

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

VOLKSWAGEN GROUP OF AMERICA, INC.,  
Petitioner

v

YECHESKAL EVAN SPERO,  
Patent Owner

Case IPR2022-01586  
US Patent No. 11,208,029 B2

WITNESS: MATTHEW A. TURK, PhD  
DATE: Tuesday, October 17, 2023  
TIME: 9:19 a.m.  
LOCATION: BROOKS KUSHMAN, PC  
1000 Town Center, 22nd Floor  
Southfield, Michigan  
REPORTER: Karen Fortna, CRR/RMR/RPR/CSR-5067  
JOB NO: 26344

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I N D E X

W I T N E S S

MATTHEW TURK, PhD	PAGE
Examination by Mr. Fitzsimmons	5

E X H I B I T S

EXHIBIT	DESCRIPTION	PAGE
Exhibit A	1B reproduction . . . . .	142
Exhibit 1001	US Patent No. 11,208,029 . . . . .	.61
Exhibit 1005	US Patent No. 6,144,158 . . . . .	.87
Exhibit 1010	International Publication No. .	128
	WO 98/54030	
Exhibit 1012	US Patent No. 5,588,733 . . . . .	124
Exhibit 2001	2-28-23 Declaration of Matthew .	.23
	A. Turk, PhD	
Exhibit 2006	8-16-23 Second Declaration of . .	.26
	Matthew A. Turk, PhD	
Exhibit 2017	International Publication No. .	148
	WO 86/05147	

Tuesday, October 17, 2023

Southfield, Michigan

9:19 a.m.

\* \* \* \*

MATTHEW TURK, PhD,

having first been duly sworn, was examined and  
testified as follows:

MR. FITZSIMMONS: Good morning, Dr. Turk.

THE WITNESS: Good morning.

EXAMINATION

BY MR. FITZSIMMONS:

Q. Can you please state your full name for the record?

A. My name is Matthew Alan Turk.

Q. And do you know why you're here today?

A. I do, yes.

Q. And what's that?

A. To provide my opinions on my deposition, to answer  
questions about my deposition -- sorry, my  
declaration.

Q. And that declaration is an inter partes review  
proceeding, correct?

A. Correct.

Q. And that, for the record, is IPR2022-01586. Does  
that sound right?

A. That sounds right to me.

1 Q. And that relates to US Patent No. 11,208,029. Does  
2 that sound right?

3 A. Yes.

4 Q. Okay. And is it okay if I refer to that as the  
5 '029 patent today?

6 A. That sounds good.

7 Q. And you understand that you're under oath here  
8 today?

9 A. Yes, I do.

10 Q. And is there any reason that would prevent you from  
11 testifying truthfully and accurately today?

12 A. No.

13 Q. For example, is there any medication that you're  
14 taking that would prevent you from testifying  
15 truthfully and accurately today?

16 A. No.

17 Q. Any other reason that would prevent you from  
18 testifying truthfully and accurately today?

19 A. No, there's not.

20 Q. And you've been deposed before, correct?

21 A. Yes, I have.

22 Q. About how many times?

23 A. I think around ten times or so.

24 Q. Okay. And so you understand that I'll be asking  
25 you questions today and you agree to answer those

1 questions?

2 A. That's right.

3 Q. And there's a court reporter here, so I'll just  
4 need you to please respond verbally so that they  
5 can be -- your answers can be recorded for the  
6 record. No nodding or head shaking. That won't be  
7 able to be picked up on the record. Is that fair?

8 A. I understand, yes.

9 Q. And if you need a break, please just ask me. Is  
10 that fair?

11 A. Yes.

12 Q. Okay. And if you don't understand a question, do  
13 you agree that you'll ask me for clarification?

14 A. Yes.

15 Q. Okay. And so if you don't ask for clarification,  
16 I'll assume you understood my question. Is that  
17 fair?

18 A. Yes.

19 Q. All right. And how did you prepare for today's  
20 deposition?

21 A. I reviewed my declaration and the materials that  
22 were used for that declaration. I met with the  
23 attorneys working on this case. Basically that.

24 Q. You said you reviewed the materials that were used  
25 for the declaration. What do you mean by that?



1 A. The materials listed in my exhibit.

2 Q. So the documents listed in the exhibit list of your  
3 declaration?

4 A. Yes, that's right.

5 Q. And you said you met with the attorneys in this  
6 case. Who did you meet with?

7 A. The two that are here today.

8 Q. And when did you meet?

9 A. Last Friday remotely and yesterday in person.

10 Q. Now on Friday, about how long did you meet  
11 remotely?

12 A. I'm not sure, but I'm guessing about two and a half  
13 hours.

14 Q. And yesterday in person, about how long did you  
15 meet?

16 A. Probably about five hours.

17 Q. And did you meet with anyone else to prepare for  
18 the deposition today?

19 A. No, not specifically for preparing for the  
20 deposition.

21 Q. You said, "Not specifically for preparing for the  
22 deposition." What do you mean by that?

23 A. I've met with other attorneys discussing related  
24 patents; I don't remember if any of those  
25 discussions had to do with this patent or not

1 offhand.

2 Q. Do you know who those attorneys were?

3 A. David Bir, I believe, is one, and Jeff Szuma, I  
4 believe, is another.

5 Q. Anyone else?

6 A. I don't think so.

7 Q. Have you met with anyone outside the Brooks Kushman  
8 law firm regarding your deposition or declaration?

9 A. No, I haven't.

10 Q. And you've provided two declarations in this  
11 proceeding; is that correct?

12 A. Yes.

13 Q. And did you review both of those declarations in  
14 preparation for today?

15 A. Yes.

16 Q. Did you review any documents that are not listed in  
17 your declaration in preparing for the deposition?

18 A. I don't believe so.

19 Q. And you mentioned that you've been deposed about  
20 ten times before. Were those inter partes review  
21 matters?

22 A. I believe some of them were; not all of them.

23 Q. And the ones that were not inter partes review  
24 matters, were those for District Court cases?

25 A. I don't remember offhand what all my depositions

1           have been. It may have been; I'm not sure.

2   Q.     Have you been deposed in any District Court case  
3           previously?

4   A.     I think so, but again, I don't remember exactly for  
5           sure.

6   Q.     Have you testified at trial before?

7   A.     Yes, I have.

8   Q.     You have. And what case or cases was that in?

9   A.     It was a case related to automated parking lot  
10          systems.

11   Q.     And what party were you testifying on behalf of?

12   A.     It's been a little while. I'm trying to remember.  
13          On behalf of Indect, the company Indect.

14   Q.     How do you spell that?

15   A.     I-N-D-E-C-T.

16   Q.     And for the times you've been deposed with respect  
17          to inter partes reviews, what parties were you  
18          testifying on behalf of in those matters?

19   A.     The only one I can remember for sure was an IPR was  
20          on behalf of Magna, the company Magna. I think  
21          it's Magna International, perhaps.

22   Q.     And are there matters where you've provided  
23          declarations where you were not deposed?

24   A.     Yes, I'm pretty sure.

25   Q.     Do you know what matters those were?

1 A. Not offhand. I've been involved in quite a few  
2 cases and I don't remember them all.

3 Q. About how many cases would you estimate you've been  
4 an expert?

5 A. Thirty would be a very rough estimate.

6 Q. And what other parties have you been an expert for?

7 A. I don't remember them all.

8 Q. Can you tell me the ones that you do remember?

9 A. The company Facebook, the company Samsung, the  
10 company Meta. There's quite a few others. I would  
11 have to go through my list to remember them  
12 offhand.

13 Q. Who's retaining you in this matter?

14 A. The patent owner.

15 Q. And who is that?

16 A. I believe the company is Torchlight.

17 Q. And so Torchlight is retaining you in this matter;  
18 is that correct?

19 A. I don't recall exactly what the legal arrangements  
20 are, but I believe that's the case.

21 Q. Is it your understanding that Torchlight is the  
22 patent owner here of the '029 patent?

23 A. I think so, but I haven't thought about this for  
24 awhile.

25 Q. And by Torchlight, you mean Torchlight Technologies

1           LLC; is that correct?

2   A.       That's probably what Torchlight is referring to,  
3           but I'm not 100 percent sure what its exact name  
4           is.

5   Q.       So when you were determining whether you had a  
6           conflict in this matter, is the entity that you  
7           thought about Torchlight Technologies?

8   A.       Probably so. I expect that I wrote in my  
9           declaration some of these details that we could  
10          look at to confirm if you'd like.

