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Transcript of Jianzhong Jiao, Ph.D.

Date: October 3, 2023

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

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Transcript of Jianzhong Jiao, Ph.D.
Conducted on October 3, 2023

1 (1 to 4)

1	1	3
1	UNITED STATES PATENT AND TRADEMARK OFFICE	1
2	BEFORE THE PATENT TRIAL AND APPEAL BOARD	2
3	-----x	A P P E A R A N C E S
4	VOLKSWAGEN GROUP OF AMERICA, INC., :	2
5	Petitioner, :	ON BEHALF OF PETITIONER:
6	vs :	3
7	YECHZKAL EVAN SPERO, :	JASON A. FITZSIMMONS, ESQUIRE
8	Patent Owner. :	4
9	-----x	IAN SOULE, ESQUIRE (via Zoom)
10	U.S. Patent No. 10,894,503 to Spero	5
11	Case Nos. IPR2023-00197, IPR2023-00328, IPR2023-00335	JOHN D. HIGGINS, ESQUIRE
12		6
13	Oral deposition of	STERNE, KESSLER, GOLDSTEIN & FOX PLLC
14	JIANZHONG JIAO, PH.D.	7
15		1101 K Street, NW
16	WASHINGTON, DC	8
17	TUESDAY, OCTOBER 3, 2023	Washington, DC 20005
18	9:24 a.m. EASTERN TIME	9
19		(202) 371-2600
20	Job No.: 509471	10
21	Pages: 1 - 118	11
22	Reported by: Lisa V. Feissner, RDR, CRR, CLR	12
		ON BEHALF OF PATENT OWNER:
		13
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2	2	4
1	Oral deposition of JIANZHONG JIAO, PH.D.,	1
2	held at the offices of:	A P P E A R A N C E S (cont'd)
3		2
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22		RACHEL CARRICK, A/V Technician
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1	C O N T E N T S	5	1	Also, if you need to take a break, please	7
2	EXAMINATION OF JIANZHONG JIAO, PH.D.	PAGE	2	don't hesitate to let me know. I will say in	
3	By Ms. Shah	6	3	advance, there's a chance that I may need to pause	
4			4	during this deposition because I -- as it turns out,	
5	E X H I B I T S		5	I'm doing this not from my office, and there may be	
6	(None marked)		6	some background circumstances that arise that are	
7			7	outside of my control. So if that arises, I'll let	
8			8	you know.	
9			9	But other than that, please let me know	
10			10	if you have any questions, and if not, we can	
11			11	commence the deposition.	
12			12	A Okay.	
13			13	MR. FITZSIMMONS: And Sangeeta, this is	
14			14	Jason Fitzsimmons, Sterne Kessler. Just since the	
15			15	deposition is covering the three proceedings with	
16			16	three declarations, if you could try to just make	
17			17	clear for the record which proceeding or which	
18			18	claims we're referring to so that's clear, it would	
19			19	be helpful for the record.	
20			20	MS. SHAH: Absolutely. We'll try to do	
21			21	that if possible. Some of the issues are central to	
22			22	all of them. But to the extent we're referring to	
1	P R O C E E D I N G S	6	1	specific testimony, we'll, of course, refer to, you	8
2	JIANZHONG JIAO, PH.D.,		2	know, a specific exhibit number for the ease of	
3	having been first duly sworn, was examined and		3	record, clarification.	
4	testified as follows:		4	MR. FITZSIMMONS: Thanks. Appreciate it.	
5	EXAMINATION		5	Q So with that, let's go ahead and start	
6	BY MS. SHAH:		6	with -- let me see here. Let's start with -- so I'd	
7	Q Good morning, Dr. Jiao. How are you		7	like to point your attention to the declaration that	
8	today?		8	you submitted, Dr. Jiao, in the IPR 2023-00197	
9	A Good morning. Good. How are you?		9	proceeding. If you can -- do you have access to	
10	Q Good. I'm glad we worked out our		10	that declaration? It's Exhibit Number 1003.	
11	technical issues so that we could commence our		11	A Okay.	
12	deposition.		12	Q Okay. So my first question is, if you	
13	So my first question -- I did want to		13	look at the table of contents, you'll see that there	
14	just briefly state, of course, as we go through		14	are -- well, actually -- yeah. So you'll see in the	
15	these deposition process, if you have any questions,		15	table of contents of your declaration that there's a	
16	please feel free to stop me to ask the question.		16	series of grounds that are listed.	
17	If you don't understand a question that I		17	A Yes.	
18	pose, please, once again, ask me to clarify the		18	Q You see that?	
19	question or -- you know, I want to make sure that		19	So can you identify for me how many	
20	you're able to answer all the questions that I pose		20	grounds exist in this that you opined on (inaudible)	
21	today, (inaudible) so you understand the questions		21	declaration?	
22	that I'm asking you.		22	A Six.	

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9 1 Q And let's go to -- let's jump to 2 paragraph 126 of that Exhibit 1003. 3 A I'm here. 4 Q You're there? Okay, great. 5 So the question I wanted to ask you is, 6 with respect to the statement that you have in 7 paragraph 126, can you explain to me that when 8 Beam -- the Beam reference discusses blanking, does 9 that also include dimming? 10 MR. FITZSIMMONS: Objection, form. 11 A Can you point to me where in my 12 declaration that I stated that such function? 13 Q One second. Well, let's look first at 14 paragraph 173 where you discuss -- well, go ahead. 15 Let's look at paragraph 173. 16 A You said paragraph 173? 17 Q Yes. 18 A Okay. 19 Q So do you see the language in paragraph 20 173 that refers to blanking? 21 A Yes. 22 Q And is it your understanding that in	11 1 A What I said is, the reduced in intensity 2 is an area identified by this reference as blanked 3 area. 4 Q Okay. So I'm sorry, just to clarify. 5 When you say that an area is reduced in intensity, 6 you are pointing to the areas that are blanked. 7 Is that correct? 8 A I point to the area to where I quoted the 9 language, blanked area tracks location of oncoming 10 vehicle. That's where intensity is reduced. 11 Q What is your understanding within Beam of 12 the term "blanking"? 13 MR. FITZSIMMONS: Objection, form. 14 Q So, for example, as provided in paragraph 15 173 where you refer to blanked areas, what is your 16 understanding of how that term is used in the Beam 17 reference? 18 MR. FITZSIMMONS: Objection, form. 19 A It's exactly what the phrase is used in 20 my declaration. That's the area that tracks 21 location of oncoming vehicle, for instance. That's 22 the area.
10 1 Beam, when they refer to blanked areas or blanking, 2 that that also includes dimming? 3 MR. FITZSIMMONS: Objection, form. 4 A My understanding is exactly stated in my 5 declaration using the quotation of the language that 6 this reference stated. 7 Q I'm sorry. Can you point to me what your 8 position is with respect to the question that I 9 posed? 10 A My position is, the blanked area tracks 11 location of oncoming vehicle. That's the area, the 12 blanked. 13 Q Okay. So the question that I asked is, 14 when Beam is referring to blanking an area, is it 15 your understanding that blanking includes the 16 concept of dimming? 17 A What I stated is using the description of 18 such reference with the statement of phrase called 19 reduced in intensity. 20 Q Okay. So then is it accurate to say that 21 in your view, when Beam talks about blanking, that 22 also includes reducing intensity?	12 1 Q Okay. I'm sorry. I'm not asking you 2 about a blanked area. 3 I'm asking, in the Beam reference, when 4 this concept of blanking is discussed, technically, 5 can you explain to me how blanking is achieved? 6 MR. FITZSIMMONS: Objection, form. 7 A I'm sorry. I didn't understand what the 8 phrase, how the blanking is achieved. What I stated 9 here is, he defined -- there are certain area, when 10 it track the vehicle, that area is called a 11 blanked -- that area is a blanked area. That's the 12 determination. 13 So I didn't understand your question, 14 achievement question. 15 Q Okay. So let's look at paragraph 184. 16 Let me know when you're there. 17 A I am there. 18 Q So with respect to paragraph 184, there 19 is this -- in quotations, there's language about the 20 outputs blanking signals, and then it continues on 21 with commands the appropriate pixels to be reduced 22 in intensity.

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1 Do you see that? 2 A I do. 3 Q So with respect to the idea of blanking 4 the signal, what is it that happens with respect to 5 the blanking of signal in the Beam reference? 6 MR. FITZSIMMONS: Objection, form. 7 A As I stated in my declaration, Beam 8 disclosed the spatial sense data detected from the 9 sensor and becomes the input to determine the 10 so-called blanking area. 11 Q And as you state here, where you say, The 12 processor used appropriate algorithms on incoming 13 data to determine the locations to be blanked, 14 output blanking signals commands the appropriate 15 pixels to be reduced in intensity. 16 Part of what I'm asking -- so once again, 17 here when it says output blanking signals and 18 commands the pixels to be reduced in intensity, but 19 reduced in intensity is referring to the blanking 20 signals that are output. 21 Is that correct? 22 A Reduce the signal is based on the	13 1 asking is, if there is a reduction in intensity -- 2 well, actually, let me clarify. 3 For the blanked area, is there no light 4 provided? 5 A My response to that, I believe in my 6 declaration, I described -- I referred to what this 7 reference disclosed, and whether it is reduced 8 intensity or to zero. 9 Q Okay. So can you point to me where in 10 the Beam reference there is a disclosure of blanking 11 as something other than zero? 12 A In paragraph 184, to be reduced in 13 intensity, reduced is less. It didn't say zero. 14 Yet I'm pretty sure in my declaration I referred to 15 Beam disclosed that reduction can be off, like zero. 16 Q I see. So "reduced in intensity" means a 17 reduction from maximum intensity to zero. That's 18 the reduction in intensity that you're referring to? 19 MR. FITZSIMMONS: Objection, form. 20 Objection, mischaracterizes the witness's testimony. 21 A What I said is, in paragraph 184, I 22 reference to the statement "reduce in intensity."
14 1 detection, in paragraph 184, spatial data detected 2 by the sensor 107 and processor calculate that 3 sensing -- sensed information to determine the 4 blanked area or select the area to be dimmed, to be 5 reduced for intensity. 6 Q And when you refer to "blanked area," 7 what does that mean? 8 A Again, it is described in the reference 9 in that the entire projected lights were coming from 10 these microbeams, the light source of microbeams, in 11 a discrete manner, and the sensing information can 12 determine which microbeam additively as the blanked 13 area need to be reduced in intensity. 14 Q So is there a reduction in intensity, or 15 is no light provided to the blanked area? 16 A I remember I disclosed this in my 17 declaration, that described by Beam. 18 Q I'm sorry. Can you point -- can you 19 point where the answer to my question is in your 20 declaration? 21 A I can take a look. 22 Q So just to clarify, the question that I'm	16 1 What I also said in my declaration, I 2 recall that Beam also disclosed to reduce to zero. 3 Q Okay. Do you see those as two different 4 things, reduce in intensity and reduce to zero? 5 When you say -- in paragraph 184, when you're 6 referring to reduce in intensity, and you're talking 7 about Beam disclosing reducing to zero, are they two 8 different things in the context of paragraph 184? 9 MR. FITZSIMMONS: Objection, form. 10 A In my understanding, reduced in intensity 11 is from one value to be below that value. My 12 understanding of zero is to give a quantitative 13 result of a reduced intensity. 14 Q Okay. So in paragraph 184, when there's 15 the statement here about the dimmed area -- 16 Do you see that? 17 A Yes. 18 Q -- is that a zero value? 19 A Dimmed area is corresponding to the 20 blanked area to be reduced in intensity. 21 Q Can you to go to paragraph 117 of your 22 declaration.

