will be actuated, and 16 either curve to the right or curve to the left. 17 So the curve signal is a map information 18 saying, map processed information to say there is 19 curve and send signal, the lamp will change toward 20 the curve. 21 Q Does Gotou describe adjusting both 22 headlamps together or individually?

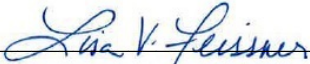
85 1 A Gotou -- in this particular declaration, 2 I do not describe -- I did not describe the 3 disclosure regarding individual lamp control. I can 4 go back to read the patent, but just from my memory, 5 it should be individually controllable. 6 Q Can you turn back to your declaration, 7 Exhibit 1003. 8 A Okay. 9 Q And then can you look at paragraph 334. 10 A Yes. 11 Q All right. So in this section, you're 12 describing a motivation to combine Karlsson, 13 Nakamura, and Gotou with reference to Ground 4, 14 correct? 15 A Yes. 16 Q So for this combination, which reference 17 are you relying on for the light source? 18 MR. FITZSIMMONS: Objection, form. 19 A Karlsson. 20 Q All right. And which reference are you 21 relying on for the optics? 22 MR. FITZSIMMONS: Objection, form.	87 1 I introduce Gotou. 2 Q Dr. Jiao, do you have your declaration 3 from the 318 IPR? 4 A Yes. 5 (Previously marked Exhibit 1003 attached 6 to the transcript.) 7 BY MR. TURNER: 8 Q All right. Can you turn to paragraph 104 9 in that declaration. 10 A Yes, I'm here. 11 Q So here, this is with reference to the 12 combination of Beam and Satonaka. For this 13 combination, which reference are you relying on for 14 the light source limitations? 15 MR. FITZSIMMONS: Objection, form. 16 A Beam. 17 Q Okay. And which reference are you 18 relying on for the processor limitations? 19 MR. FITZSIMMONS: Objection, form. 20 A I relied on Beam. In case it is not 21 clear that Beam explicitly disclosed 22 coordinate-based calculation, I introduced Satonaka.
86 1 A Karlsson. 2 Q All right. And which reference are you 3 relying on for the sensors such as the cameras? 4 MR. FITZSIMMONS: Objection, form. 5 A Karlsson. 6 Q All right. And for this combination, 7 which reference are you relying on for the processor 8 limitations? 9 MR. FITZSIMMONS: Objection, form. 10 A I said earlier when you used the word 11 control process alternatively is for 12 coordinate-specific calculation, just in case it was 13 not clear, I introduced Nakamura for 14 coordinate-based calculation in order to determine 15 the location of a target by Karlsson; where the 16 information needed for the curvature from GPS map 17 data, that's what I introduce Gotou, for the map 18 process -- map data or GPS process. 19 So control/processing in this combination 20 is based on Karlsson by introduce in case not 21 coordinate-specific in Nakamura; when the road 22 curvature being detected and using map or GPS data,	88 1 Q So you say in case it's not clear. Are 2 you adding Satonaka, or is that alternatively, 3 you're relying on Satonaka's processor? 4 MR. FITZSIMMONS: Objection, form. 5 A In my opinion, Beam's processor, storing, 6 determining, producing -- determining -- I'm sorry. 7 A process of producing the position 8 information is there, position including 9 coordinates. But in case an argument is that it 10 didn't -- Beam does not explicitly describe 11 coordinates, and step by step how the coordinate is 12 being stored, determined, processed, that's where I 13 introduced Satonaka for the coordinate calculations, 14 determination, storage is what the details. 15 Q So is it your opinion that Beam does 16 disclose this determining and storing coordinates 17 limitation, or Beam does not teach this limitation? 18 A Beam -- 19 MR. FITZSIMMONS: Objection, form. 20 A Beam disclosed implicitly 21 coordinate-specific information. Beam explicitly 22 disclosed the position information, determining