11   Q.       What's your process for determining whether or not  
12          you have a conflict in a matter?

13   A.       I consider expert engagements I've had, other  
14          professional involvements I have or have had with  
15          individuals, with entities, and see if there are  
16          any relationships that could cause concern or could  
17          cause undue influence in my opinion.

18   Q.       Is that a process you went through here?

19   A.       Yes.

20   Q.       Who pays your bills in this matter?

21   A.       I believe the company does.

22   Q.       And when you say "the company," you're referring to  
23          Torchlight; is that correct?

24   A.       If I'm remembering correctly, yes.

25   Q.       So according to your recollection, your invoices

1 are paid directly by Torchlight Technologies; is  
2 that correct?

3 A. I don't actually recall if they're paid by the  
4 company or by the law firm.

5 Q. Where do you send your invoices for this matter?

6 MS. SHAH: Objection. Relevance.

7 THE WITNESS: I believe I send them to  
8 one of the attorneys.

9 BY MR. FITZSIMMONS:

10 Q. And how much are you charging for your work in this  
11 matter?

12 A. I think my rate for this matter is \$490 an hour.

13 Q. Is that your regular rate?

14 A. My regular rate for a new case now is higher than  
15 that, but it's in the ballpark.

16 Q. And so since you began working on this matter,  
17 you've increased your hourly rate; is that right?

18 A. Yes; that's right.

19 Q. And what's that new hourly rate?

20 MS. SHAH: Objection. Relevance.

21 THE WITNESS: It depends on the case.

22 BY MR. FITZSIMMONS:

23 Q. How does it depend on the case?

24 A. One of the ways it depends on the case is how busy  
25 I am and how much time I have to allocate in my

1 schedule to it and how much time I think the case  
2 is going to take and probably other factors as  
3 well.

4 Q. Other factors like what?

5 MS. SHAH: Objection. Relevance.

6 THE WITNESS: How much I like the  
7 material and think it would be interesting is one  
8 of the factors.

9 BY MR. FITZSIMMONS:

10 Q. Were you familiar with Torchlight Technologies  
11 before working on this matter?

12 A. I don't think so.

13 Q. Who approached you about providing a declaration in  
14 this matter?

15 A. About the declaration specifically? The attorneys  
16 that I was working with.

17 Q. Have you spoken with anyone at Torchlight  
18 Technologies?

19 A. Not to my knowledge.

20 Q. When you say not to your knowledge, what do you  
21 mean by that?

22 A. I speak to a lot of people and I don't know where  
23 every one of them is from and what they're  
24 associated with and if they're part of Torchlight  
25 Technologies.

1 Q. Are you familiar with Curiam Capital LLC?

2 MS. SHAH: Objection. Relevance.

3 THE WITNESS: Will you spell that,  
4 please?

5 MR. FITZSIMMONS: Curiam, C-U-R-I-A-M,  
6 Capital.

7 THE WITNESS: It does not ring a bell.

8 BY MR. FITZSIMMONS:

9 Q. Did you consider Curiam Capital when determining  
10 whether you had any potential conflicts in this  
11 matter?

12 A. It's possible I could have, but I don't recall  
13 looking at them at this point.

14 Q. Are you retained in any other matters relating to  
15 the '029 patent?

16 MS. SHAH: Objection. Vague.

17 THE WITNESS: Can you explain what you  
18 mean?

19 BY MR. FITZSIMMONS:

20 Q. Let me rephrase that. Are you retained in any  
21 other matters where the '029 patent is the subject  
22 of a dispute?

23 A. Are you asking about a separate retention?

24 Q. Correct.

25 A. No.



1 Q. You are retained in other matters where  
2 Mr. Yechezkal Evan Spero is an inventor on the  
3 patent, correct?

4 MS. SHAH: Objection. Vague.

5 THE WITNESS: I have one retention that  
6 involves the '029 and other patents.

7 BY MR. FITZSIMMONS:

8 Q. And those other patents, Mr. Spero is an inventor  
9 on those patents, correct?

10 A. Yes, I believe so.

11 Q. One of those is the '551 patent; does that sound  
12 familiar?

13 A. It does, yes.

14 Q. And another is the '503 patent; does that sound  
15 familiar to you?

16 A. Yes.

17 Q. What's your current employment role?

18 A. I'm the president of the Toyota Technological  
19 Institute at Chicago, or TTIC.

20 Q. And you've been there since 2019; is that right?

21 A. That's correct.

22 Q. And what are your responsibilities there?

23 A. I report to the board of trustees and I manage or  
24 run the institute, which is an academic research  
25 institute.

1 Q. What type of research do you do at TTIC?

2 A. Personally, I do research related to computer  
3 vision and imaging.

4 Q. And previously you were a professor at UC Santa  
5 Barbara; is that correct?

6 A. That's right.

7 Q. And you started there in the year 2000; does that  
8 sound right?

9 A. That's right.

10 Q. And you were a professor in the computer science  
11 department?

12 A. Yes, in addition to the media arts and technology  
13 program.

14 Q. Is that a separate department at the school?

15 A. Yes, essentially.

16 Q. You were also the director of the Four Eyes Lab; is  
17 that correct?

18 A. That's correct.

19 Q. And that's a research lab for computer vision; is  
20 that right?

21 A. Not only computer vision, but it includes computer  
22 vision.

23 Q. What else does it include?

24 A. A range of areas related to imaging, to  
25 human-computer interaction, to artificial

1 intelligence, machine learning and some other  
2 related disciplines.

3 Q. What's human-computer interaction mean?

4 A. It's a study of how people interact with technology  
5 in general and computer-based technology typically.

6 Q. Can you give me an example of what human-computer  
7 interaction would include?

8 A. A simple example would be the laptops here or  
9 tablets here, the way people interact with them by  
10 typing, tapping, touching, speaking in some cases.  
11 These are all ways that humans are interacting with  
12 a computer, so principles and software and systems  
13 related to those matters.

14 Q. Okay. You worked at Microsoft as well previously;  
15 is that right?

16 A. Yes, I did.

17 Q. When did you work there?

18 A. 1994 to 2000.

19 Q. And at Microsoft, you did research in computer  
20 vision as well; is that right?

21 A. Among some other things, but that's right.

22 Q. And what are those other things?

23 A. Some of the areas I've already mentioned, including  
24 human-computer interaction and imaging and  
25 artificial intelligence and machine learning.

1 Q. When you say "computer vision," would that be  
2 identifying objects or people in images or video?

3 A. That's part of it. That's usually associated with  
4 computer vision.

5 Q. How else would you define computer vision?

6 A. It's a wide range of problems and topics typically  
7 related to images in some sense that could be taken  
8 by a camera or other kinds of sensors and usually  
9 to try to understand something about the scene.

10 Q. What other -- you mentioned cameras. What other  
11 kinds of sensors are used in computer vision?

12 MS. SHAH: Objection. Relevance.

13 THE WITNESS: And excuse me, did you say  
14 are used in computer vision?

15 MR. FITZSIMMONS: Yes.

16 THE WITNESS: There are really a wide  
17 range of sensors that can be and are used in  
18 computer vision, so for example, various medical  
19 sensors that are not cameras. Even something as  
20 large as astronomical -- I'm not sure how to phrase  
21 it exactly. Astronomical sensors spread around the  
22 earth can be used as input to computer vision.

23 BY MR. FITZSIMMONS:

24 Q. So computer vision focuses on the inputs from those  
25 sensors; is that fair?

1 A. It does focus on the inputs of the sensors. It  
2 also focuses on understanding the sensors and how  
3 they work. And then there's a very close  
4 relationship with a field of computer graphics,  
5 which is basically about the other direction, how  
6 the rays go out and go out into the world to form  
7 images or to illuminate things or whatever.

8 Q. Your CV said you were also at Teleos, T-E-L-E-O-S;  
9 is that correct?

10 A. That's correct.

11 Q. What's Teleos?

12 A. Teleos was a small company in the Bay Area of  
13 California working on imaging, computer vision,  
14 artificial intelligence, robotics, a range of  
15 problems in domains like that.

16 Q. And your CV also says that you were at LIFIA-IMAG.  
17 What does that stand for?

18 A. That is a university or part of a university in  
19 France.

20 Q. And at MIT, your post-doc research was in facial  
21 recognition; is that right?

22 A. That's correct.

23 Q. And you got your PhD at the MIT media lab; is that  
24 right?

25 A. That's right.

1 Q. And your dissertation was in facial or object  
2 recognition; is that right?

3 A. That's correct.

4 Q. And when you were working at Martin Marietta, you  
5 were also doing research on computer vision  
6 algorithms; is that right?