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17 1 A I'm here. 2 Q Do you see the first sentence that 3 states, Though it is in my opinion that Beam 4 explicitly or implicitly discloses every feature 5 recited in claims 20, 24, 25? 6 A Yes, I saw it. 7 Q What is your understanding of the 8 difference between explicitly or implicitly in that 9 sentence? 10 A Do you want me explain the legal 11 definition? I'm not a lawyer. 12 Q What's your understanding of the 13 difference between those, if you have a legal 14 understanding, but really more just in the context 15 of what's written there. 16 A Well, based on the person of ordinary 17 skill in the art, my understanding is "explicitly" 18 means more directly. "Implicitly" means maybe 19 indirectly or can be interpreted to. 20 Q But do you have an understanding of those 21 words as tied to any legal principles? 22 A Legal principle in regarding to?	19 1 Q Okay. So are those terms -- based on 2 your reading of the legal doctrine of anticipation, 3 does -- when it's your opinion that Beam explicitly 4 discloses every feature, is that tied to the 5 doctrine of anticipation? 6 MR. FITZSIMMONS: Objection, form. 7 Objection, calls for a legal conclusion. 8 A I thought my declaration is -- described 9 obviousness. 10 Q Okay. So it's your understanding, then, 11 that the sentence that it's your opinion that Beam 12 explicitly or implicitly discloses every feature is 13 related to the issue of whether Beam -- whether it's 14 obvious from the Beam reference -- whether all the 15 features of claims 20, 24, and 25 are obvious in the 16 Beam reference? 17 MR. FITZSIMMONS: Objection, form. 18 A Again, my declaration is -- my 19 declaration is to support an argument for 20 obviousness, which is based on my understanding of 21 paragraph -- starting from paragraph 31. 22 Q Okay. Looking at paragraph -- continuing
18 1 Q Like, for example, are you familiar with 2 the idea of -- the legal principle -- the -- what is 3 referred to as anticipation, the doctrine of 4 anticipation? Are you familiar with that doctrine? 5 A I stated in my declaration for my 6 understanding. I can go back to read it. 7 Q Okay. Go ahead, and if that would help 8 you to answer the question, feel free to look at it. 9 A I wrote in paragraph -- starting from 10 paragraph 33 on page 12 for my understanding of 11 obviousness. Do you want me to read the section? 12 That's my understanding. 13 Q I just wanted you to go ahead and refresh 14 your recollection. If you would like to read it out 15 loud, that's also fine. I just wanted to make sure 16 that to the extent you included language about your 17 understanding of anticipation, you had an 18 opportunity to review it just now. 19 A As I read, the understanding of 20 obviousness is based on the disclosure prior arts. 21 Again, "explicitly" for me is more directly. 22 "Implicitly" means maybe indirectly.	20 1 on to the next paragraph, paragraph 118. Can you -- 2 go ahead and take a look at paragraph 118. I have 3 some questions about paragraphs 118 and 119. 4 A Okay. 5 Q Can you specifically identify what 6 hardware you're referring to in paragraph 118? 7 A In paragraph 118, I identified light 8 source is the microbeam that is the combination of 9 hardware lamp 202 and spatial light modulator 203. 10 Q Okay. And then when we go to paragraph 11 119, can you point to the specific hardware that 12 you're relying on for paragraph 119. 13 A In paragraph 119, I described the 14 comparison of two embodiments, which both disclosed 15 light source. Embodiment 1 is 202 combining with 16 203. Embodiment 2 is combined function in -- oh, 17 I'm sorry. In -- I didn't see the figure. But in 18 the light source, embodiment 2 is element 401, which 19 is in Figure 4. 20 Q Okay. I'm sorry. You were indicating 21 that the one embodiment is the lamp 202 and another 22 embodiment is the array of light sources 401.

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21 1 Is that what you were referring to? 2 MR. FITZSIMMONS: Objection, form. 3 A No. What I said is, in paragraph 119, 4 that I described two embodiments from Beam to 5 disclose light source, namely, microbeams. 6 Embodiment 1 is illustrated with two 7 elements, 202, 203. Embodiment 2 is illustrated 8 with one combined element 401. That's -- that's 9 what's stated in my declaration 119. 10 Q So in the second embodiment that includes 11 the light source 401, is there an SLM? Is there a 12 spatial light modulator? 13 A Light source 401, as illustrated, it is 14 microbeam. The definition or description microbeam 15 includes emitter, whether it's lamp or LEDs, and 16 spatial light modulator, which is optical element. 17 So whether it's separate in Figure 2 or 18 combined in Figure 4, Beam consistently described 19 the light source, namely, microbeam, that it 20 comprised with two elements, emitter and optical 21 elements, namely, spatial light modulator. 22 Q Okay. So it's your position that a	23 1 Beam's -- disclosure Exhibit 1005 in column 3, 61-64 2 in my paragraph 119. I can go back to each column 3 to re-review what is -- the specification the 4 disclosure described. 5 Again, it is my understanding that Beam 6 disclosed light source as such, that is, a 7 combination of emitter and spatial light modulator 8 as a microbeam. 9 Q So in paragraph 118, in the second 10 sentence, when you say, Each microbeam is a 11 directional "source," why did you put the word 12 "source" in quotes? 13 A Well, that's the statement. Each 14 microbeam is a light source. Only here emphasizes 15 directional light source as Beam disclosed is 16 independently control its spatial, and we use the 17 word "spatial" or "angular distribution." When you 18 have light emission that being able to control to 19 angularly or spatially, that is directional. 20 Q Can you go to paragraph 77, please. 21 A I'm here. 22 Q Okay. So if you see in the second
22 1 microbeam is a light source? 2 A It is my position that Beam disclosed 3 light source that is named as microbeam. 4 Q Can you point to me where in the Beam 5 reference Beam discloses light source as a 6 microbeam? 7 A It is in my declaration. I can go back 8 the entire reference and to point out. The 9 microbeam is what's used as his invention -- his 10 disclosure as light source. 11 Q If you could point to me specifically 12 where in your declaration or in the Beam 13 reference -- actually, if you can point to your 14 declaration that identifies where in the Beam 15 reference light source is named as a microbeam. 16 A The first part that -- in my declaration, 17 paragraph 118, I stated the combination of -- I 18 stated that microbeam is a directional light source 19 that I reference to Exhibit 1005 for column 4, 20 26-29, and column 3, 30-21 [sic], and a bunch of 21 figures. 22 In addition, I also referred to the	24 1 sentence of paragraph 77, you have the term 2 "blanked" immediately followed by "(attenuated)." 3 A I'm sorry. Paragraph 177? 4 Q No, sorry. 77. Just 77, not 177. 5 A I'm sorry. Can you repeat your question? 6 I'm here, I just read paragraph 77. 7 Q Yes. So in the second sentence of 8 paragraph 77 -- 9 A Yes. 10 Q -- when you say, Rays from lamp 202 fall 11 on and are reflected or blanked (attenuated), are 12 you equating "attenuated" with "blanking"? 13 A "Attenuated," POSA's understanding, 14 including me, it means reduced. Attenuation is 15 reduction of transmission or reduction of emission. 16 Q Okay. And so in this context, blanking 17 is attenuation? 18 A What I said, again, is the light ray from 19 lamps, as described by Beam, they're going to hit 20 the spatial light modulator, which served two 21 functions, reflected or attenuated. 22 Q When it serves the function of

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25 1 attenuation, does light escape the lamp? 2 MR. FITZSIMMONS: Objection, form. 3 A Spatial light modulator is a modulation 4 device to the light or light ray that serves 5 function of reflection attenuation. 6 Q I'm sorry. I just wasn't clear. Is it 7 reflection attenuation, or reflection or 8 attenuation? 9 A Both. 10 Q Okay. 11 A Can be both. 12 Q And how is that achieved by a spatial 13 light modulator? If you can start off by explaining 14 to me how a spatial light modulator reflects light. 15 MR. FITZSIMMONS: Objection, form. 16 A I believe I described -- disclosed in my 17 declaration that uses description in Beam 18 specification and his claims. 19 Q Can you point to me where that is in your 20 declaration? 21 A I can go back to look. 22 Well, in paragraph 76, I refer to	27 1 A Well, my declaration -- paragraph 119, I 2 refer to several -- part of the reference, 3 Exhibit 1009, column 3, 61-64; column 5, 3-16. And 4 there is a few indicators in the reference -- the 5 Beam reference. If you want, I can go back to the 6 reference to look at each column and give you the -- 7 Q If you could go through and identify 8 where in Beam there is a teaching that the LED 9 embodiment combines the spatial light modulator. 10 I'm sorry. From a given -- all the references you 11 identified in your declaration, if you could point 12 to which of those references supports the position 13 that the LED embodiment includes the spatial light 14 modulator. 15 A One of them is column 8, Exhibit 5, from 16 4 to 17, wherein it said, Light source include a ray 17 of individual independently controllable microbeam 18 source -- here's also your first question, the light 19 source is microbeam source -- selected from a group 20 of consists of light-emitting diodes, lasers, and 21 others, and spatial light modulator. 22 So this is explanation, microbeam is
26 1 Exhibit 1005 at column 3, 8-44, and column 6, 53 2 to 7- -- 6:53 to column 7:13. Let me see. 3 There's -- and also, in paragraph 77, I refer to 4 Exhibit 105, which is Beam's disclosure, column 4, 5 26-59. 6 I think in these disclosures in Beam's 7 specification and claims, it explained how light 8 spatial modulator works. 9 Q You mentioned in paragraph 119 that there 10 was comparison of embodiments. 11 A What I stated is -- in paragraph 119 is, 12 besides first embodiment, additionally, Beam 13 disclosed the second embodiment, which light is 14 generated from LED rather than non-LED. 15 Q Does the LED embodiment include the 16 spatial light modulator? 17 A The second embodiment is the LEDs, the 18 light emitted from solid-state emitter combining 19 with spatial light modulator. 20 Q Can you identify for me where in Beam the 21 second embodiment, which is the LED embodiment, 22 combines the spatial light modulator?	28 1 emission and modulation combined. 2 Also, column 5, number 3-6, in -- 202 and 3 203 are replaced by 401. My understanding is 4 combined into one. 5 Q So it's your understanding that if 6 something is replaced by, it's combined with? 7 A It is my understanding in this particular 8 description, by looking at his specification as well 9 as Figure 4 and 6 and his claim 4, that the light 10 source must include both emitter and spatial light 11 modulator, especially if you look at Figure 6. And 12 Figure 6 is alternative Figure 5. You have to have 13 a modulator in order to work as microbeam. 14 Q I'm sorry. Can you explain to me -- you 15 just mentioned that Figure 6 is an alternative to 16 Figure 5 and that you have to have the modulator in 17 order to work as a microbeam. 18 Can you explain that conclusion that you 19 just drew? 20 MR. FITZSIMMONS: Objection, form. 21 A Figure 6 is second or alternative 22 embodiment from Figure 5. Both disclose microbeam

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29 1 concept that is the individually controllable 2 directional and intensity-wise light sources. 3 Therefore, Figure 4 is -- I'm sorry -- 4 Figure 6 is alternative Figure 5. You have to have 5 a way to emit light and to control the 6 directionality and attenuation of the light. 7 Therefore, a person of ordinary skill in 8 the art would understand you have to have some way 9 to modulate light. That's why they combined the two 10 elements into one, namely 401. 11 Q Now can you turn to paragraph 126 of your 12 declaration. 13 A I'm here. 14 Q So you see the first sentence that says, 15 First, including an additional or alternative 16 control technique (software implementation) for 17 Beam? 18 A Yes. 19 Q Can you describe for me how the 20 additional control technique for Beam functions. 21 MR. FITZSIMMONS: Objection, form. 22 A I'm sorry. Additional control function?	31 1 region is part of motivations to combine because 2 that may make the software design easier. 3 Q In paragraph 126, is the software 4 implementation in addition to the hardware 5 implementation that's referred to in paragraph 125? 6 MR. FITZSIMMONS: Objection, form. 7 A I'm sorry. Can you point to me where in 8 my declaration I state about hardware portion? I 9 don't think it was 125. 10 Q If you could take a look at 125. In 11 paragraph 125, when you're referring to the building 12 blocks -- 13 A Yes. 14 Q -- would you describe that as hardware? 15 A I described the hardware implementation 16 in my declaration, paragraph 135. 17 Q Okay. Let's go to paragraph 135. 18 So when you have paragraph 135, that 19 first sentence, when it says, Additionally or 20 alternatively, a POSA would have sought to 21 incorporate known components (hardware 22 implementation), is that -- is the hardware
30 1 Addition to Beam or from Beam? I didn't understand 2 the question. 3 Q Well, if you can explain to me what that 4 sentence specifically says, including an additional 5 or alternative control technique for Beam. 6 Let's start off with, what is the 7 additional control technique? 8 A I stated in my declaration, the secondary 9 reference, namely, Thominet, who disclosed known 10 technique of using multiple directional beam 11 regions. That's what I meant, additional 12 alternative, is there is a region, meaning, almost 13 like grouping. 14 Q So is "additional" the same as 15 "alternative"? 16 MR. FITZSIMMONS: Objection, form. 17 Q In that sentence in paragraph 126, is 18 "additional" the same as "alternative"? 19 MR. FITZSIMMONS: Objection, form. 20 A My statement in my declaration, I stated 21 additional, alternative, and that disclosed by 22 Thominet, that group the microbeams in the different	32 1 implementation being added to the software 2 implementation that is described in the preceding 3 paragraphs? 4 A What I describe in my declaration, for 5 motivations to combine, I happened to described in 6 two scenarios -- two aspects, the software aspect, 7 which is starting from paragraph 131, and hardware 8 aspect starting from paragraph 135. 9 The combination of these two reference is 10 being described in my declaration with the two 11 aspects of execution software and the hardware. 12 Q Okay. So in paragraph 135, when it 13 starts off and says, Additionally or alternatively, 14 a POSA would have sought to incorporate known 15 components (hardware implementation), is the 16 "additionally or alternatively" language referring 17 to the software implementation that preceded or not? 18 A Again, I'm not a lawyer to give you 19 precise description for the legal basis of 20 obviousness. 21 But my understanding is when you combine 22 two prior arts, you can describe two -- the