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89 1 position. 2 However, if the argument is, position is 3 not coordinate-specific, that's where I introduce 4 Satonaka, with coordinate-specific determination, 5 including algorithm, is disclosed by Satonaka. 6 Q So in your opinion, does the term 7 "position" require coordinates? 8 MR. FITZSIMMONS: Objection, form. 9 Objection, scope. 10 A As I state in my declaration, person of 11 ordinary skill in the arts understand in the 12 lighting business, lighting industry, any time we 13 use headlamp in terms of either position or area is 14 related coordinates, even not explicitly saying -- 15 position is XY, by the way, we don't need to use 16 XY -- the position is a coordinate concept. 17 Q So if you don't use the XY position, what 18 coordinate concept do you use in the headlamp 19 industry? 20 MR. FITZSIMMONS: Objection, form. 21 Objection, scope. 22 A Headlamp concept is project lights	91 1 which reference are you relying on for the optics 2 limitations? 3 A Beam. 4 MR. FITZSIMMONS: Objection, form. 5 A Beam. 6 Q And which reference are you relying on 7 for the sensors or camera limitations? 8 MR. FITZSIMMONS: Objection, form. 9 A Beam. 10 Q Now, if we could turn to paragraph 205 of 11 the same declaration. 12 A I'm here. 13 Q So this is with reference to Ground 2, 14 which is the combination of Beam, Satonaka, and 15 Kobayashi. 16 For this combination, which reference are 17 you relying on for the light source limitations? 18 MR. FITZSIMMONS: Objection, form. 19 A Beam. 20 Q And which reference are you relying on 21 for the optics limitations? 22 MR. FITZSIMMONS: Objection, form.
90 1 forward in two directions. We use the term -- 2 instead of XY, we use term H, horizontal; V, 3 vertical. 4 Q Are these terms, "horizontal" and 5 "vertical," relative to a common point? 6 MR. FITZSIMMONS: Objection, form. 7 A What did you mean? Origin? "Common 8 point," what does that mean? Origin? What does 9 "common point" mean? 10 Q So for the headlamp concept, you use -- 11 what do the terms "horizontal" and "vertical" refer 12 to? 13 A Horizontal and the vertical is reference 14 to how the light is projected in front of a vehicle 15 with reference to the vehicle. Horizontal means 16 along the ground. Vertical is perpendicular to the 17 ground. Horizontal, vertical means the angular 18 distribution or angular measure, not length, not in 19 any kind of measurements, millimeters, inches, no. 20 It's angle. 21 Q So if we go back to the Beam/Satonaka 22 combination that you reference in your declaration,	92 1 A Beam. 2 Q And which reference are you relying on 3 for the sensors or camera limitations? 4 MR. FITZSIMMONS: Objection, form. 5 A Beam. 6 Q Which reference are you relying on for 7 the controller or processor limitations? 8 MR. FITZSIMMONS: Objection, form. 9 A I relied on Beam's processor for 10 determining the position. Where in case the 11 coordinate-specific information is argued, I 12 introduce Satonaka where coordinate-specific 13 calculations are disclosed. 14 In the case of upcoming curvature and 15 when a map information is needed in an 16 implementation of processing, storage, and driving 17 the beam change, I introduced Kobayashi. 18 Q Can you turn to paragraph 245 of your 19 declaration. 20 So now we're -- with reference to the 21 Ground 3 combination of Karlsson and Nakamura, which 22 reference are you relying on for the light source