7 A. Among other things, yes.

8 Q. What other things?

9 A. I was working on a vehicle project, autonomous  
10 vehicles, and that included computer vision work,  
11 robotics work, various aspects of sensing and  
12 imaging.

13 Q. And from your CV, I see that you've received a  
14 number of awards for your work in computer vision  
15 and facial recognition; is that right?

16 A. That's right.

17 Q. And you also have a number of papers on computer  
18 vision and facial recognition; is that right?

19 A. Yes, I do.

20 Q. Do you have a sense of how many papers?

21 A. Do you mean just in those areas?

22 Q. Yes.

23 A. I would guess around 120, but I don't know exactly.

24 Q. And you've also done lectures on computer vision  
25 and facial recognition, correct?

1 A. That's correct.

2 Q. Do you know about how many lectures in those areas?

3 A. No, I don't.

4 Q. You also have a few patents; is that correct?

5 A. That's right.

6 Q. And those patents relate to computer vision and  
7 facial recognition; is that right?

8 A. Yes. They also relate to augmented reality.

9 Q. When you say "augmented reality," what do you mean  
10 by that?

11 A. Augmented reality is a way of combining the real  
12 world for a human with augmented information, so  
13 information about the world, about various things,  
14 so combining technology and reality.

15 Q. Would you say that you're an expert in computer  
16 vision?

17 A. Yes.

18 Q. What makes you an expert in computer vision?

19 A. My education, my research background, my  
20 involvement in professional societies; lots of  
21 things.

22 Q. Would you say you're an expert in facial  
23 recognition?

24 A. Yes.

25 Q. What makes you an expert in facial recognition?

1 A. I've studied and worked in facial recognition for a  
2 long time.

3 Q. How long?

4 A. Some number of years. It's hard to say  
5 specifically because it's not necessarily  
6 contiguous, but for several years.

7 Q. Can you provide an estimate of how many years?

8 A. So do you mean -- would a year count if I worked  
9 one day that year or only if I worked 365 days?  
10 Just so I can understand your question.

11 Q. Let's say if you worked for the majority, so at  
12 least half a year in that space.

13 A. I would guess very roughly there's maybe six years  
14 for which that's the case.

15 Q. And you're a member of a number of organizations  
16 and societies; is that right?

17 A. That's correct.

18 Q. And those are all listed on your CV?

19 A. There are certainly several listed on my CV; I  
20 don't recall if it's all of them or not, but yes.

21 (Marked for identification:

22 Deposition Exhibit No. 2001.)

23 BY MR. FITZSIMMONS:

24 Q. Let's introduce Exhibit No. 2001. And this is your  
25 first declaration in this proceeding. Do you



1 recognize this document, Dr. Turk?

2 A. Yes, I do.

3 Q. Okay. And what is this document?

4 A. This is my first declaration in this IPR case that  
5 was submitted in February of this year.

6 Q. And is that your signature there on the last page?

7 A. Yes, it is.

8 Q. Did you place your signature there?

9 A. Yes, I did.

10 Q. When did you last review this document?

11 A. Briefly yesterday.

12 Q. What do you mean by "briefly"?

13 A. I looked over it yesterday.

14 Q. For about how long?

15 A. I don't recall specifically.

16 Q. More than an hour?

17 A. Yesterday? Probably less than an hour, just  
18 guessing.

19 Q. Did you write this declaration?

20 A. I worked with the attorneys in coming up with it,  
21 so we -- it was a joint effort.

22 Q. So you didn't write all the words in that  
23 declaration?

24 A. I did not write every word in there.

25 Q. What was your process for preparing that

1 declaration?

2 A. Initially discussing the '029 patent, the petition  
3 in this case, related work, the other things that  
4 are in my list of exhibits, having many discussions  
5 about various points and what I thought about this  
6 thing or that thing, eventually starting with a  
7 draft and discussing the key points in a draft --  
8 in the draft, editing to come up with something  
9 that I felt was indicative of my opinions, that  
10 expressed my opinions specifically. That was the  
11 process.

12 Q. You said you worked with the attorneys on it. Who  
13 did you specifically work with?

14 A. It was primarily Ms. Shah in this room.

15 Q. You said "primarily," so was there anyone else?

16 A. Probably. I don't remember specifically who I  
17 worked with regarding this patent only or regarding  
18 this patent, but probably also Mr. Turner as well.

19 Q. About how much time did you spend preparing that  
20 first declaration?

21 A. I don't remember.

22 Q. And do you still stand by the opinions expressed in  
23 that first declaration, Exhibit 2001?

24 A. Yes, I do.

25 MR. FITZSIMMONS: And for ease, we'll

1           also just introduce your second declaration now as  
2           well. That's Exhibit 2006.

3                       (Marked for identification:

4                       Deposition Exhibit No. 2006.)

5 BY MR. FITZSIMMONS:

6 Q.       And do you recognize this document, Dr. Turk?

7 A.       Yes, I do.

8 Q.       And what is this document?

9 A.       It's the second declaration I wrote for this case.

10 Q.      And is that your signature on the last page?

11 A.      It is, yes.

12 Q.      And did you place your signature there?

13 A.      Yes.

14 Q.      When did you last review your second declaration?

15 A.      Yesterday.

16 Q.      And if I refer to these as your first and second  
17           declaration, you'll understand I'm referring to  
18           Exhibit 2001 and Exhibit 2006, respectively?

19 A.      Yes, I do.

20 Q.      I'll do my best to do that. If you're unclear  
21           which declaration I'm referring to, please just  
22           ask.

23                       What was your process for preparing your  
24           second declaration?

25 A.      It was essentially the same as the process for the

1 first one.

2 Q. And who did you work with to prepare your second  
3 declaration?

4 A. I believe it was the same people that I had  
5 mentioned for the first declaration.

6 Q. Anyone else, to your recollection?

7 A. Not that I'm sure about.

8 Q. About how much time did you spend preparing your  
9 second declaration?

10 A. I don't remember offhand.

11 Q. Can you provide an estimate?

12 A. Not really. I don't have a good sense to estimate  
13 the amount of time.

14 Q. So you said you went through the same process as  
15 your first declaration to prepare your second  
16 declaration, so would that have involved multiple  
17 drafts or revisions to it?

18 A. Yes, we did a lot of back and forth, updating,  
19 editing.

20 Q. And you still stand by your opinions in your second  
21 declaration, Exhibit 2006?

22 A. Yes, I do.

23 Q. Let's turn to page 67 of your second declaration  
24 and start there. Exhibit 2006. Are you there?

25 A. Yes.

1 Q. And paragraphs 89 to 90, do you see those there?

2 Those are comparing the Karlsson reference,

3 Exhibit 1010, and the Flaaten reference,

4 Exhibit 2017; is that right?

5 A. Yes.

6 Q. And then if you turn to page 68, do you see

7 paragraphs 91 and 92 there?

8 A. Yes.

9 Q. And what do those say?

10 A. They say "Intentionally left blank."

11 Q. Did you remove those paragraphs?

12 A. Not that I recall, but I don't remember

13 specifically why we left those blank.

14 Q. Do you know what those paragraphs said before they

15 said intentionally left blank?

16 A. No, I don't.

17 Q. Have you ever intentionally left blank a paragraph

18 in a declaration before?

19 A. I believe so, yes.

20 Q. What was the purpose of that?

21 A. If I recall, there have been multiple purposes.

22 Sometimes we just didn't want to change the

23 numbering of paragraphs, so something we decided

24 didn't need to be there was replaced with an

25 "Intentionally left blank."

1 Q. Do you recall in this case you decided that there  
2 was something that didn't need to be there in  
3 paragraphs 91 or 92?

4 A. I don't recall.

5 Q. Let's turn back to page 7 of your declaration.

6 MS. SHAH: Objection. Vague.

7 MR. FITZSIMMONS: I'm sorry, I want to  
8 make sure I'm clear. I said turn back to page 7.

9 MS. SHAH: No, I just -- so you will --

10 MR. FITZSIMMONS: Page 7 at the bottom is  
11 there.

12 MS. SHAH: No, I understand. I'm sorry,  
13 I just want to clarify. You're going to continue  
14 with one declaration all the way through and then  
15 switch to the other one, so this question is about  
16 this document?