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33 1 motivation to combine two prior arts in the way that 2 person of ordinary skill would look into this 3 disclosure. In my declaration, I happen to group 4 them into software and hardware. 5 Is your question saying, is -- both is 6 necessary or both is alternative, addition? All I 7 said is my declaration, they're alternatively, 8 additionally. 9 Q I'm trying to understand what it means 10 when you say "additionally or alternatively." 11 What is -- the hardware implementation is 12 in addition to what? 13 A In the declaration, it means addition to 14 paragraph 131 and the following paragraph. Then I 15 stated also alternatively and additionally, you can 16 combine the hardware. You can have hardware 17 implementation starting from paragraph 135. 18 Q Okay. So hardware implementation can 19 then be added to the software implementation that's 20 described in paragraphs 131 to 134? 21 MR. FITZSIMMONS: Objection, form. 22 A I will still use my statement in	35 1 reference, semiconductor light source 10 on the 2 curved surface 12. And following that, and also 3 says, combining into Beam's system (with a flat 4 array). 5 In my view, this is additionally, 6 alternatively, software -- I mean, hardware 7 addition. 8 Q I'm sorry. It's not clear when you say 9 "additional reference." What are you referring to? 10 MR. FITZSIMMONS: Objection, form. 11 Q In your prior answer, you said, Thominet 12 was an additional reference, semiconductor light 13 source 10 on a curved surface. I'm not clear what 14 is -- again, I'm not clear what's being added. 15 A Okay. 16 MR. FITZSIMMONS: Objection, form. Not 17 sure there's a question there. 18 A When I said Thominet is additional 19 reference to Beam as motivation of combine as 20 obviousness, my understanding of your question is, 21 from my paragraph 135, when I state, hardware 22 implementation -- my understanding the question was
34 1 paragraph 135. I said, Additionally and 2 alternatively, a POSA would have thought to 3 incorporate or combine the hardware implementation. 4 Q Yes, I understand the sentence. I'm 5 trying to understand, when the words "additionally 6 or alternatively" are used, with respect to the 7 hardware implementation, what is being added to the 8 hardware implementation and what is being 9 substituted with the hardware implementation? 10 MR. FITZSIMMONS: Objection, form. 11 A Starting from paragraph 135, I believe I 12 described what is the hardware implementation, and I 13 can go through these few sections and read it to you 14 what is I described for alternatively or 15 additionally, what is hardware implementation. 16 Q If you can point to something within the 17 declaration that explains whether the hardware 18 implementation is added to the software 19 implementation, that's what I'm trying to 20 understand. 21 A Paragraph 135, third line on page 72, and 22 top of page 72, I said, Thominet, additional	36 1 asking what's the hardware implementation. 2 Did I understand the question correctly? 3 Q No. I'm trying to -- going back to 4 paragraph 135, I'm trying to understand the use of 5 the language "additionally or alternatively." 6 So the sentence begins, Second, 7 additionally or alternatively, a POSA would have 8 sought to incorporate known components (hardware 9 implementation) of Thominet semiconductor light 10 sources. 11 I'm still trying to understand, what is 12 that additionally or alternatively to? 13 MR. FITZSIMMONS: Objection, form. 14 Q Is the hardware implementation 15 additionally or alternatively with respect to the 16 software implementation, or something else? 17 MR. FITZSIMMONS: Objection, form, asked 18 and answered. 19 A Again, paragraph 135 is the follow -- 20 it's to follow my previous statement for the 21 motivation to combine, paragraph 131 starting, for 22 the software implementation.

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37 1 My declaration then said, Second, 2 additionally or alternatively, the POSA would have 3 sought to incorporate technique other than software, 4 it's a hardware implementation. 5 Q Okay. So when you say "additionally," 6 does that mean that the hardware could be added to 7 the software for that combination? 8 MR. FITZSIMMONS: Objection, form. 9 A Yes. 10 Q Is it necessary for the software to be 11 added to the hardware to achieve the functions that 12 are described in paragraph 135? 13 MR. FITZSIMMONS: Objection, form. 14 A Did I understand your question correctly? 15 You said software added to the hardware? Or you can 16 ask your question again. 17 Q Sure. In paragraph 135, there's a 18 description here that states that Thominet provides 19 different spatial distributions for different 20 traffic situations. 21 Can those functions be provided without 22 software, without specifically the software of	39 1 Q So what specific aspects of the hardware 2 combination provides spatial distribution for 3 different driving situations? 4 A I stated the hardware combination -- 5 again, same paragraph -- is using the light source 6 10 from Thominet, that being placed on the curved 7 surface 12, and to replace the flat surface of Beam. 8 That's, again, alternatively and additively, the 9 hardware implementation. 10 By doing so, you can also achieve the 11 different spatial distribution with different 12 driving conditions, just maybe a little easily, 13 because in optical design, the curved surface as a 14 source is easier to design than flat surface, from 15 optical design point of view. 16 Q In paragraph 135, when you're referring 17 to the provision of different spatial distributions 18 for different driving situations, can that 19 capability be achieved without software? 20 A I stated in my declaration -- this 21 section is -- refer to the claims listed on 22 page 162. Again, my position is that the primary
38 1 Thominet? 2 MR. FITZSIMMONS: Objection, form. 3 A My position, again, is, in my 4 declaration, I stated, starting from 131, is, in my 5 view, the motivation to combine, you can start with 6 software implementation, again, paragraph 131. 7 Additionally, you can also do hardware combination, 8 starting from paragraph 135. Additionally or 9 alternatively. 10 Q No, I understand that. I'm asking a 11 specific question about the sentence in paragraph 12 135. 13 When there's the statement that says that 14 Thominet can provide different spatial distributions 15 for different driving situations, does that 16 functionality require software? 17 A It is clearly stated in my declaration, 18 this is -- the hardware is again and would like -- 19 would have provided different spatial distribution. 20 And this is, again, additionally, alternatively, 21 from my previous statement of 131 and the following 22 paragraph.	40 1 reference to Beam disclosed all those elements, and 2 I stated -- and I stated it is my opinion that Beam 3 explicitly or implicitly disclosed every elements. 4 And I further stated in -- there's 5 motivation to combine, in case if the argument is 6 not clearly disclose every single element. That's 7 why I introduce Thominet, the second reference, 8 where I also state, In the combination of Beam and 9 Thominet, and there are two aspects, you can do 10 software combination; additionally, alternatively, 11 you can also do hardware combination. But that's 12 all my position here. 13 Q Okay. I'm not sure that you answered the 14 question, though, that I asked, which is 15 specifically with respect to paragraph 135. 16 With respect to the provision of 17 different spatial distributions, can that capability 18 be achieved without software? 19 MR. FITZSIMMONS: Objection, form, asked 20 and answered. 21 A I think I did answer it, because at the 22 beginning of my statement on 62, paragraph 117, I

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41 1 stated, and Beam disclosed every elements, including 2 the spatial -- what's the word you're using -- 3 spatial distribution, provide a different spatial 4 distribution. 5 The combination, whether software or 6 hardware, is additionally, alternatively, that 7 provide some design benefit and both make the design 8 easier, whether software change or hardware change. 9 Q Okay. So then for paragraph 135, the 10 hardware change relies on the software from Beam, so 11 you change the curve substrate -- you change the 12 flat substrate in Beam to the curved substrate in 13 Thominet, and you're relying on the software from 14 Beam? 15 MR. FITZSIMMONS: Objection, form. 16 Objection, mischaracterizes the witness's testimony. 17 A I think I stated, one more time, in 18 paragraph 117, Beam disclosed every elements listed 19 in that title. Every element include different 20 spatial distribution. 21 But just for clarity and to add, the 22 reference Thominet, either hardware or software,	43 1 Q Okay. So when you make a hardware 2 implementation, you modify the hardware of Beam, and 3 when you make a software implementation, you're 4 modifying the software of Beam? 5 MR. FITZSIMMONS: Objection, form. 6 A I stated -- I think my position was 7 pretty clearly stated in both sections. What do you 8 do for motivation to combine? From software aspect, 9 you improve Beam by adding group. Additionally, 10 alternatively, for hardware implementation, you 11 improve Beam by curve the surface of the light 12 source. 13 Q Okay. I'm sorry. You just mentioned 14 from a software aspect, you improve Beam by adding 15 group? 16 A What I used, the word, is different 17 spatial distribution, as I illustrated reference 18 Figures 1 and 2 from Thominet, is they have 19 different grouping for different functionalities or 20 regions of light projection. 21 Q So when you add the different groupings, 22 as you mentioned, the different functionalities or
42 1 they are additionally, alternatively. Without these 2 changes -- and Beam disclosed every single element. 3 With the combination software and hardware that make 4 the design easier. So the added benefits. 5 Q Okay. But specifically with the hardware 6 implementation that you're referring to in paragraph 7 135, what software is being used in conjunction with 8 that hardware implementation? 9 MR. FITZSIMMONS: Objection, form. 10 A I think, again, I said it clearly. 11 Additionally or alternatively, you can, again, do a 12 software combination if it make your design easier. 13 Then you can also do the hardware combination. 14 That's two aspects that I state, additionally or 15 alternatively. 16 So if you don't change the hardware -- 17 again, adding the curved surface make the design 18 easier. But Beam has the software capability for 19 the spatial light distribution. Adding the software 20 implementation, again, as stated in my paragraph 21 131, is to make design easier -- software design 22 easier.	44 1 regions of light projection in Thominet, does that 2 replace Beam's software controls? 3 MR. FITZSIMMONS: Objection, form. 4 A I said, again, Beam software is 5 explicitly, implicitly can do everything that in the 6 claim, every single claim. 7 Thominet used alternatively or 8 differently is to, instead of -- as Beam used 9 individual control, there's many, many set in the 10 microbeams in 401, where Thominet disclosed you can 11 group them into different region. 12 It's similar software, but make it coding 13 easier if you group them for different region and 14 functionality. It's not replacing anything. It's 15 improving the software, or additionally, you know, 16 make the implementation easier. 17 MR. FITZSIMMONS: We've been going about 18 almost an hour and a half. So maybe if there is a 19 good stopping point somewhere soon. 20 MS. SHAH: This is a great stopping 21 point. We'll take ten minutes. 22 (Recess from 10:50 a.m. until 11:13 a.m.)