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93 1 limitations? 2 MR. FITZSIMMONS: Objection, form. 3 A Karlsson. 4 Q And for Ground 3, which reference are you 5 relying on for the optics limitations? 6 MR. FITZSIMMONS: Objection, form. 7 A Karlsson. 8 Q And again, for Ground 3, which reference 9 are you relying on for the sensors or camera 10 limitations? 11 MR. FITZSIMMONS: Objection, form. 12 A Karlsson. 13 Q And still for Ground 3, which reference 14 are you relying on for the processor limitations? 15 MR. FITZSIMMONS: Objection, form. 16 A I relied on Karlsson's – the disclosure 17 for determining, storage, and process the signal for 18 the projection of the area of the beam pattern. 19 However, if the argument is that that 20 area is not explicitly stated coordinate-specific, I 21 introduced Nakamura because there's more 22 coordinate-specific processor calculation disclosed	95 1 Nakamura. 2 And when the road curvature claim is 3 cited where the map data is needed, I introduced – 4 I referenced Gotou. 5 So it's combination of three in terms of 6 store, processing the data. 7 Q Does your combination include three 8 different processors? 9 MR. FITZSIMMONS: Objection, form. 10 A My combination is largely software 11 changes. The processor – define a processor, 12 because only – the process to take – providing the 13 information, one processor can do all. But if you 14 have multiple processors, so be it. But as long as 15 all three type of information is being processed 16 through software. 17 Q For this Ground 4 combination, which 18 reference are you relying on for the optics 19 limitations? 20 MR. FITZSIMMONS: Objection, form, again. 21 A Karlsson. 22 Q And for Ground 4, which reference are you
94 1 by Nakamura. 2 Q Can you turn to paragraph 342 of the same 3 declaration, please. 4 A All right, got it. 5 Q Okay. So for Ground 4, this is the 6 combination of Karlsson, Nakamura, and Gotou. 7 Which reference are you relying on for 8 the light source limitation? 9 MR. FITZSIMMONS: Objection, form. 10 A I'm sorry. It's Gotou. That's the name. 11 But okay. The question is, what light 12 source? 13 Q Yes. 14 A Karlsson. 15 Q And which reference do you rely on for 16 the processor limitations? 17 MR. FITZSIMMONS: Objection, form. 18 A I relied on Karlsson for determination or 19 direction of light changes should be in terms of 20 detecting the imaging or objects. 21 However, if the argument is, that's not 22 coordinate-specific, that's why I also introduced	96 1 relying on for the sensors or the camera 2 limitations? 3 MR. FITZSIMMONS: Objection, form. 4 A Karlsson. 5 MR. TURNER: Do you guys mind if we take 6 a break? 7 MR. FITZSIMMONS: Break is fine. 8 (Recess from 4:28 p.m. until 4:36 p.m.) 9 MR. TURNER: So I'm done with direct. So 10 I'll turn it over to you, Jason, if you have any 11 redirect. 12 MR. FITZSIMMONS: Thanks, Andy. I 13 thought you might say that. Maybe give us ten 14 minutes, and we'll sync back up. 15 MR. TURNER: Okay. That's fine. 16 (Recess from 4:36 p.m. until 4:46 p.m.) 17 MR. FITZSIMMONS: Thanks. No further 18 questions for redirect from us. So we can close the 19 deposition. 20 Thank you, Dr. Jiao. 21 THE WITNESS: Thank you. 22 MR. TURNER: And thank you, Dr. Jiao.

97 1 COURT REPORTER: Is there anything else 2 for the record? 3 MR. TURNER: No. 4 MR. FITZSIMMONS: Nothing else. 5 THE WITNESS: I don't know if you allow 6 me to clarify one statement I made. Is that doable 7 or not doable? 8 MR. TURNER: We can do that. 9 THE WITNESS: Andy asked me a question. 10 This is regarding Beam and Satonaka's combination. 11 The question he was asking four elements, light 12 source, optics, and control process. 13 What I said, I said Beam. But I also 14 want to add, in case there's any argument for 15 coordinate-based, I introduced Satonaka for the 16 processor. Andy, if you recall that question. 17 MR. TURNER: Okay. 18 MR. FITZSIMMONS: Thank you, Dr. Jiao. 19 THE WITNESS: Thank you. 20 MR. TURNER: Thank you. 21 (Transcript orders discussed.) 22 (Off the record at 4:49 p.m.)	99 1 I further certify that I am not related 2 to 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 this 30th day of AUGUST, 2023. 10 11 12  13 NOTARY PUBLIC IN AND FOR 14 THE DISTRICT OF COLUMBIA 15 MY COMMISSION EXPIRES JUNE 15, 2028 16 17 18 19 20 21 22
98 1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC 2 3 I, Lisa V. Feissner, RDR, CRR and Notary 4 Public in and for the District of Columbia, do 5 hereby certify: 6 7 That JIANZHONG JIAO, the witness whose 8 deposition is hereinbefore set forth, was duly sworn 9 by me before the commencement of such deposition, 10 and that such deposition was taken before me and is 11 a true record of the testimony given by such 12 witness. 13 14 I further certify that the adverse party, 15 VOLKSWAGEN GROUP OF AMERICA, INC., was represented 16 by counsel at the deposition. 17 18 I further certify that the deposition of 19 JIANZHONG JIAO, occurred REMOTELY on WEDNESDAY, 20 AUGUST 23, 2023, commencing at 12:04 p.m. and 21 concluding at 4:40 p.m. 22	

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