17 MR. FITZSIMMONS: Exhibit 2006. I'll try  
18 to make it clear if I'm switching.

19 MS. SHAH: That's fine. I just wanted to  
20 make sure the record was clear.

21 MR. FITZSIMMONS: I didn't know if I was  
22 referring to a PDF page that was different.

23 MS. SHAH: No, this is perfect. Thanks.

24 BY MR. FITZSIMMONS:

25 Q. Page 7, Exhibit 2006. You see paragraph 2 there?

1 A. Yes.

2 Q. Can you read that for me, please?

3 A. It says, "I am making this second declaration at  
4 the request of Yechezkal Evan Spero in the matter  
5 of inter partes review of US Patent No. 11,208,029  
6 (the '029 patent) to Yechezkal Evan Spero."

7 Q. Have you ever met Mr. Spero?

8 A. I don't believe so.

9 Q. Have you ever spoken to Mr. Spero?

10 A. Not that I'm aware of.

11 Q. Have you ever corresponded with Mr. Spero?

12 A. Not that I'm aware of.

13 Q. Have you ever emailed with Mr. Spero?

14 A. Not that I'm aware of.

15 Q. Your declaration says that you're making the second  
16 declaration at the request of Mr. Spero. What do  
17 you mean by "at the request of"?

18 A. I mean that was communicated to me by the attorneys  
19 I'm working with in this case.

20 Q. So it's your understanding that Mr. Spero requested  
21 that you prepare this declaration; is that correct?

22 A. I don't know exactly how the process went in terms  
23 of who requested what, but I do believe that the  
24 attorneys I worked with were requesting me to do  
25 this on behalf of him.

1 Q. But you said your engagement is with Torchlight  
2 Technologies; is that correct?

3 MS. SHAH: Objection. Relevance. I  
4 object to this entire line of questioning. I just  
5 want to state for the record, this has nothing to  
6 do with this IPR proceeding, and if we continue  
7 down the line, I will call the PTAB, so I'm stating  
8 the objection for the record.

9 THE WITNESS: Will you repeat the  
10 question, please?

11 BY MR. FITZSIMMONS:

12 Q. You said that your engagement is with Torchlight  
13 Technologies; is that correct?

14 A. I don't remember exactly what I said earlier, but I  
15 believe I indicated I don't remember, you know,  
16 100 percent exactly how the engagement is specified  
17 legally, but in general, that sounds right.

18 Q. Had you ever heard of Mr. Spero before working in  
19 this proceeding?

20 A. Not that I recall.

21 Q. Did you do any research on Mr. Spero as part of  
22 your preparation in this proceeding?

23 A. I don't think I did.

24 Q. So if my understanding is correct, you provided  
25 your declaration at the request of Mr. Spero, but



1           you've never met him or spoken to him; is that  
2           correct?

3   A.     I believe that's correct.

4   Q.     To your knowledge, did Mr. Spero review your  
5           declaration?

6   A.     I don't know.

7   Q.     Do you know anything about Mr. Spero?

8                   MS. SHAH: Objection. Relevance and  
9           overly broad.

10                   THE WITNESS: I know that he's the  
11           inventor -- the author of this patent.

12   BY MR. FITZSIMMONS:

13   Q.     Do you know who Joseph Stam is?

14   A.     I recall hearing that name.

15   Q.     Where do you recall hearing it?

16   A.     In discussions in this case or another patent by  
17           this inventor.

18   Q.     Let's turn to paragraph 7 now of Exhibit 2006. And  
19           do you see in paragraph 7(a) there, you say, "The  
20           documents listed above" -- which I believe is  
21           referring to your exhibit list -- and that you  
22           considered additional patents and documents? Do  
23           you see that?

24   A.     Yes, I do.

25   Q.     What are the additional patents and documents you

1 are referring to?

2 A. All of the patents and documents that are  
3 referenced in this report that are not in the  
4 exhibit list.

5 Q. Is there anything else you considered that's not  
6 listed in your exhibit list recited in your  
7 declaration that you considered?

8 A. I don't believe so.

9 Q. In looking at your exhibit list that's on pages 5  
10 and 6 of your second declaration, there's several  
11 documents from Dr. Jiao; is that correct?

12 A. Yes.

13 Q. And did you review his deposition transcript in  
14 this proceeding?

15 A. I did.

16 Q. And that's Exhibit 2007, correct?

17 A. That's right.

18 Q. And did you review Dr. Jiao's declaration in this  
19 proceeding related to the '029 patent?

20 A. I reviewed a declaration of Dr. Jiao; I don't  
21 believe it was related to this patent, the Exhibit  
22 2009, but I might be confused by the patent  
23 numbering, the case numbering.

24 Q. Which document are you referring to in the exhibit  
25 list?

1 A. 2009.

2 Q. And that's from IPR Proceeding 2023-00318, correct?

3 A. That's right.

4 Q. That is not from this proceeding, IPR2022-01586,  
5 correct?

6 A. That's right.

7 Q. So is it my understanding that you did not review  
8 Dr. Jiao's declaration in this proceeding,  
9 IPR2022-01586?

10 A. So looking in my list of exhibits here, I can't  
11 remember at the moment if I omitted that  
12 accidentally or if there was not a declaration of  
13 Dr. Jiao in this case. I definitely reviewed a  
14 declaration of Dr. Jiao.

15 Q. In your exhibit list, you include several articles  
16 by Dr. Jiao; is that correct?

17 A. That is correct, Dr. Jiao and co-author.

18 Q. So articles where Dr. Jiao is at least a co-author,  
19 correct?

20 A. That's correct.

21 Q. And those are Exhibits 2010, 2012, 2013, 2014 and  
22 2015; is that right?

23 A. That's right.

24 Q. Did you personally locate those articles?

25 A. I did locate them.

1 Q. You did? How did you locate those articles?

2 A. I located them online through these URLs.

3 Q. And how did you find those articles?

4 A. They were referred to me by the attorneys I'm  
5 working with in this case.

6 Q. I see. So you didn't search for those articles  
7 online; they were provided to you by the attorneys?

8 A. That's correct.

9 Q. Were any of the exhibits cited in your list here  
10 that you personally found or were they all provided  
11 to you?

12 A. I provided Exhibit 2002 and others were suggested  
13 to me.

14 Q. And Exhibit 2002 is your CV, correct?

15 A. That's right.

16 Q. Let's go back to paragraph 7. Do you see 7(c)  
17 there?

18 A. Yes.

19 Q. And so in 7(c), you're stating that you formed your  
20 opinions by considering -- and 7(c) says -- "my  
21 knowledge and experience based upon my work and  
22 study in this area as described below," correct?

23 A. That's correct.

24 Q. What do you mean by "in this area" in that  
25 paragraph?

1 A. I mean the area of the patent, '029.

2 Q. And what would you say that area of the patent --  
3 of the '029 patent is?

4 A. Broadly, about lighting technology.

5 Q. In paragraph 7(b) there, same page, you say that  
6 you considered "the relevant legal standards,  
7 including the standard for obviousness provided in  
8 what's known as the KSR case," correct?

9 A. That's correct.

10 Q. And have you read that case?

11 A. I've read summaries of the case; I've not read the  
12 full case.

13 Q. What is your understanding of the standard for  
14 obviousness?

15 MS. SHAH: Objection. Calls for a legal  
16 conclusion.

17 THE WITNESS: Are you asking in general  
18 or what KSR International specifically says about  
19 it?

20 BY MR. FITZSIMMONS:

21 Q. You said you considered "the relevant legal  
22 standards, including the standard for obviousness  
23 provided in KSR," so I'm asking you what your  
24 understanding of the standard for obviousness  
25 provided in KSR is.

1 A. I don't know specifically what KSR describes as the  
2 standard for obviousness.

3 Q. But you're saying here that you considered that  
4 standard, right?

5 A. I did.

6 Q. But you don't know what that standard is?

7 A. I don't remember the specifics of how the KSR  
8 International case describes it in detail.

9 Q. What's your understanding of obviousness?

10 A. My understanding of obviousness is written in my  
11 declaration. Let me find it. It's written in  
12 Section 2, "Relevant Legal Standards." It starts  
13 on page 14.

14 Q. And so what's your understanding of obviousness?

15 A. What is written here in paragraphs 23 and 24.

16 Q. While we're here, let's go to paragraph 26,  
17 page 16. Paragraph 26 and through to paragraph 28,  
18 which is a bit further down -- it starts on page 20  
19 and continues on to page 21, I believe -- you cite  
20 some standards in that section; is that right?

21 A. I notice citing one standard generally in the first  
22 paragraph and I cite the Michigan Vehicle Code Act  
23 on page 21, so generally, yes.