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45 1 BY MS. SHAH: 2 Q So can we go to paragraph 126 of your 3 declaration. 4 A I'm here. 5 Q So this paragraph relates to the software 6 implementation. 7 Is that correct? 8 A Yes. 9 Q And can you point out for me in this 10 software implementation what controls selective 11 blanking? 12 MR. FITZSIMMONS: Objection, form. 13 A The selective area is based on the 14 sensoring capability of each reference of -- that's 15 not going to change, and each reference of 16 capability for doing so. 17 Q I'm sorry. I was talking about the 18 selective blanking. So you're saying -- I guess I'm 19 not clear about your answer. 20 So how does the sensor capability relate 21 to how selective blanking is achieved or not 22 achieved?	47 1 is the entire panel of light source. 2 Q So when we say "additionally or 3 alternatively" here, we're referring to in one 4 instance adding Thominet's multiple direction beam 5 capability with Beam's software? Is that what 6 you're referring to? 7 MR. FITZSIMMONS: Objection, form. 8 A I'm referring to my declaration. The 9 software implementation is such, Beam adds this 10 concept called a region, and I illustrated in my 11 declaration, page 65, Figure 1 and 2, for selecting 12 this region to direct a directional beam into 13 designated function, and Beam add alternative, 14 additional software control capability, again, by 15 defined region to make overall design work a little 16 easier. 17 Q Turning to paragraph 122. 18 A Yes. 19 Q When you say, Thominet expressly 20 discloses "semiconductor light sources 10 arranged 21 in the different partial regions, 22, 24, 26, 28 are 22 actually involved independently," does that mean
46 1 MR. FITZSIMMONS: Objection, form. 2 A Well, again, in my statement is, these -- 3 the different beam functions in Beam's disclosure, 4 the angle or distribution of each microbeam can be 5 sighted by controller based on sensor information 6 that we previous talked about it. And here is 7 adding additional alternative control for Beam by -- 8 again, to use different region of Thominet in terms 9 of emission. 10 Q So is Thominet's software added to Beam's 11 to achieve selective blanking? 12 A What I said in my declaration, the 13 Thominet's technique is to add selective source as, 14 like, grouping region for different functions for 15 emission. 16 Q Okay. I'm sorry. Was there something 17 else? Was your answer completed? 18 A My answer again is, the directional 19 beam -- this multiple direction beam, in Thominet's 20 addition is to have region -- or I used the word 21 "grouping" alternatively -- to determine which 22 regions for which function versus Beam's situation	48 1 that -- 2 A I'm sorry. Paragraph one more time? 3 Q I'm sorry. Paragraph 122 of your 4 declaration, page 64. 5 A Okay. Can you repeat your question? 6 Q Yes. So in the first sentence of 7 paragraph 122, the description of actuatable 8 independently, is that referring to the different 9 partial regions? 10 A So this is stated just like Beam 11 described, which it has many, many of these 12 microbeams. Each of those microbeams is 13 independently controllable to change its angle or 14 position and/or attenuation. 15 So Beam disclosed those rays of light 16 sources, and each of them is independently 17 controllable for changing direction and intensity. 18 Q So are you saying that Thominet has the 19 same level of capability, that each individual 20 microbeam has the ability to be independently 21 actuated? 22 A What I said in my declaration is, what

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49 1 Thominet also disclosed the light source illustrated 2 Figure 10, they can be arranged in different partial 3 region, mainly in – they can group them in any way 4 they wanted to. They can group individual. 5 Q So in Thominet, are the groups controlled 6 together? 7 A I don't understand the question. 8 Q So you mentioned that in Thominet, the 9 light sources are arranged in different partial 10 regions. 11 A Can be. That's what Thominet disclosed. 12 It's all controllable individually. Thominet 13 disclosed regions from the source – from light 14 source point of view. 15 Q So the regions are controlled 16 individually? 17 MR. FITZSIMMONS: Objection, form. 18 A It's whatever described by Thominet is, 19 they can control these individually emitted light 20 source into a group and for the reason different 21 functionality, et cetera. 22 So the individual light source can be	51 1 group, which is region. 2 So I don't understand the word 3 "together." 4 Q Are they controlled as a unit? The LEDs 5 that are colored in pink in Figure 1 on page 65, to 6 achieve the predefined function in Thominet, are 7 they defined as a unit? 8 MR. FITZSIMMONS: Objection, form. 9 A I still don't understand the definition 10 of "a unit." 11 Q Let me rephrase. 12 You see on page 65, there's Figure 1 that 13 has multiple different colors associated with the 14 various light sources on the substrate. 15 Do you see that? 16 A Yes. 17 Q And so the ones that are shown in the 18 color pink, do they relate to a specific function? 19 Are they grouped together to achieve a specific 20 function? 21 MR. FITZSIMMONS: Objection, form. 22 A Figure 1 is illustration of where the
50 1 grouped together for the purpose of different 2 functions. So that is a different region of the 3 light source, as illustrated, again, Figure 1 and 2 4 from Thominet. 5 Q So as you see in Figure 1, which has the 6 different color arrangements -- do you see that in 7 Figure 1 on page 65 of your declaration? 8 A Yes. 9 Q Are those different colors -- do they 10 represent different regions of the light source? 11 A Yes. As example. 12 Q And are those different regions 13 controlled together? So, for example, all the LEDs 14 that are shown -- that are depicted in the color 15 pink, are they controlled together? 16 MR. FITZSIMMONS: Objection, form. 17 A I don't understand your words "together." 18 Control is to control every single individual light 19 source same as Beam. But Thominet additionally is, 20 besides individually, you can add a regional, like 21 grouping them. So the control is all associated 22 with your design needs. Individually to form a	52 1 light source emitted light corresponding to the 2 projection of vehicle headlamp, which is Figure 2. 3 So that illustration, for any person of ordinary 4 skill in the art will understand that this is many, 5 many discrete light sources, like Beam did. But 6 Thominet disclosed you can put many, many of these 7 individually controllable light sources, still 8 individually controllable, as a group or a region. 9 Yes, for the purpose to project light to a specific 10 spatial area of the lighting. 11 So I don't understand the question. 12 Together or not, yeah, you control the 13 whole light source, but you can control individually 14 or as a group. A group is consists of individuals. 15 Q Is it your understanding that the 16 different colors depict -- the different colors of 17 the LED light sources depict different groups that 18 are then used for different control functions in 19 Thominet? 20 A The way that I put color is example of 21 how the light source emission related to light 22 projection on the road or on -- in front of the

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53 1 vehicle. 2 As a person of ordinary skill in the art 3 will understand, the vehicle lighting is such, you 4 have a source, you have corresponding the light 5 projection in front of the vehicle. 6 So this just depict the source 7 relationship with the light projected to front of 8 the vehicle. 9 Q So then all the colors -- all the light 10 sources of one given color achieve different light 11 projections on the road? 12 MR. FITZSIMMONS: Objection, form. 13 A Did I disclose any color aspect for my 14 declaration for these claims? 15 Q I'm only referring to the colors that are 16 shown in Figure 1, and then the corresponding 17 effects in Figure 2 that we've been discussing. 18 A The illustrated color is not color of the 19 light source, right? 20 Q I have to leave that for you to tell me. 21 But I'm really just talking about the kind of -- the 22 colors that have been placed onto the various light	55 1 front of vehicle to achieve different functionality 2 that include headlamp, high beam. 3 And if you want to pinpoint which 4 particular LED or light source is aimed for light 5 headlamp, high beam, his concept is, there's a 6 region that does for high beam. 7 Q Actually, let's talk about -- if you can 8 pinpoint for me the region associated with the fog 9 beam. 10 MR. FITZSIMMONS: Objection, form. 11 A I'm sorry. The region for... 12 Q The region associated with fog beams. 13 MR. FITZSIMMONS: Objection, form. 14 A Can you point out to where I state it in 15 my declaration? 16 Q If you can look at paragraph 227. 17 A Okay. 18 Q Do you see the sentence that's the second 19 sentence that says that, Beam recognizes safety 20 benefits of different spatial distributions for 21 conditions like rain, snow, and fog? 22 A Yes.
54 1 sources in Figure 1, what the purpose of those 2 colors are with respect to the projection of light 3 in front of the vehicle. 4 A I don't believe, for my declaration in 5 this section, I ever mentioned the color of light. 6 If I do, can you point to me? 7 Q Yeah, I'm sorry. I'm not talking about 8 that the colors in Figure 1 achieve colored light 9 projected on the road. 10 What I'm asking is whether those colors 11 represent groupings that then create different light 12 projections as shown in Figure 2. 13 A Yes. It's a region. It's illustrating 14 the concept of region disclosed by Thominet. 15 Q So if you wanted to achieve high beam 16 function in Thominet, how would you go about doing 17 that based on the groupings identified in Figure 1? 18 MR. FITZSIMMONS: Objection, form. 19 Objection, incomplete hypothetical. 20 A I still will go back to my declaration 21 which described that Thominet disclosed by selecting 22 a region of the light source to be projected in	56 1 Q And then a little bit down further in 2 that paragraph, it says, Combining Thominet with 3 Beam would have made Beam's systems more direct, or 4 active, or specifically aimed for different 5 functions, than prior systems, as Beam seeks to do. 6 A Yes. 7 Q So can you explain to me how Thominet -- 8 the combination of Thominet -- the controls of 9 Thominet are added -- the software controls of 10 Thominet are added to Beam to allow Beam's systems 11 to be more direct or active with respect to 12 specifically aimed -- I'm sorry. 13 How would Thominet's software be added to 14 Beam's system so that it can be more, quote, direct 15 or active or specifically aimed for different 16 functions? 17 MR. FITZSIMMONS: Objection, form, 18 mischaracterizes the reference and testimony. 19 A That's a different question from your 20 previous ask for the fog situation. Specifically 21 questioning how the fog lamp function is achieved, 22 or just general, how does Thominet control the

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57 1 direction of the light? 2 Q If you can take the first one, that would 3 be great, then we can take the second one. 4 MR. FITZSIMMONS: Objection, form. 5 Q How would the fog lamp function be 6 achieved in Beam with the addition of Thominet? 7 MR. FITZSIMMONS: Objection, form. 8 A I relied on the disclosure from Thominet 9 that describes the projection of different region of 10 light sources in front of vehicle. For instance, 11 Figure 4 of reference 1006 from Thominet. 12 A person of ordinary skill in the art 13 will understand, for the fog situation, where the 14 light should be. 15 My description in my declaration says 16 Beam recognizes such. It may not directly address 17 the control to put a light for the fog situation. 18 And Thominet, with his grouping concept, 19 regional concept, and person of ordinary skill in 20 the art would know, when the fog happens, where the 21 light should be, similarly illustrated Figure 4 for 22 Thominet.	59 1 controllable for intensity? 2 A Do you mind re-asking the question for 3 attenuation? 4 Q Yes. 5 A A person of ordinary skill understands 6 attenuation means intensity control. 7 Q And is it the case that in Beam, 8 attenuation or intensity reduction is achieved 9 through the spatial light modulator? 10 A Attenuation is to control the light 11 source when LED is used in this case, is for lamp, 12 is for combination of emission and spatial light 13 modulation. 14 So the control is control the light being 15 attenuated from the light source. 16 Q But the combination requires a spatial 17 light modulator to achieve that attenuation? 18 MR. FITZSIMMONS: Objection, form, 19 mischaracterizes testimony. 20 A Again, I described in my declaration, 21 Beam's disclosure is microbeam as light source that 22 is individually controllable angularly and
58 1 So that particular region for light 2 grouped individually controlled from Beam, maybe 3 turn on the same time and to achieve fog lamp 4 function. 5 Q Does Beam teach controlling groups of 6 light sources? 7 A I think in my declaration, I described 8 what I disclose the beam is, for all the light 9 sources, in many of them, they're all individually 10 controllable for direction and intensity, without 11 disclose group them together or putting them in 12 region that Thominet did. 13 So from control point of view or 14 individually controllable, Thominet added is, yeah, 15 you can also group them for designated functions, 16 including fog. 17 Q In your last answer, you stated that in 18 Beam, all the light sources are individually 19 controllable for direction and intensity. 20 Can you point to something in your 21 declaration or in the Beam reference itself that 22 establishes that the individual light sources are	60 1 intensity-wise. 2 I can go back to my declaration to point 3 out that particular paragraph. But since you 4 mentioned the word earlier, attenuation, that's more 5 direct. Attenuation is intensity control. 6 Q How does the (inaudible) -- 7 (Reporter interruption.) 8 Q How does the LED embodiment in Beam 9 achieve attenuation? 10 A I described in my declaration that LED is 11 example of the light source described by Beam, which 12 is the microbeam. 13 The microbeam is individually 14 controllable for directional, angularly, and 15 intensity, attenuation. That is described -- it's 16 disclosed in the Beam's specification and the 17 claims. 18 Q Can you point to me where in your 19 declaration you're describing how specifically the 20 LED environment in Beam achieves attenuation. 21 A My declaration describes the light source 22 disclosed by Beam, microbeams, namely microbeams,

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61 1 that is -- including LED as emission, that is 2 individually controllable for intensity and angular 3 distribution. 4 I can go back to my declaration and find 5 the paragraph. 6 Q Thank you. 7 A Do you want me to? 8 Q Yes, please. 9 A My declaration on page 37, paragraph 75, 10 first I talk about individually controllable 11 light-emitting dial. And further, I also talk 12 about -- paragraph 77 -- oh, in that same paragraph, 13 Beam uses the term "source," and my understanding or 14 a POSA's understanding is not only the emitter but 15 include the optical elements. Beam uses term 16 "spatial light modulator." 17 So this is where I disclosed individual 18 emissions -- light source emissions is controllable. 19 And you asked -- your question is whether 20 it's angular in light intensity. I'm pretty sure I 21 can find it in that section. 22 Paragraph 76 stated, controllable in	63 1 A Yes. 2 Q Hold on one second. 3 In paragraph 229, do you see that you 4 describe Thominet provides beam regions 22, 24, 26, 5 28? 6 A Yes. 7 Q How does Beam -- I'm sorry. 8 Does Thominet determine regions 22, 24, 9 26, and 28 using software? 10 MR. FITZSIMMONS: Objection, form. 11 A I don't understand the question. 12 His disclosure is disclosed a certain 13 region of light source can be projected -- a person 14 of ordinary skill in the art should know of the 15 light in front of the vehicle, illustrated his 16 Figure 4. 17 So he illustrated in his light source has 18 these area or regions or groups for corresponding 19 the projection in front of the vehicle. And I don't 20 understand what does it mean, software control, 21 control software. 22 This is his disclosure for his invention,
62 1 direction, pattern, intensity, et cetera. 2 So that's Beam's disclosure, which is 3 Exhibit 5005, column 3, 8-44, at column 6 and at 4 column 7. 5 Q So in an earlier question, you stated 6 that Beam uses the term "source," and my 7 understanding or a POSA's understanding is not only 8 the emitter, but including the optical elements. 9 Beam uses the term "spatial light modulator." 10 So are you -- you're interpreting 11 "source" as including the optical elements, and one 12 of those optical elements is the spatial light 13 modulator? 14 A I think I stated in my declaration and 15 especially an early declaration, Beam described 16 his -- Beam disclosed his definition of a light 17 source is microbeam. It is POSA and myself 18 understanding that light source lingo in Beam's 19 disclosure is microbeam include the emitting element 20 and optical elements. And spatial light modulator 21 is optical element. 22 Q Can you turn to paragraph 229.	64 1 and anybody -- person of ordinary skill would 2 understand, they're a certain part of light source 3 will corresponding to the light projected in front 4 of the vehicle. 5 Q Can hardware provide the regions 22, 24, 6 26, 28 with different angles/aimings for different 7 driving situations, as stated in paragraph 229? 8 MR. FITZSIMMONS: Objection, form. 9 A I don't understand the question. Can you 10 rephrase in a way so I can better understand? 11 Q Paragraph 229 states that the Thominet's 12 semiconductor light source sources are arranged on 13 curved surface 12 providing beam regions 22, 24, 26, 14 28 with different angles/aimings for different 15 driving situations. 16 What I'm asking is, can the provision of 17 those beam regions to create different 18 angles/aimings be created with just the curved 19 surface 12 in Thominet coupled with the 20 semiconductor light sources 10? 21 MR. FITZSIMMONS: Objection, form. 22 A The creation of light direction of

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65 1 individual light sources is controlled by the 2 control, how did you control the direction of 3 individual light source direction and intensity to 4 combine. 5 The Thominet's addition, one more time, 6 to Beam is Thominet describe, this individually 7 controlled microbeam can be grouped into a region 8 corresponding to different projection in front of 9 the vehicle. 10 And to answer your question, to control 11 the intensity and direction, you're saying is only 12 achieved by the curve? The answer is no. 13 Q So again, just to make sure I'm clear, to 14 achieve the control, specifically intensity and 15 direction, in Thominet, that requires software 16 controls? 17 A It is always software control the light 18 direction and intensity change, both Beam and 19 Thominet. 20 Q Sorry. Just give me one minute. 21 A I'm sorry. Software through processor. 22 If you think a processor is hardware, that could be	67 1 that done in combination with the hardware? 2 MR. FITZSIMMONS: Objection, form. 3 A Depends by how you define. I mean, go 4 through -- the control function to the light source, 5 direction and intensity, is go through controller. 6 And I'm not -- and Beam disclosed to use processor. 7 And Thominet, his word in his schematic is -- his 8 similar concept is the processor. A processor 9 obviously include the programming capability, which 10 is software, and the chip that could be considered 11 hardware, semiconductor chip. 12 Q Does the hardware in Thominet group the 13 regions? 14 MR. FITZSIMMONS: Objection, form. 15 Q For example, by wiring them together? 16 MR. FITZSIMMONS: Same objection. 17 Hypothetical. 18 A I still don't understand. 19 Each light source for Thominet is 20 individually controllable. When you use the word 21 wire them together, is light source panel that 22 consists of many individual light source --
66 1 combination. You have to go through a controller. 2 Q Understood. So you mentioned that the 3 controller -- that the software through the 4 processor is what controls the light direction and 5 intensity. 6 So specifically with respect to Thominet, 7 when you have the regions that function together, 8 how is the -- how is the software controlling those 9 regions? 10 MR. FITZSIMMONS: Objection, form. 11 A I still don't understand the question. 12 Selected region, Thominet disclosed, is 13 corresponding to the light projection in front of 14 the vehicle. Person of ordinary skill in the art 15 will understand which region needs to be turned on 16 for different functions. Selection is by the 17 design. And you provide a command to the software 18 by detecting whatever things will turn certain 19 functions on. 20 Q And when you command the software to 21 detect specific things that will turn functions on, 22 is that done through exclusively the software, or is	68 1 individually controllable light source similar to 2 microbeam. 3 I don't understand the question, wire 4 them together. 5 Q Hardwired. Are groups of LEDs hardwired 6 to achieve a certain function? 7 MR. FITZSIMMONS: Objection, form. 8 A You mean, you ask -- the person of 9 ordinary skill in the art will understand when you 10 have many, many individual elements of light 11 source -- you asked me how to wire them? 12 Q I'm asking you, to achieve the groupings 13 and functions in Thominet, are groups of LEDs wired 14 together and then controlled as one unit? 15 MR. FITZSIMMONS: Objection, form. 16 A I think this -- I don't understand. 17 All the LEDs are electrically connected. 18 The control capability is to control -- both the 19 prior arts disclose they're all individually 20 controllable. They all have to be electrically 21 connected in order to be individually controllable. 22 The only difference is, you control as one or as

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69 1 multiple to turn them on together. That is the 2 addition from Thominet. 3 Q Okay. And so when you control them as a 4 multiple to turn them on together, is that 5 determination of which light sources to turn on 6 together defined by the software? 7 MR. FITZSIMMONS: Objection, form. 8 A A processor includes the control command 9 in all cases. Beam disclosed, again, individual 10 elements can be controllable, turn on and off or 11 dimmed, similar to Thominet. 12 And the question is whether -- do a group 13 them together, yes, the software -- you may want to 14 modify the software to recognize group that 15 disclosed by Thominet. Again, outside of making the 16 design easier because you group them together. 17 Q So would it be the case that Beam, 18 without Thominet's software, would not know how to 19 detect regions 22, 24, 26, and 28 that you describe 20 in paragraph 229 of your declaration? 21 MR. FITZSIMMONS: Objection, form. 22 Objection, incomplete hypothetical.	71 1 headlamp is projected different angle. Any person 2 of ordinary skill would know a headlamp is not one 3 spot. It's multiple area. 4 It's like, again, I described it with 5 Beam's disclosure is, is vehicle headlamp. And 6 similarly, Thominet is vehicle headlamp. 7 Q Does Beam have the ability to segment a 8 field of view into specific regions? 9 MR. FITZSIMMONS: Objection, form. 10 A In my declaration, paragraph 74, I 11 stated, Beam disclosed automotive headlamp and 12 defining headlights that control the intensity, 13 angle, or position one or more narrow microbeams, 14 meaning Beam's disclosure consists of microbeams 15 that function as adaptive headlamp. Headlamp always 16 have different regions. Commonly known as different 17 regions. 18 Q So does Beam have the ability to control 19 different regions differently? 20 A I don't understand the word "different." 21 MR. FITZSIMMONS: Objection, form. 22 A Beam disclose every microbeam is
70 1 A My declaration, paragraph 229, described 2 an example of Thominet's regional concept that's 3 illustrated by these numbers. These are examples. 4 Beam has disclosure for the headlamp 5 projections, certainly had different regions. 6 That's why they can detect oncoming vehicles and 7 preceding vehicles to reduce the glare. 8 It's both description for vehicle 9 lighting for lighting devices where Thominet 10 additively used example to select different region 11 illustrated in Figure 2. These are same type of 12 practice as one with example of grouping. 13 Q You mentioned in your last answer that 14 Beam had the disclosure of headlight projections 15 that certainly included different regions. Can you 16 describe the different regions that Beam creates and 17 how it creates those regions? 18 MR. FITZSIMMONS: Objection, form, 19 compound question. 20 A Well, I described the Beam disclosure in 21 my declaration, and Beam disclosure vehicle 22 headlight. I can go back to that paragraph. The	72 1 individually controllable to put a light into a 2 headlight. 3 Q What's your understanding of the term 4 "region"? 5 A Different angle. 6 Q And what's your understanding of the term 7 "segment" or "section"? 8 MR. FITZSIMMONS: Objection, form. 9 A Angular section. 10 Q So an angle is a segment? 11 A Angle -- 12 MR. FITZSIMMONS: Objection, form. 13 A Angle is dimensional metrics. Angular 14 section is what's generally understood for lighting. 15 A person of ordinary skill understands the section 16 means there is a section of angle in the front of 17 the vehicle. 18 Q Okay. So does Beam have the ability to 19 control a section of angle in front of the 20 vehicle -- 21 MR. FITZSIMMONS: Objection to form. 22 Q -- differently than another section of

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73 1 angle in front of the vehicle? 2 MR. FITZSIMMONS: Objection, form. 3 A I described in my declaration that Beam 4 disclosed adaptive headlamp system, a headlight 5 system that consists of many, many microbeams, each 6 one individually controllable in intensity and 7 angle, or means angle. 8 And Beam disclosed when other vehicle is 9 being detected, that particular angular section is 10 dimmed or turned off or whatever that control 11 command demanded to, to avoid glare. 12 Q In your last answer, you mentioned that 13 Beam discloses when another vehicle is detected, the 14 particular angular section is dimmed or turned off. 15 Is it the case that a spatial light 16 modulator is required to be able to achieve the 17 dimming aspect? 18 MR. FITZSIMMONS: Objection, form. 19 A Beam disclosure is control the light 20 source, namely microbeam, individually. Beam's 21 microbeam or light sources consist of emitter and 22 modulator. Beam disclosed the capability of	75 1 situations, end quote? 2 MR. FITZSIMMONS: Objection, form. 3 A I still don't understand the question. I 4 stated here, is additional control referenced by 5 Thominet is to addition to implement Beam's control. 6 Q So is it the case in paragraph 131, to 7 achieve the different spatial distributions for 8 different driving situations, that you need to have 9 the additional control from Thominet coupled with 10 Beam's controller 108, illuminator 109, and SLM 203? 11 MR. FITZSIMMONS: Objection, form. 12 A I believe I stated in my declaration, the 13 beginning of the motivation to combine, that is 14 additionally, alternatively. And this software 15 implementation is additionally or alternatively. 16 And I think in my beginning of the 17 declaration of this section for these claims, I 18 stated Thominet disclosed these elements explicitly 19 or implicitly. In case it's not clear, I introduced 20 Thominet. Therefore it's additionally and 21 alternatively, yeah, you implement a software for 22 these control you just asked.
74 1 controlling individual source intensity and angle to 2 achieve the section -- angular section, dimming, or 3 other reductions to avoid glare. 4 I cannot hear. 5 Q That was intentional. Give me one 6 second. 7 Is it the case that the -- that Beam 8 alone with just the hardware of Thominet, can it 9 achieve -- can it provide the different regions -- 10 hold on. Let me look at your paragraph 11 specifically. 12 In paragraph 132, if you could turn to 13 that paragraph, please. Actually, I'm sorry. If 14 you could look at paragraph 131 first. 15 A Okay. 16 Q So is it the case that the software 17 implementation that's described in paragraph 131 of 18 having multiple directional beam regions with 19 different angles/aimings requires both the 20 controller 108 in Beam, the illuminator 109, and SLM 21 203 to, quote, provide Beam's system with different 22 spatial distributions for different driving	76 1 Q So again, with respect to paragraph 131, 2 the additional control that's described, that's 3 adding the software from Thominet to Beam's 4 controller 108? 5 MR. FITZSIMMONS: Objection, form, asked 6 and answered. 7 A That was stated in my previous paragraph, 8 as motivation to combine, additionally and 9 alternatively, you wanted to do software 10 implementation and adding Thominet's, the regional 11 control into Beam's software control -- software and 12 control elements. 13 Q Okay. So stated differently, could you 14 achieve the different spatial distributions for 15 different driving situations that are described in 16 paragraph 131 without the additional control from 17 Thominet that's described as part of the software 18 implementation? 19 MR. FITZSIMMONS: Objection, form, asked 20 and answered. 21 A Again, I stated earlier, these claim 22 elements 20, 24, and 25 was disclosed by Beam