24 Q. Okay. I'll take those one at a time. So in  
25 paragraph 26, you reference the Federal Motor

1 Vehicle Safety Standards, FMVSS; is that right?

2 A. That's right.

3 Q. Okay. That's not included in your exhibits list,

4 correct?

5 A. I believe that is correct, yes.

6 Q. Did you review the FMVSS?

7 A. I looked at it. I've generally been aware of it,

8 so I didn't review it in much detail for this.

9 Q. What do you mean you've generally been aware of it?

10 A. I've known that there is a Federal Motor Vehicle

11 Safety Standards regulation in the US. I don't

12 recall how long I've known it or how I learned

13 about it.

14 Q. So in preparing this declaration, did you read --

15 excuse me -- did you read the entire FMVSS

16 document?

17 A. No, I didn't.

18 Q. Did you read parts of it?

19 A. I don't recall. I may have looked at parts of it.

20 Q. Which parts?

21 A. I don't recall.

22 Q. So you can't specifically recall reviewing any part

23 of the FMVSS in preparing your declaration?

24 A. I don't recall specifically what I knew generally

25 prior to this and what I looked at specifically for

1 the declaration with regard to that standard, those  
2 standards.

3 Q. Who publishes the FMVSS?

4 A. I don't know for sure. My guess would be the US  
5 government.

6 Q. Do you know which part of the FMVSS deals with  
7 lamps, reflective devices and associated equipment?

8 A. No, not offhand.

9 Q. Do you know if motor vehicle standards ever change?

10 A. I'm almost sure that they do.

11 Q. And do you know if the FMVSS has ever changed?

12 A. I don't recall having specific knowledge of it, but  
13 I presume it does.

14 Q. Generally, regulatory requirements change over  
15 time; is that fair?

16 A. I think that's generally true.

17 Q. Did you consider the FMVSS in your obviousness  
18 analysis in your declaration?

19 MS. SHAH: Objection. Vague.

20 THE WITNESS: I didn't compare to  
21 specific things in the FMVSS in my analysis.

22 BY MR. FITZSIMMONS:

23 Q. But did you consider the FMVSS in your obviousness  
24 analysis?

25 MS. SHAH: Objection. Asked and



1 answered.

2 THE WITNESS: I considered the  
3 existence of regulations such as the FMVSS in my  
4 analysis.

5 BY MR. FITZSIMMONS:

6 Q. How did the existence of regulations factor into  
7 your obviousness analysis?

8 A. Generally as described in this paragraph 26, that  
9 there are regulations about many aspects of vehicle  
10 safety, including headlamps and illuminations, and  
11 they regulate many things, several of which are  
12 listed here, so an understanding that such  
13 regulation exists and has existed for many years  
14 was part of my analysis.

15 Q. So in that paragraph 26, you say, "The FMVSS in the  
16 US specify requirements with respect to maximums"  
17 -- excuse me -- "with respect to minimum/maximum  
18 intensity, color and beam pattern and shape for  
19 specific types of vehicle lights," is that correct?

20 A. That's correct.

21 Q. What do you mean by "shape" in that sentence?

22 A. In this sentence, generally I mean the boundary of  
23 the light that is being emitted by a headlamp.

24 Q. What do you mean by the "boundary of the light"?

25 A. One way to think about this is if you have a wall

1 directly in front of a car with a light and you  
2 shine it on that wall, you can draw a boundary of  
3 what is illuminated on the wall, which describes --  
4 it's one way of describing shape for a vehicle  
5 light.

6 Q. Would it matter how far that wall is from the  
7 vehicle?

8 MS. SHAH: Objection. Calls for  
9 speculation. Vague.

10 THE WITNESS: It depends on what you mean  
11 by it, but it wouldn't be exactly the same shape  
12 and size and everything if the wall changed in  
13 terms of distance.

14 BY MR. FITZSIMMONS:

15 Q. How would the shape change if the wall was further  
16 away?

17 MS. SHAH: Objection. Calls for  
18 speculation. Vague.

19 THE WITNESS: That can depend somewhat on  
20 the details of the source, but it would at least  
21 make the shape larger for walls further away.

22 May I add to that? When I said it would  
23 make the shape larger, I mean specifically the  
24 drawing on the wall that is our representation of  
25 the shape.

1 BY MR. FITZSIMMONS:

2 Q. And so the -- are you saying that the shape depends  
3 on the distance you are away from the headlamp?

4 MS. SHAH: Objection. Vague.

5 THE WITNESS: What I'm saying is that the  
6 outline we drew in the scenario does depend on the  
7 distance.

8 BY MR. FITZSIMMONS:

9 Q. Is there a difference between beam pattern and  
10 shape in your sentence there in paragraph 26?

11 A. Yes, I mean somewhat different things by those two  
12 in the sentence.

13 Q. Can you explain to me what the difference is  
14 between the beam pattern and shape?

15 A. By beam pattern, in the sentence, I basically mean  
16 within that outline we drew on the wall in our  
17 previous example, what parts are bright or dark or  
18 in between or what is the pattern of light within  
19 that outline of the shape on the wall?

20 Q. So what do you mean by -- let me try to break it  
21 down. What do you mean by beam pattern?

22 A. I believe I just answered that question.

23 Q. So are you saying that beam pattern has to do with  
24 how bright or dark an area of the light is?

25 MS. SHAH: Objection. Mischaracterizes

1 the witness' prior answer. Vague.

2 THE WITNESS: The way I'm using it here,  
3 beam pattern is related to brightness and darkness  
4 of illumination within the shape.

5 BY MR. FITZSIMMONS:

6 Q. Do you know if there's an FMVSS shape requirement  
7 for high beams?

8 MS. SHAH: Objection. Vague.

9 THE WITNESS: I'm not sure.

10 BY MR. FITZSIMMONS:

11 Q. Do you know if there is a FMVSS shape requirement  
12 for low beams?

13 A. I'm not sure.

14 Q. Do you know if there's a FMVSS shape requirement  
15 for fog lamps?

16 A. I'm not sure.

17 Q. Do you know if there's a FMVSS shape requirement  
18 for cornering lamps?

19 A. I'm not sure.

20 Q. Do you know if there's a FMVSS requirement for the  
21 minimum intensity for high beams?

22 A. I'm not sure.

23 Q. Do you know if there's a FMVSS requirement for  
24 minimum intensity of low beams or fog lamps or  
25 cornering lamps?

1 A. As I said earlier, I don't know the FMVSS  
2 regulations in all their detail, so I'm not sure.

3 Q. So I presume the answer is the same, but do you  
4 know if there's a FMVSS requirement for maximum  
5 intensity for high beams, low beams, fog lamps or  
6 cornering lamps?

7 MS. SHAH: Objection. Asked and  
8 answered.

9 THE WITNESS: I'm not sure.

10 BY MR. FITZSIMMONS:

11 Q. Do you know if there's an FMVSS requirement for the  
12 color of high beams, low beams, fog lamps or  
13 cornering lamps?

14 A. I'm not sure.

15 Q. Still paragraph 26, page 16 of Exhibit 2006,  
16 towards the bottom, do you see where you say "a  
17 POSA would not have considered combining features  
18 from lamps having different functions"?

19 A. I do, yes.

20 Q. You see that's what you said?

21 A. Yes.

22 Q. What do you mean by "combining features from  
23 lamps"?

24 A. I mean designing or building a lamp that has some  
25 features from one design and other features from

1 another design.

2 Q. So in your opinion, you wouldn't design or build a  
3 lamp that has some features from one design and  
4 other features from another design?

5 A. I would not -- sorry, could you repeat the  
6 beginning of that question?

7 Q. Sure. You said -- my question was, "What do you  
8 mean by combining features from lamps?" And you  
9 said, "I mean designing or building a lamp that has  
10 some features from one design and other features  
11 from another design." And then my question was,  
12 "So in your opinion, you wouldn't design or build a  
13 lamp that has some features from one design and  
14 other features from another design?"

15 A. Thank you.

16 I wouldn't do that and expect it to work  
17 necessarily without significant consideration,  
18 perhaps experimentation, to convince myself that  
19 the combination made sense.

20 Q. What do you mean by "features from one design and  
21 features from another design" in your previous  
22 response?

23 A. I guess I just mean what those words say.

24 Q. What does the phrase "optically combined" mean to  
25 you?

1 A. In general, without any other context, I would say  
2 it probably has something to do with directing  
3 light of more than one sources or more than one  
4 direction, but it could potentially mean a number  
5 of things.