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77 1 explicitly, implicitly. If you -- if a patent owner 2 feels that is not clear, I introduced 3 Thominet additionally and alternatively. And having 4 the control that is in the concept of region or 5 grouping, then you alter the software to achieve 6 these functions that can be achieved. But this will 7 make the design easier. 8 Q Is it your position that beam regions 22, 9 24, 26, and 28 could be provided by Beam alone? 10 MR. FITZSIMMONS: Objection, form. 11 A You probably meant Thominet's regions, 12 right? 13 Q I was -- in your prior answer, you 14 stated, I'm quoting, I stated earlier these claim 15 elements 20, 24, and 25 was disclosed by Beam 16 explicitly, implicitly. 17 So I'm just trying to understand that 18 answer. 19 A Okay. Can you repeat the question one 20 more time. I'm referring to claim element 20, 24. 21 I thought you meant illustration of the region. 22 Q Oh, I see. Okay. So no. I'm talking	79 1 the ability to create regions similar to the regions 2 described in the Thominet reference as 22, 24, 26, 3 and 28? 4 MR. FITZSIMMONS: Objection, form. 5 A I will repeat my answer is that Beam 6 disclosed explicitly, implicitly for any claim 7 elements related to the questions you just asked. 8 Beam disclosed an individually controlled 9 light source can put light into any desired 10 direction and intensity, without divided region, 11 which a POSA would know what a region means. 12 Q So in your last answer, when you said 13 "without divided region," what does that mean? 14 A As Thominet disclosed, as stated, 15 additionally, alternatively, the light projected in 16 front of the vehicle can be example for using 17 Figure 2, divided into these angular regions. 18 Everything in Figure 2 is headlight lamps that Beam 19 disclosed, without using the example of these 20 angular regions. 21 (Recess from 12:33 p.m. until 1:30 p.m.) 22 BY MS. SHAH:
78 1 about specifically beam regions 22, 24, 26, and 2 28 -- 3 A Okay. 4 Q -- that are outlined in Thominet. 5 A Okay. 6 MR. FITZSIMMONS: Objection to form. I'm 7 not sure what that pending question is. 8 (Cross-talk.) 9 Q Go ahead, Dr. Jiao. If you have the 10 question, I just want to make sure that you're clear 11 about the question that I'm asking. 12 A Right. First of all, I want to clarify. 13 My previous answer that Beam explicitly, implicitly 14 disclosed, the number I used is claim 20, claim 24, 15 and claim 25. 16 If your question is, the region described 17 by Thominet of region 24, 22 -- I don't see 25. 18 Your question is, does Beam disclose this region? 19 No. Beam disclosed headlamp. Thominet used example 20 to point out that headlamp can be divided into 21 different regions for different functionality. 22 Q Does the Beam reference by itself have	80 1 Q So I wanted to pick up where we left off, 2 which was with respect to paragraph 229. You can 3 take a look at that again. 4 A Okay. 5 Q So the question is, if you had only the 6 hardware of Thominet without the software, could you 7 provide beam regions 22, 24, 26, and 28? 8 MR. FITZSIMMONS: Objection, form. 9 Objection, incomplete hypothetical. 10 A I think I would go back to my declaration 11 in paragraph 223, that the region that you're 12 pointing to is only to add to what -- I'm sorry -- 13 add to what Beam disclosed just by -- what Beam 14 disclosed is these spatially distributed, 15 individually controllable microbeams where Thominet 16 made them -- sectioned them into regions illustrated 17 22, 24, 26, 28. 18 So by grouping them into -- by grouping 19 them into regions, you just need to modify the 20 software. The capability of projecting entire beam 21 pattern exists in Beam's disclosure. 22 Q Is your answer complete?

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81 1 A Yes. 2 MS. SHAH: Okay. I'm sorry, Lisa, but I 3 don't have the ability to scroll the realtime feed. 4 (A discussion was held off the record.) 5 Q So I've had a chance to read your answer. 6 I want to clarify that -- I think the answer is yes, 7 but I wanted to clarify that that's, in fact, the 8 case. So I'll read back my question. 9 So the question I asked you was, if you 10 had only the hardware of Thominet without the 11 software, could you provide beam regions 22, 24, 26, 12 and 28 as described in the Thominet reference? 13 MR. FITZSIMMONS: Objection, form. 14 Objection, incomplete hypothetical. And objection, 15 asked and answered. 16 A What do you mean? 17 Q I mean, can the hardware of Thominet 18 alone create -- sorry -- rather, provide beam 19 regions 22, 24, 26, and 28? 20 MR. FITZSIMMONS: Objection, form, 21 incomplete hypothetical, asked and answered. 22 A The region concept disclosed by Thominet	83 1 declaration, again, the POSA will understand, any 2 headlamp beam pattern or forward lighting beam 3 pattern, the POSA will be able to know which part of 4 the light is to do what and coming from what part of 5 the light source. 6 So when you use the word "software," it's 7 really the POSA's to implement software. In this 8 case, Thominet happened to group them, and Beam has 9 the capability to control, just modify the software 10 to add the group concept. 11 Q Is it your position that a POSA could 12 readily modify the software to achieve any 13 functionality? 14 MR. FITZSIMMONS: Objection, form, 15 incomplete hypothetical. 16 A I answer that question in that paragraph, 17 I think it's 232. I think that that was part of the 18 response to a question. A POSA would know how to do 19 this software implementation on top of what 20 Thominet -- on top of what Beam disclosed by adding 21 the regional feature into the software. 22 Q Can you go to paragraph 349.
82 1 illustrated Figure 1, 2 is a control concept. It's 2 not hardware, per se, concept. These individually 3 controlled light sources always there. You can 4 control them as group, as a region. 5 So therefore, your question is, without 6 software -- without software, nothing can work. 7 Everything is controlled through the processor. 8 And perhaps I could say this. As 9 Thominet disclosed, his regional concept illustrated 10 in the figure, his concept, he defined these regions 11 mainly in the software control process. These are 12 gradients of rays of individually controllable light 13 sources. 14 The region illustrated in Figure 2, 15 there's no differences in terms -- he didn't 16 describe the differences between each individual 17 source. Instead, he just, for example, grouped into 18 Figure 2. 19 Q And the groupings in Figure 2 are defined 20 by software in Thominet? 21 MR. FITZSIMMONS: Objection, form. 22 A I don't think I said it -- in my	84 1 A Yes. 2 Q In paragraph 349, you state that Harbers 3 uses multiple directional beam segments. 4 A I did. 5 (Cross-talk.) 6 Q I'm sorry. 7 Can you confirm that that's the case in 8 paragraph 349? 9 A Yes, I stated using multiple directional 10 beam segments. 11 Q And are those multiple directional beam 12 segments in Harbers achieved again through the 13 controls -- the processor controls? 14 MR. FITZSIMMONS: Objection, form. 15 A I responded -- I can use my response in 16 my declaration 350. 17 Q Okay. 18 A That's what I said. 19 Q What specifically are you pointing to? 20 A I point to this additional software 21 implementation to have the multiple directional beam 22 segment control for different aiming or angle.

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85 1 Q So is it possible, then, for just the 2 hardware of Harbers without the software to 3 expressly group the -- expressly create the four 4 groupings 11, 12, 13, and 14 -- 5 MR. FITZSIMMONS: Objection, form. 6 Q -- that are identified on page 192 of 7 your declaration? 8 MR. FITZSIMMONS: Objection, form. 9 A Page 192, you meant? 10 Q You could look at 192 or paragraph 349 or 11 thereabouts. 12 A I believe what I explained in these two 13 paragraphs, if you can look at Figure 1B on 14 page 191, and Figure 2 of Exhibit 1011, which is 15 Harbers reference, the concept of segment is to just 16 choose these individually controllable light sources 17 into a segment similar as grouping, is mainly a 18 software function. 19 Q When you say "mainly a software 20 function," are there any hardware components 21 associated with creating those groupings? 22 A Yeah, if you consider the processor as	87 1 Q Can you move to paragraph 184 of your 2 declaration. 3 A Yes. 4 Q Do you see the claim language that's just 5 above paragraph 184 in your declaration? 6 A Yes. 7 Q Do you see that in that claim, there is 8 two sections, a first subsection and a second 9 subsection? 10 A Can you just read the language to tell me 11 these sections? 12 Q So it will be in claim limitation 20.9 13 and 20.10. If you can review those two claim 14 limitations, and I wanted to ask you some questions 15 about them in relationship to paragraph 184. 16 A Okay, I did. 17 Q So in paragraph 184, in reference to 18 limitation 20.9, is the step of determining, within 19 a field of view, at least a first subsection 20 including a detected vehicle, is that step met by 21 pixel evaluation in the Beam reference? 22 MR. FITZSIMMONS: Objection, form.
86 1 chip, they may change the chip, and that may be 2 hardware. 3 Q All right. So that's the only hardware 4 associated with the software function, it's the 5 usage of the chip to implement the control features? 6 MR. FITZSIMMONS: Objection, form, 7 mischaracterizes testimony. 8 A What I said is to -- Harbers disclosed 9 the segment concept. To implement them is through a 10 controller that disclosed by Karlsson as well. And 11 you can reprogram them with maybe different chips or 12 maybe just changing algorithm to make them 13 sectional. 14 Q In your last answer, when you said 15 reprogram them -- reprogram them or maybe just 16 changing the algorithm, when you reprogram 17 something, are you changing the algorithm of the 18 chip? 19 A Algorithm is concept of a calculation 20 mechanism, right, that is software concept, yes. 21 When you change the algorithm, means you're changing 22 the software.	88 1 A What I state in my declaration is the 2 sensing 107 produce input to the processor 1105. 3 And processor uses appropriate algorithm on incoming 4 data to determine the location to be blanked. 5 Q Where is the incoming data obtained from? 6 Is that the pixel evaluation, or something else? 7 MR. FITZSIMMONS: Objection, form. 8 A Incoming data, Beam disclosed, is from 9 the spatial sensed data, from sensor 107. 10 Q What is the relationship between the 11 spatial sensed data from sensor 107 and the pixels 12 that are then referred to in paragraph 184 of your 13 declaration? 14 MR. FITZSIMMONS: Objection, form. 15 A Relationship is the processor's capable 16 to control the pixel based on the sensing sensed 17 spatial sense data, and to determine -- to detect a 18 vehicle, first subsection, to be dimmed. Or use the 19 word, to be blanked. 20 Q Is the second subsection also -- strike 21 that. 22 Is the illumination that is determined