6 Q. Do you know if there's a definition of "optically  
7 combined" in the FMVSS?

8 A. I don't know.

9 Q. Let's go to page 21 now, paragraph 28.

10 Paragraph 28 actually starts on page 20 and  
11 continues on to page 21, but I will refer to  
12 page 21.

13 You cite the Michigan Vehicle Code Act 300  
14 of 1949, section 257.698(4), correct?

15 A. That's right.

16 Q. And that act is not listed in your exhibit  
17 references list, correct?

18 A. I believe that's correct.

19 Q. Do you mind if I just call that the MVCA?

20 A. That's fine.

21 Q. Did you review the MVCA before preparing your  
22 declaration there?

23 A. I did, yes.

24 Q. When did you review that?

25 A. It would have been sometime before mid August this

1 year.

2 Q. Was that the first time you have ever reviewed the  
3 MVCA?

4 A. I'm not sure.

5 Q. You don't recall reviewing the MVCA before about  
6 August of this year though?

7 A. I don't recall, but I could have.

8 Q. Who provided you with the MVCA document?

9 A. I believe one of the attorneys I've been working  
10 with in this case provided me the link.

11 Q. Did you review the entire document?

12 A. I don't recall. I believe I -- yeah, I don't  
13 recall.

14 Q. Has the MVCA been amended since 1949?

15 A. I don't know.

16 Q. Do you know which version you're citing in your  
17 declaration?

18 A. What do you mean by which version?

19 Q. Do you know if there are multiple versions of the  
20 MVCA?

21 A. I don't know for sure.

22 Q. Why do you cite the Michigan Vehicle Code Act as  
23 opposed to some other state?

24 A. I don't recall if there was any particular reason  
25 to use that one as opposed to others, but it was an



1 example.

2 Q. An example of what?

3 A. Going back to your earlier question in paragraph 26  
4 where I start with "Regulations such as the FMVSS,"  
5 this is an example of such a regulation.

6 Q. So you're saying the MVCA is an example of a  
7 regulation such as the FMVSS; is that correct?

8 MS. SHAH: Objection. Mischaracterizes  
9 the testimony.

10 THE WITNESS: I would say those two are  
11 examples of regulations.

12 BY MR. FITZSIMMONS:

13 Q. Regulations of what?

14 A. Regulations related to motor vehicle safety design,  
15 related to motor vehicles.

16 Q. In the paragraph there on page 21 above where  
17 you have the MVCA citation, do you see where it  
18 says, "The standards prescribed in 49 CFR  
19 Section 571.108"?

20 A. Yes.

21 Q. That code is not listed in your exhibits reference  
22 list, correct?

23 A. That is correct.

24 Q. Did you review 49 CFR Section 571.108?

25 A. I don't --

1 Q. Excuse me. Before preparing your declaration.

2 A. I don't believe so. That is quoted in the quote  
3 from the MVCA.

4 Q. Do you know what 49 CFR Section 517.108 is?

5 A. Not offhand. I would have to look.

6 Q. Paragraphs 29 through 33, you discuss what's in the  
7 heading there as design tradeoffs; is that right?

8 A. Yes.

9 Q. Are those part of what you considered in your  
10 obviousness analysis?

11 A. It provides background for my obviousness analysis.

12 Q. What do you mean by background?

13 A. Generally understanding design aspects of a system  
14 is important for a person of ordinary skill in the  
15 art in order to know if something is obvious or  
16 not.

17 Q. In your opinion, are design tradeoffs relevant in  
18 determining whether there's a motivation to combine  
19 references in obviousness analysis?

20 A. I think they could well be.

21 Q. You would agree that design tradeoffs do not  
22 necessarily obviate a motivation to combine  
23 references, correct?

24 MS. SHAH: Objection. Vague.

25 THE WITNESS: I think it would depend on

1 the specific tradeoff. Maybe a design tradeoff  
2 could obviate motivation to combine; it probably  
3 doesn't necessarily, so it maybe just depends.

4 MR. FITZSIMMONS: Let's go back to  
5 paragraph 25.

6 MS. SHAH: Go ahead and finish your  
7 question. I just was wondering if you want to take  
8 a break.

9 MR. FITZSIMMONS: Maybe five minutes.

10 MS. SHAH: Yeah, fine.

11 BY MR. FITZSIMMONS:

12 Q. So on page 16, actually, but still paragraph 25, do  
13 you see where you talk about design challenges --  
14 excuse me -- "Challenges associated with use of  
15 LEDs in these applications could be overcome to  
16 meet government regulations and industry  
17 standards"?

18 A. I see that, yes.

19 Q. In your opinion, if a prior art combination would  
20 not meet government regulations or industry  
21 standards, then it wouldn't render patent claims  
22 obvious?

23 MS. SHAH: Objection. Vague.

24 THE WITNESS: I think it depends on the  
25 specific combination and the specific regulations

1 involved. I don't think it's -- I think it depends  
2 on that.

3 MS. SHAH: Is this a good breaking  
4 point?

5 MR. FITZSIMMONS: A couple minutes here.

6 MS. SHAH: Okay.

7 BY MR. FITZSIMMONS:

8 Q. So based on that answer, is it fair to say that  
9 there could be a prior art combination of  
10 references that do not meet government regulations  
11 for industry standards yet render patent claims  
12 obvious?

13 MS. SHAH: Objection. Vague.

14 THE WITNESS: I think that's possible.

15 BY MR. FITZSIMMONS:

16 Q. The '029 patent claims recite using LEDs in vehicle  
17 headlamps, correct?

18 A. That's right.

19 Q. The '029 patent doesn't purport to solve any  
20 technical problem in order to meet government  
21 regulations or industry standards, correct?

22 MS. SHAH: Objection. Vague.

23 THE WITNESS: I don't recall if that was  
24 part of the motivation -- stated motivation of the  
25 '029 or not.

1 BY MR. FITZSIMMONS:

2 Q. Did the system in the '029 patent meet government  
3 regulations and industry standards at the time of  
4 the alleged invention?

5 MS. SHAH: Objection. Vague.

6 THE WITNESS: I haven't analyzed that so  
7 I'm not really sure.

8 BY MR. FITZSIMMONS:

9 Q. You agree that before the '029 patent, there were  
10 prior art references that disclosed to use LEDs in  
11 vehicle headlamps, correct?

12 A. Yes.

13 MR. FITZSIMMONS: Okay. Let's take a  
14 break.

15 (Whereupon a break was taken  
16 from 10:48 a.m. to 11:02 a.m.)

17 BY MR. FITZSIMMONS:

18 Q. Dr. Turk, have you ever designed a headlamp with  
19 LED light sources?

20 A. I have not.

21 Q. Have you ever designed a headlamp for adaptive  
22 front lighting systems or AFS?

23 A. No.

24 Q. Have you ever designed a vehicle forward lighting  
25 system?

1 A. No.

2 MS. SHAH: Objection. Relevance.

3 BY MR. FITZSIMMONS:

4 Q. Have you ever worked in an industry where you were  
5 involved in the area of automotive lighting and  
6 lighting control systems?

7 A. A bit.

8 Q. What do you mean by "a bit"?

9 A. I worked for three years on a project about  
10 autonomous vehicles, which included some work and  
11 design considerations about the lighting of the  
12 vehicle.

13 Q. And where were you working for that project?

14 A. At Martin Marietta.

15 Q. And you said it "included some work and design  
16 considerations about the lighting of the vehicle."  
17 What do you mean by that?

18 A. The goal of the project was to build an autonomous  
19 vehicle that would drive by itself and part of that  
20 was driving at dusk or at night and so designing  
21 and thinking about the illumination for the  
22 vehicle, of the vehicle, and how that would impact  
23 the complete system as part of that project.

24 Q. How long were you working on that project?

25 A. I think it was almost three years.

1 Q. What portion of that project would you say was  
2 focused on the illumination for the vehicle?

3 A. I don't know how to define "portion."

4 Q. Was the illumination of the vehicle the main focus  
5 of that project?

6 A. The main focus, as I said, was to build an  
7 autonomous vehicle and illumination was an  
8 important part of it.

9 Q. Did you personally work on the illumination portion  
10 of that project?

11 A. I did at times.

12 Q. And what did you specifically work on with regards  
13 to the illumination?

14 A. It was a long time ago and I don't remember too  
15 much detail about it, but certainly an important  
16 question was how much and what kind of illumination  
17 was necessary to be able to do what we needed to  
18 do.

19 Q. And what was it that you would say you needed to  
20 do?

21 A. We needed to sense and understand the world around  
22 the vehicle so that it would know where to drive,  
23 among other things.