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89 1 through the second subsection also achieved by the 2 inputs from sensor 107? 3 A I'm sorry. Illumination is referring to 4 which subsection in your question? 5 Q Yeah, for this question, I'm asking about 6 illumination associated with the second subsection, 7 which is discussed in limitation 20.10 in your 8 declaration. 9 A Well, what I describe is the -- for the 10 second subsection, where no vehicle is detected, in 11 my declaration, I stated Beam disclosed that higher 12 brightness beam in the area do not have any vehicle 13 detected. 14 So the second subsection is in 15 conjunction for first subsection, that beam detects 16 there's a vehicle there, the lights in that section 17 be dimmed, and the subsection without vehicle, Beam 18 discloses to have a higher brightness. 19 Q Can you turn to page 104 of your 20 declaration. 21 A Yes. 22 Q Do you see your annotations to Figures 1C	91 1 Q Are you there? 2 A Is there a question for me? I'm around 3 310, yes. 4 Q So do you see the first sentence of 310? 5 Can you confirm that it states, Beam-Thominet does 6 not expressly disclose using road curvature data, 7 such as from GPS or navigation beacons, as an input 8 to control the intensity, shape, and/or angular 9 position of the microbeams, but it would have been 10 obvious to a POSA to do so? Do you see that first 11 sentence? 12 A Yes. 13 Q So how would the combination of Beam and 14 Thominet's software use road curvature data as an 15 input to control the intensity? 16 MR. FITZSIMMONS: Objection, form. 17 A I describe in my paragraph 298 of my 18 declaration, and Beam's disclosed a controller 19 module used a sensor spatial data (video). 20 "Spatial data" means the road 21 information. In POSA's view, including me, that 22 must include the curvature or curve of the road.
90 1 and 1D on that page? 2 A Yes. 3 Q Can you point to the first subsection in 4 those -- in Figure 1C? 5 A It's the shaded area where oncoming 6 vehicles -- driver's eyes are on the oncoming 7 vehicle driver's eye side. 8 Q And then can you point to the second 9 subsection in Figure 1C. 10 A That is shaded area -- I'm sorry. You 11 asked the second subsection? 12 Q Yes. 13 A Oh. It's opposite for whatever shaded 14 area. There's green area. If the first subsection 15 is where the vehicle being detected, a second 16 subsection is remaining area where there's no 17 vehicle. 18 Q Can you turn to paragraph 310 of your 19 declaration, please. 20 A I'm sorry. Paragraph -- 21 Q 310. 22 A Yes.	92 1 Q How does the combination of Beam with 2 Thominet's software use the road curvature data to 3 control the shape? 4 MR. FITZSIMMONS: Objection, form. 5 A That will be also in my declaration. The 6 processor commands appropriate pixel disclosed in 7 Beam's column 6, 14-27, column 5. And that's where 8 the comments to appropriate pixel. Again, use the 9 road data -- I mean, use the spatial data. 10 Q I'm sorry. You said it's appropriate 11 pixel, I believe? 12 A Yes. Commands appropriate pixels. 13 Q How would Beam and Thominet's software 14 (inaudible) -- 15 MR. FITZSIMMONS: Objection, form. 16 (Reporter interruption.) 17 Q How would Beam and Thominet's software, 18 as referenced in paragraph 310 of the declaration, 19 use road curvature data as inputs to control the 20 angular position? 21 MR. FITZSIMMONS: Objection, form. 22 A Well, that was the disclosure that I

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93 1 described in paragraph 289. There is a sensor 2 spatial data disclosed by Thominet disclosure, and 3 that data is used to command the controller for the 4 appropriate pixel. It means the appropriate light 5 source where the light should be. So the spatial 6 data is there. And road curvature was inclusive in 7 the spatial data. 8 I think I also put illustration Figure 1 9 of Beam where the projected lights happen to be on a 10 curved road as based on spatial data. 11 Q Can you shift to paragraph 333, please. 12 A Yes. 13 Q Could you read paragraph 333. I wanted 14 to ask you a question about it. 15 A You want me to read paragraph 333, right? 16 Q Yes. 17 A Karlsson discloses spotlight beams 34 can 18 be...a grid of separate light sources, such as 19 LEDs...controlled either individually or in 20 groups...and may also be made up of...light 21 modulator means and light modulator means number 3 22 advantageously can be switched to...given	95 1 in Karlsson have an embodiment that includes both an 2 LED array and light modulator means 3? 3 MR. FITZSIMMONS: Objection, form. 4 A Yes. Again, I repeat what I said. 5 Spotlight beam can be the arrays and also made up of 6 light modulator means. And that's light source. 7 Q Why would a person of skill in the art 8 include both an LED array and light modulator 9 means 3 in a single embodiment? 10 MR. FITZSIMMONS: Objection, form. 11 Objection, incomplete hypothetical. 12 A In the field of automotive lighting, 13 especially forward lighting, the light is projected 14 on a road in front of a vehicle in an angular 15 distribution, which is directional. 16 Karlsson disclosed microbeam -- I'm 17 sorry -- spotlight to form such function by having 18 many individually controllable spotlights. And a 19 person of ordinary skill in the art would understand 20 these spotlights has angular control -- has to be 21 angularly controlled. So therefore, it has to have 22 emission -- light emission and modulation.
94 1 directions. That referenced in Exhibit 1010, 11, 2 25-28, and column 14, 1-9, Figure 3, 6, 14. 3 Each spotlight beam is a directional 4 source, having its own independent directional 5 (angle/aiming), that combines to form the headlamp 6 beam, so the combined of Karlsson's spotlight beams 7 form many, at least three -- formed -- I'm sorry -- 8 formed many, at least three directional sources 9 having different angle/aimings. And which was 10 pointed to by Karlsson in column 4, 25-31, 11 column 14, 1-3, and Figure 6 on 14. 12 Q So in paragraph 333, is it your position 13 that the Karlsson light source has a single 14 embodiment that includes an LED array and light 15 modulator means 3? 16 MR. FITZSIMMONS: Objection, form. 17 A What I stated, Karlsson's disclosure of a 18 spotlight beam is the light source. 19 Q I'm sorry. Is your answer complete? 20 A Yes. 21 Q What I was asking is, based on your 22 statements in paragraph 333, does the light source	96 1 Q Can you turn to paragraphs 346 and 348 in 2 your declaration. 3 A Yes. 4 Q In paragraph 348, which LEDs are adjusted 5 when a control signal from sensor 23 is detected? 6 A I'm sorry. Paragraph 348, are you 7 reading that? 8 Q I will read it. 9 So you see here in paragraph 348, it 10 states that, Karlsson's signal -- I'm sorry. 11 Karlsson's system, in response to a 12 control signal from sensor means 23, provides a 13 desired lighting pattern in given directions. 14 Do you see that? 15 A Yes. 16 Q So my question is, which LEDs are 17 adjusted when a control signal from sensor 23 is 18 detected? 19 MR. FITZSIMMONS: Objection, form, 20 incomplete hypothetical. 21 A What I said, Karlsson's system comprises 22 of a light source that is including emission and

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97 1 modulator that forms spot beam. 2 Karlsson's disclosure is to control the 3 spot beam, I use the word 33 -- I mean, number 33 in 4 response to the sensed means; that if you sense 5 other vehicles, for instance, the corresponding 6 spotlight beam will be adjusted. 7 Q To control the spotlight beam, how does 8 Karlsson determine which LEDs should be controlled? 9 MR. FITZSIMMONS: Objection, form. 10 A Karlsson disclosed spot beam. That is 11 the light source including LED and spatial 12 modulator. Karlsson's disclosure is to control 13 these spot beams individually, as illustrated in his 14 reference Figure 6 in my declaration 1.9. These are 15 microbeams. As well as Figure 14. 16 Q Is your response complete? 17 A Yes. 18 Q Okay. So in a process of controlling the 19 individual spot beams, how does -- to achieve a 20 given pattern, how does Karlsson determine which 21 LEDs to control? 22 MR. FITZSIMMONS: Objection, form.	99 1 A 352? 2 Q Yes. 3 A Yes, I'm here. 4 Q In paragraph 352, when you're referring 5 to the combination of Harbers with Karlsson, that 6 includes just an array, meaning an LED array? 7 A Where did you read that? 8 MR. FITZSIMMONS: Is that a question? 9 Objection, form. 10 Q That is a question. 11 A Where did you read "LED array" in my 12 declaration? 13 Q Paragraph 352 talks about organizing 14 Karlsson's array of spotlight beams. 15 A Yeah, that's spotlight beams. Spotlight 16 is combination of emitter and modulator. 17 Q So is it fair, then, to say paragraph 352 18 refers to the combination of an LED array and a 19 spatial light modulator? 20 A Karlsson disclosed the light source 21 defined as spotlight, and paragraph 352 describe 22 array of such spotlight beams that is function as
98 1 Objection, asked and answered. 2 A Karlsson disclosed microbeam illustrated 3 in Figure 6 and Figure 14. These are individually 4 controllable means, whether it's LEDs, whether it's 5 modulator, they're individually controllable in 6 terms of direction and intensity for corresponding 7 detected data, to project the light inside a beam 8 pattern. 9 So determination which microbeam is 10 operating in whatever direction or intensity, that's 11 part of his disclosure using his controlling device, 12 control means. 13 Q How does Karlsson determine how many LEDs 14 to control? 15 MR. FITZSIMMONS: Objection, form. 16 A Karlsson disclosed microbeams. Karlsson 17 didn't specify each microbeams consist of which 18 LEDs, because the microbeam is a light source. The 19 claim language is light source need to be 20 directional and individually controllable. Karlsson 21 disclosed that. 22 Q Can you turn to paragraph 352.	100 1 multiple directional source. 2 Q So is the array that's referred to as 3 spotlight beams, does that have to -- does that 4 involve the LED array in Karlsson? 5 MR. FITZSIMMONS: Objection, form. 6 A I can go back to the declaration. I 7 referred to the description of Karlsson's disclosure 8 for spot beams. If I remember correctly, I think he 9 used multiple examples of light emission plus 10 spatial modulation to form the spot beam. I don't 11 believe I described his use the word in your 12 question, "LED array." Did you use that? 13 Q I did use the term "LED array." 14 A I don't believe I ever used that term 15 "LED array" in my declaration. 16 MR. FITZSIMMONS: Sangeeta, we've been 17 going about another hour. Would this be a good 18 stopping point? 19 MS. SHAH: Sure. 20 (Recess from 2:31 p.m. until 2:46 p.m.) 21 BY MR. FITZSIMMONS: 22 Q Dr. Jiao, are you ready for us?

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101 1 A Yes. 2 Q So picking back up again with respect to 3 paragraph 352 of your declaration. 4 A Okay. 5 Q When you say Karlsson's array of 6 spotlight beams can be organized based on Harbers 7 into multiple beam segments, does that combination 8 include a lamp plus a modulator? 9 A Did I mention "lamp"? 10 Q No, I only used the word "light source." 11 The light source was not (inaudible). 12 A Spotlight is the light source. 13 Q What is the source of emission that's 14 referred to in paragraph 352? 15 A Karlsson disclosed array of spot beam as 16 the light source. I think in my declaration, I also 17 referred to Karlsson's description of the light 18 source -- description of a spot beam, which includes 19 emission, light emission elements, and light 20 modulator. 21 And I can go back to my declaration to 22 find his light emission. He has multiple examples	103 1 MR. FITZSIMMONS: Objection, form. 2 Q I'm sorry. Are you clear about the 3 question, Dr. Jiao? Do you need me to read back the 4 question? 5 A Yeah, I see your question. 6 What I described is the software 7 implementation and additional control for these 8 directional beams. The Harbers disclosure is to 9 make a segment versus Karlsson without distinction 10 of a segment by using the word "array" of spot 11 beams. 12 Q So what I'm trying to understand is, in 13 the software implementation that you describe in 14 paragraph 350, what components of those control 15 features originate from Harbers versus Karlsson? 16 A Control means you control the light 17 emission. And Karlsson means individual spot beams 18 can be individually controlled using his control 19 software. Harbers added, in addition to individual 20 control, you can also group them into segments. 21 So that is additional control is the 22 disclosure by Harbers into a segment control, into
102 1 of light emission. 2 I think in that declaration, I need to go 3 back, more directly in a reference of Exhibit 1010, 4 page 4, line 36, that is the description of Karlsson 5 discloses the light emission element. 6 Q Can you read into the record specifically 7 what you're referring to. 8 A For instance -- well, I'm reading, For 9 example, a plurality -- I'm sorry, I don't pronounce 10 this word perfectly -- plurality of light-emitting 11 diodes or as another embodiment of the invention by 12 typically distributed means of optical fibers. On 13 the other hand, a single light source or plurality 14 of light source is disclosed. 15 So his light emission is including LED 16 and maybe others. 17 Q Can you turn to paragraph 350 of your 18 declaration. 19 A Okay. I'm here. 20 Q So in paragraph 350, can you identify 21 what control features originate from Harbers. Let's 22 start with that.	104 1 a -- group them into a segment. 2 Q Okay. So without Harbers' software 3 controls, with just Karlsson, can you achieve 4 segmented control? 5 MR. FITZSIMMONS: Objection, form, 6 incomplete hypothetical. 7 A This is a similar question I responded. 8 The concept of a segment is related 9 direction or region or angular section of headlights 10 or light projected from the headlamps in front of a 11 vehicle. 12 Group them into segment is an example how 13 to put a light into the headlamp beam pattern. 14 Karlsson project the light in his beam 15 pattern using any of these individually controllable 16 spotlights. Harbers added additional control by 17 group them into segment. 18 So without grouping, you can still 19 achieve the function, but just segment concept makes 20 software design easier -- of control mechanism a 21 little easier. 22 Q So can you describe for me how in