24 Q. Have you ever worked for a vehicle headlamp  
25 company?

1 A. No.

2 Q. Have you ever worked for an LED company?

3 A. No.

4 Q. Have you ever worked for what's known as a general  
5 or interior lighting company?

6 A. No.

7 MS. SHAH: Objection. Vague.

8 BY MR. FITZSIMMONS:

9 Q. You're not an expert in vehicle forward lighting,  
10 correct?

11 MS. SHAH: Objection. Vague.

12 THE WITNESS: I'm an expert in imaging  
13 and vehicle forward lighting is one of many  
14 components of imaging, so in general, I would say  
15 yes, I am.

16 BY MR. FITZSIMMONS:

17 Q. But you've never designed a vehicle forward  
18 lighting system, correct?

19 MS. SHAH: Objection. Relevance.

20 THE WITNESS: I've not personally  
21 designed a full vehicle forward lighting system,  
22 no.

23 BY MR. FITZSIMMONS:

24 Q. You don't have any patents for vehicle forward  
25 lighting, correct?



1 A. No, I don't.

2 Q. You haven't received any awards for vehicle forward  
3 lighting, correct?

4 A. Not specifically for that, no.

5 Q. You haven't written any papers on vehicle forward  
6 lighting, correct?

7 A. I'm not sure. It may be that some of our papers  
8 about this autonomous vehicle project I was  
9 discussing include aspects of forward lighting, but  
10 I would have to look back at them.

11 Q. Not that you can recall, though?

12 A. Not that I recall right now.

13 Q. So all of the things -- strike that.

14 So patents, awards, papers, things that  
15 you said qualified you as an expert in computer  
16 vision and facial recognition, you don't have  
17 similar patents, awards or papers with respect to  
18 vehicle forward lighting, correct?

19 MS. SHAH: Objection. Vague.

20 THE WITNESS: Those specific things were  
21 examples of my expertise, things that came out of  
22 my expertise; they were not what defined my  
23 expertise. So the things that you've asked about  
24 that I said no to, I don't have those things that  
25 have come out of my expertise in lighting,

1 including vehicle lighting, but I'm an expert in  
2 the areas that make up vehicle lighting.

3 BY MR. FITZSIMMONS:

4 Q. When you say "the areas that make up vehicle  
5 lighting," what do you mean by that?

6 A. Vehicle lighting is fundamentally about the physics  
7 and engineering aspects of optics and I'm an expert  
8 on those things.

9 Q. Are you a member of the Society of Automotive  
10 Engineers?

11 A. No, I'm not.

12 Q. Are you a member of the International Society for  
13 Optical Engineering?

14 A. No, I'm not.

15 Q. Are you aware of the Illuminating Engineering  
16 Society?

17 A. No.

18 Q. Dr. Turk, do you know who Dr. Jian Zhong Jiao is?  
19 And I'll spell that for you. J-I-A-N, Z-H-O-N-G,  
20 J-I-A-O. Do you know Dr. Jiao?

21 A. I know who he is.

22 Q. Did you know him before you were retained in this  
23 matter?

24 A. I don't believe so.

25 Q. And again, you cite several articles that name

1 Dr. Jiao as an author, correct?

2 A. That's correct.

3 Q. And if I recall, you said you didn't personally  
4 find those papers, though, right; they were  
5 provided to you?

6 A. They were provided to me; that's correct.

7 Q. And did you read those papers in their entirety?

8 A. Yes, I did.

9 Q. And you would agree that Dr. Jiao is an expert in  
10 vehicle forward lighting, right?

11 MS. SHAH: Objection. Relevance.

12 THE WITNESS: I believe I've read in his  
13 declaration that he claims to be an expert and I  
14 have no reasons to disagree with him, but I don't  
15 know that personally.

16 BY MR. FITZSIMMONS:

17 Q. Would you agree that Dr. Jiao is an expert in LED  
18 headlamps?

19 A. I would give the same answer.

20 MS. SHAH: Objection. Relevance.

21 THE WITNESS: I would give the same  
22 answer to that.

23 BY MR. FITZSIMMONS:

24 Q. In paragraph 30 of your second declaration, so back  
25 in Exhibit 2006. Page 23. You see there you say,

1 in paragraph 30, "experts in vehicle forward  
2 lighting," correct?

3 A. I'm sorry, where are you pointing to?

4 Q. Paragraph 30. You say "experts in vehicle forward  
5 lighting."

6 A. Oh, yes, I see it.

7 Q. And after that, in paragraph 30, you cite  
8 Exhibit 2012, correct?

9 A. That's correct.

10 Q. And you also cite Exhibit 2010, correct, on the  
11 next page?

12 A. That's correct.

13 Q. And those are both articles by Dr. Jiao where he's  
14 an author, correct?

15 A. Yes; that's correct.

16 Q. And so here in your declaration, you agree that  
17 Dr. Jiao is an expert in vehicle forward lighting,  
18 correct?

19 A. I do state that, yes.

20 Q. Let's turn to paragraph 47, still in your second  
21 declaration. In paragraph 47 there, you state, "I  
22 have been asked to provide my opinion as to the  
23 level of skill of a person having ordinary skill in  
24 the art (POSA) of the '029 patent at the time of  
25 the claimed invention," correct?

1 A. Yes.

2 Q. Then down towards the bottom of the page in  
3 paragraph 48, you state, "I understand that  
4 petitioner has proposed the following level of  
5 ordinary skill," correct?

6 A. Yes, I see that.

7 Q. Can you please read that level of ordinary skill?

8 A. It says, "A POSA at the time of the alleged  
9 invention would have had a bachelor's degree (BS)  
10 in mechanical engineering, electrical engineering,  
11 optical engineering, applied physics or an  
12 equivalent field, as well as at least two years of  
13 industry experience in the area of automotive  
14 lighting and lighting control systems."

15 Q. In paragraph 49, you state, "I understand that  
16 patent owner accepts petitioner's proposed level of  
17 ordinary skill in the art," correct?

18 A. Yes.

19 Q. Do you also accept the petitioner's proposed level  
20 of ordinary skill in the art?

21 MS. SHAH: Objection. Vague.

22 THE WITNESS: Yes.

23 BY MR. FITZSIMMONS:

24 Q. And so is the level of skill you read for me from  
25 paragraph 48 the level of skill you applied in your

1 analysis in your declaration?

2 A. Yes.

3 (Marked for identification:

4 Deposition Exhibit No. 1001.)

5 BY MR. FITZSIMMONS:

6 Q. I'm going to hand you Exhibit 1001. This is the  
7 '029 patent. You're familiar with this document,  
8 Doctor?

9 A. Yes.

10 Q. And let's look at paragraph 37 of your declaration,  
11 second declaration. Do you see in paragraph 37,  
12 the first sentence there, where it says, "...years  
13 after the earliest priority date of the '029  
14 patent"?

15 A. Yes.

16 Q. In your opinion, what is the earliest priority date  
17 of the '029 patent?

18 MS. SHAH: Objection. Calls for a legal  
19 conclusion.

20 THE WITNESS: I'm trying to remember  
21 offhand what I've been told about this. I  
22 believe it was the year 2002 or somewhere around  
23 there.

24 BY MR. FITZSIMMONS:

25 Q. And so how did you determine the year 2002 or

1           somewhere around there?

2   A.     I didn't determine it myself; I was told what to  
3           use as the priority date.

4   Q.     So you didn't analyze the priority date of the '029  
5           patent; is that correct?

6   A.     That's correct.

7   Q.     The '029 patent claims, do they require compliance  
8           with government rules or regulations?

9                   MS. SHAH: Objection. Vague.

10                   THE WITNESS: Not to my knowledge.

11 BY MR. FITZSIMMONS:

12 Q.     Do the '029 patents claims require any specific  
13           intensity?

14                   MS. SHAH: Same objection.

15                   THE WITNESS: What do you mean by "any  
16           specific intensity"?

17 BY MR. FITZSIMMONS:

18 Q.     How would you define "intensity"?

19 A.     Intensity is a broadly applied word that can mean  
20           different things in different contexts. Generally,  
21           it has something to do with brightness or energy or  
22           energy per area or something like that of light and  
23           is often also relative to the human observers, so  
24           it generally is similar to the concept of  
25           brightness.