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105 1 Karlsson you could achieve multiple directional beam 2 segments with different angles/aimings without 3 Harbers' controls? 4 MR. FITZSIMMONS: Objection, form. 5 A I stated in my declaration starting from 6 page 182, paragraph 332, is Karlsson explicitly and 7 implicitly disclosed these features in these claims, 8 including direct the light into desired area. 9 Harbers, again, just put these 10 individually controllable spotlights into -- 11 grouping into a section. 12 Karlsson's control -- I think his control 13 means -- he disclosed -- who disclosed as able to 14 project light from all these spot beam rays into a 15 desired directional area of headlamps. 16 Q So the specific groupings to control the 17 spotlights are achieved by Harbers alone? 18 MR. FITZSIMMONS: Objection, form, 19 mischaracterizes the testimony. 20 (Reporter interruption.) 21 Q So the specific groupings to control the 22 spotlight --	107 1 processor and with the programming capability, which 2 is software. So the POSA's view, in this 3 disclosure, controller includes the software and the 4 processor. 5 Q In paragraphs 298-299, for example, of 6 your declaration, do the combinations of Beam and 7 Thominet's software and hardware include a spatial 8 light modulator? 9 A Paragraph 298, is that you're referring 10 to? Is that the question? 11 Q Paragraph 298 and 299. 12 A Then yes, I'm here. So what was the 13 question? 14 Q The question is whether those 15 combinations include a spatial light modulator? 16 A What combination? 17 Q Beam and Thominet's software and 18 hardware. 19 A Beam and Thominet's combination, in my 20 disclosure, paragraph 289, is that disclosure 21 discloses or renders -- disclosed the directional 22 light source.
106 1 A Again, Karlsson disclosed individually 2 controlled spot beam, spotlight, to put it into the 3 directional sections of a headlamp. 4 Harbers introduced group of these 5 individuals into a section. So that add additional 6 control benefit or control feature in terms of 7 design or maybe execution, too. 8 MS. SHAH: If you can just give me a 9 couple minutes, please. 10 (Brief recess.) 11 BY MS. SHAH: 12 Q I wanted to take you to paragraph 300 of 13 your declaration. 14 A Yes, I'm here. 15 Q What is the purpose of irradiation 16 control means 4 as described in paragraph 300? 17 A It's a controller that takes input data 18 to control the light distribution. 19 Q Is the controller a physical hardware 20 component, or is it controlled through software? 21 MR. FITZSIMMONS: Objection, form. 22 A Controller usually consists of data	108 1 I answered a question, what is definition 2 in Beam, light source, which is microbeam. That 3 includes modulator, spatial modulator. More 4 precisely, light spatial modulator -- spatial light 5 modulator. Sorry. 6 Q Does the Beam and Thominet combination 7 always require a spatial light modulator? 8 MR. FITZSIMMONS: Objection, form. 9 A The definition of the light source in 10 this disclosure that I reference to always includes 11 light emission elements and optical elements. In 12 this case, it's light spatial modulator, or spatial 13 light modulator. This always includes -- yeah, in 14 this case, this includes modulator. 15 Q Can you turn to paragraph 202. 16 A Yes, I'm here. 17 Q You see the usage of the term "predefined 18 illuminance" in paragraph 202? 19 A Yes. 20 Q In reference to paragraph 202, can you 21 tell me how the predefined illuminance from the Stam 22 reference is incorporated into the LED (inaudible)?

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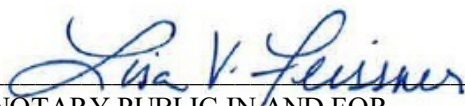
109 1 (Reporter interruption.) 2 Q In reference to paragraph 202, can you 3 tell me how the predefined illuminance from the Stam 4 reference is incorporated into the LED embodiment of 5 the Beam and Thominet combination? 6 MR. FITZSIMMONS: Objection, form. 7 A Beam -- I'm sorry. Stam -- 8 Beam-Thominet-Stam combination how to implement this 9 predefined illumination, I describe in my 10 declaration, page 143, paragraph starting 261. 11 Q What specifically are you pointing to in 12 paragraph 261? 13 A This is starting from 261, I described -- 14 MR. FITZSIMMONS: Sorry. I just want to 15 correct the record there in the answer. It says, 16 combination very hard to implement. I think it was 17 just how to implement this predefined illumination. 18 COURT REPORTER: Thank you. 19 A In the section that I titled, POSA would 20 have been motivated to combine Beam, Thominet, and 21 Stam with reasonable expectation of success, on 22 page 143.	111 1 109, which is provide illumination, 109. That's the 2 response to your question. Beam disclosed 3 illuminator 109. 4 Q Does illuminator 109 include LEDs? 5 A Beam describes 109 has all the components 6 of light emission and light modulation. I can go 7 back to my declaration, and when I first introduce 8 Beam, I made description of what Beam disclosed. 9 And I'm reading Beam's reference is 109. It says, 10 which uses them to determine which microbeam is to 11 be reduced into the intensity (inaudible) those data 12 are used to control illuminator 109. 13 109 is the light projection unit. That 14 included light source, which is microbeam. 15 Q I'm sorry, I'm not clear if you answered 16 my question. 17 Does illuminator 109 include LEDs? 18 A What I said is illuminator include the 19 light source. And light source is defined as 20 microbeam. Microbeam includes light emission 21 elements and modulator, optical elements. 22 If you use the word loosely "LED" as
110 1 Starting from paragraph 261, I described 2 such combination. Paragraph 264 explained further 3 that is first including the Stam's known technique 4 for the predefined -- quantitatively defined number. 5 And secondly, I also mentioned 6 incorporate known feature from Stam into 7 Beam-Thominet combination in its controller and/or 8 illuminator. 9 Q And when you say "illuminator," what are 10 you referring to specifically? 11 A That's in the Exhibit 1007. Which is 12 1007? Let me locate. 1007. 13 My declaration was referring to as 14 Exhibit 1007, right? I'm still locating 1007. 15 Okay. So that terminology comes from 16 Stam, 109. I'm sorry, into -- let me go back. 17 So my declaration is stating, See 18 Exhibit 1007. Then into Beam-Thominet's system, 19 namely, controller 108 and 109. So let me go back 20 to Beam. 21 Okay. 109 is using Beam's disclosure. 22 The way Beam described 109 is such -- illuminator	112 1 emitting elements, yes, it's inclusive. 2 Q So going back to Stam's predefined 3 illuminance that's referred to in paragraph 263 -- I 4 guess 262-264, for example. 5 A Paragraph 262 and -- one more time. What 6 was the question? 7 Q The question is, in reference to Stam's 8 predefined illuminance, which is included in that 9 combination, how do you -- well, strike that. 10 Do you have to modify Beam's blanking 11 control strategy to incorporate Stam's predefined 12 illuminance feature? 13 MR. FITZSIMMONS: Objection, form. 14 A I don't understand. Can you describe the 15 "strategy"? 16 Q Let's see. Let me go back to what you 17 said. So in paragraph 176 -- 18 A 176? 19 Q -- you make reference to algorithms 20 within Beam that determine locations to blank. 21 Do you see that? 22 A I'm at 176, right?

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113 1 Q Yes. 2 A Okay. Where do you want me to read? 3 Q Do you see here in paragraph 176 where it 4 states, Beam discloses using appropriate algorithms 5 on incoming data to determine locations to blank? 6 A Yes, I read it. 7 Q So in reference to that blanking control 8 strategy, I'm asking how do you incorporate -- once 9 you have that blanking control strategy, how do you 10 incorporate Stam's predefined illuminance? 11 MR. FITZSIMMONS: Objection, form. 12 A First of all, in my declaration, I stated 13 that predefined illumination was disclosed by Stam. 14 It is in my declaration to state this element has 15 been disclosed. 16 In particular, if I remember correctly, I 17 can't point out particular paragraph, I'm pretty 18 sure Stam uses "default illumination level." My 19 page 138, paragraph 253. 20 So the predefined illumination level, 21 meaning default, is disclosed by Stam -- I mean, 22 it's disclosed by Beam.	115 1 MR. FITZSIMMONS: Objection, form. 2 A I don't clearly understand your 3 terminology for "reconcile." 4 It's additive from Beam that it has a 5 predefined value, yet Stam introduced a quantified 6 predefined value. 7 So in process of control for this 8 combination, you may modify the software to put 9 these quantified value into your algorithm. 10 Q So in Beam, it's your contention that 11 Beam has a predefined value, and so what is that? 12 MR. FITZSIMMONS: Objection, form, 13 mischaracterizes testimony. 14 A I think I stated in my declaration, 15 page 152, paragraph 133 [sic], Beam's default 16 illumination level equivalent of today's low beams 17 is a predefined illumination. 18 Maybe you would say "illuminance" rather 19 than "illumination," or say "luminance." 20 MS. SHAH: I don't think I have any other 21 questions today. Thank you very much, Dr. Jiao. 22 MR. FITZSIMMONS: Thanks. Let's take a
114 1 Stam further discloses a quantitative 2 value of predefined illumination. And in my 3 declaration, I think I mentioned specifically a 4 footnote of page 142, and that's disclosed by Stam 5 using a specific lux value for perceived glare. 6 So going back to your question, is to 7 control by detecting other vehicles and reduce the 8 light level to a predefined that was in Beam's 9 control -- you used the word "strategy," I didn't 10 use the word "strategy" -- it was in Beam's 11 disclosure. Stam, his technique is at a quantified 12 value. 13 So the control -- what I stated in my 14 declaration, go back to paragraph -- I think it's 15 172, I think I used the word -- I mean, sorry -- 16 What I said is, including additional 17 control technique, because Stam introduced a 18 quantitative value for the predefined illumination. 19 Q So when you're combining Stam's 20 predefined illumination quantitative value with the 21 blanking controls that are described in Beam, how do 22 you reconcile the two?	116 1 five-minute break, and we'll be back. Thanks. 2 (Recess from 3:38 p.m. until 3:47 p.m.) 3 MR. FITZSIMMONS: No further questions 4 from us. So we can close the deposition. 5 MS. SHAH: Thank you very much. 6 COURT REPORTER: Is there anything else 7 for the record? 8 MS. SHAH: No. That's all for me. 9 (Transcript orders discussed.) 10 COURT REPORTER: Thank you. That's all I 11 need. 12 (Off the record at 3:48 p.m.) 13 14 15 16 17 18 19 20 21 22

Transcript of Jianzhong Jiao, Ph.D.
Conducted on October 3, 2023

30 (117 to 120)

117 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, PH.D., 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 at the offices of STERNE, 20 KESSLER, GOLDSTEIN & FOX PLLC, 1101 K STREET, NW, 21 WASHINGTON, DC 20005 on TUESDAY, OCTOBER 3, 2023, 22 commencing at 9:24 a.m. and concluding at 3:48 p.m.	
118 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 5th day of OCTOBER, 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	

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