1 Q. So based on your understanding of intensity, did  
2 the '029 patent claims require any specific  
3 intensity?

4 MS. SHAH: Objection. Vague.

5 THE WITNESS: Can you tell me what you  
6 mean by "specific intensity"?

7 BY MR. FITZSIMMONS:

8 Q. Do they require any intensity?

9 A. Yes.

10 Q. What's that intensity?

11 A. It can't be all dark; it does require light.

12 Q. Is that the only requirement for intensity in the  
13 '029 patent claims?

14 MS. SHAH: Objection. Vague.

15 THE WITNESS: I don't know offhand.

16 BY MR. FITZSIMMONS:

17 Q. Do the '029 patent claims require any particular  
18 packaging size of the LEDs?

19 MS. SHAH: Objection. Vague.

20 THE WITNESS: I don't recall the claims  
21 mentioning packaging size, but I could look.

22 MR. FITZSIMMONS: You can look.

23 THE WITNESS: In a quick look through  
24 the claims, I don't see any mention of packaging  
25 size.



1 BY MR. FITZSIMMONS:

2 Q. Do the '029 patent claims require any particular  
3 beam pattern?

4 MS. SHAH: Objection. Vague.

5 THE WITNESS: I would have to check.

6 MR. FITZSIMMONS: You have the claims  
7 there that you just reviewed. You can check them.

8 THE WITNESS: In quick look through, I  
9 don't think they require a specific pattern.

10 BY MR. FITZSIMMONS:

11 Q. And maybe I asked this already, but did you review  
12 the '029 claims in preparation for today's  
13 deposition?

14 A. I did, yes.

15 Q. And did you review the '029 patent claims before  
16 preparing your declaration, Exhibit 2006?

17 A. Yes.

18 Q. All right. Have you seen any commercially  
19 available headlamps that would meet what's recited  
20 in the '029 patent claims?

21 MS. SHAH: Objection. Relevance. Vague.

22 THE WITNESS: I've never thought about  
23 that question. I don't know offhand.

24 BY MR. FITZSIMMONS:

25 Q. On page 30 now of your declaration, Exhibit 2006,

1       towards the bottom of the page, you have a quote  
2       there that says, "To achieve high performance," and  
3       then it goes on and says, "...sufficient lumen and  
4       luminance of the light sources and sufficient  
5       optical systems are always necessary and  
6       important." Do you see that?

7   A.    Yes.

8   Q.    Do you still agree with that statement?

9   A.    Yes. May I revise that answer? I agree that I  
10       quoted the statement in my declaration.

11   Q.    Would you also agree that at the time of the  
12       purported invention of the '029 patent, a person  
13       skilled in the art would have known that sufficient  
14       lumen and luminance of light sources and sufficient  
15       optical systems are always necessary and important  
16       in vehicle headlamps?

17   A.    I expect so, yes.

18   Q.    I'll ask you to go back to the '029 patent itself  
19       now, Exhibit 1001, and let's turn to column 11,  
20       lines 5 through 8. Can you start there and read  
21       starting with, "This invention..."?

22   A.    "This invention comprises a different approach,  
23       which is to provide the end user with the most  
24       correct lighting solution not a new technology lamp  
25       to replace the old one."

1 Q. And so the '029 patent doesn't claim to be  
2 inventing any new hardware, correct?

3 MS. SHAH: Objection. Relevance. Calls  
4 for a legal conclusion.

5 THE WITNESS: That sentence doesn't say  
6 anything about hardware.

7 BY MR. FITZSIMMONS:

8 Q. The '029 patent isn't purporting to have invented  
9 any new lamp, correct?

10 MS. SHAH: Objection. Vague. Calls for  
11 a legal conclusion.

12 THE WITNESS: Are you referring to the  
13 sentence we're at or the patent in general or what?

14 MR. FITZSIMMONS: The sentence you just  
15 read.

16 THE WITNESS: Sorry, can you read the  
17 question again?

18 BY MR. FITZSIMMONS:

19 Q. The '029 patent isn't purporting to have invented  
20 any new lamp, correct?

21 MS. SHAH: Same objections.

22 THE WITNESS: The sentence is not saying  
23 that it doesn't invent the new lamp, it's making  
24 the point that it's not just replacing an old one  
25 with a new one.

1 BY MR. FITZSIMMONS:

2 Q. From your review of the '029 patent, does it  
3 disclose a new lamp for vehicle headlights?

4 MS. SHAH: Objection. Vague.

5 THE WITNESS: I don't recall opining  
6 about that in my declaration. Would you like me  
7 to point to somewhere where that might be  
8 discussed?

9 BY MR. FITZSIMMONS:

10 Q. So you quote this passage in paragraph 42 of your  
11 declaration and you underline "not a new technology  
12 lamp." Do you see that?

13 A. Still getting there. I don't see an underlined  
14 "not a new technology lamp." Forty-two?

15 Q. Paragraph 42. Sorry. You see the sentence there  
16 the '029 patent describes?

17 A. Paragraph 42. I don't see it.

18 Q. Okay. Do you see the words there -- the quote that  
19 we were just discussing from the '029 patent,  
20 11:5-7?

21 A. Yes, I was looking for an underlined portion. It's  
22 not underlined in my version. Sorry.

23 Q. Sorry, there's underlining further down. You see  
24 where you quote that?

25 A. Yes, I see that.

1 Q. And the '029 patent proposes using LEDs in  
2 headlamps, correct?

3 A. Yes.

4 Q. Does the '029 patent purport to have improved upon  
5 existing LEDs for use in its headlamps?

6 MS. SHAH: Objection. Vague.

7 THE WITNESS: I don't recall if it does  
8 and I don't think I commented on that in my  
9 declaration.

10 BY MR. FITZSIMMONS:

11 Q. But you reviewed the '029 patent, correct?

12 A. I have, yes.

13 Q. And you don't recall the '029 patent purporting to  
14 have improved upon existing LEDs, correct?

15 MS. SHAH: Objection. Asked and  
16 answered.

17 THE WITNESS: It's a long patent, it's, I  
18 believe, 99 columns plus all the figures and other  
19 things, so I don't remember it word for word, so my  
20 opinions are in the declaration and I don't  
21 think -- I don't recall writing about that in my  
22 declaration, but if you want to point me somewhere,  
23 I'm happy to look.

24 BY MR. FITZSIMMONS:

25 Q. I'm asking about the '029 patent, which you said

1           you reviewed, correct?

2   A.     Yes.

3   Q.     And so you're telling me you don't recall the '029  
4           patent purporting to have improved upon existing  
5           LEDs, correct?

6                   MS. SHAH:  Objection.  Vague.  Asked and  
7           answered.

8                   THE WITNESS:  That's what I'm saying.

9  BY MR. FITZSIMMONS:

10 Q.     Does the '029 patent purport to have improved upon  
11          LED packaging?

12 A.     I don't recall it doing that, but I would still  
13          give the same answer in that it's a long patent; I  
14          don't remember everything in there.  I don't think  
15          I opined on that in my declaration, but if you'd  
16          like to point me to somewhere relevant to the  
17          question, I'll look over it.

18 Q.     I'm talking about the '029 patent, which is the  
19          subject of the proceeding here.  Does the '029  
20          patent purport to have improved upon heat  
21          management systems for vehicle headlamps, to your  
22          recollection?

23                   MS. SHAH:  Objection.  Vague.  Relevance.

24                   THE WITNESS:  I'll give you the same  
25          answer I gave for the last question, which is it's

1 a long patent; I don't remember it word for word.  
2 I provided my opinion of it in the declaration, so  
3 if you want to point me to somewhere in there, I'll  
4 look over that.

5 BY MR. FITZSIMMONS:

6 Q. And so to your recollection, the '029 patent does  
7 not purport to have improved upon the heat  
8 management system for vehicle headlamps, correct?

9 MS. SHAH: Objection. Mischaracterizes  
10 the witness' testimony. Asked and answered.

11 THE WITNESS: Offhand, with the caveats  
12 that I've already given you, I don't recall  
13 discussing that.

14 BY MR. FITZSIMMONS:

15 Q. Let's go to column 19 of the '029 patent. Down  
16 towards the bottom and then it continues -- so for  
17 line 63 -- column 19 -- excuse me, line 64, that  
18 is, starting with, "Based on progress to date..., "  
19 and then through column 20, line 2. I'll give you  
20 a second there to read those few lines.

21 A. I see that.

22 Q. Can you read for me the second sentence, starting  
23 with, "This invention relates...?"

24 A. "This invention relates to technologies which are  
25 feasible at the present state of the art l/W" --

1       which I believe is lumens per watts -- "as well  
2       as those which will become feasible in the  
3       future."

4   Q.    So the '029 patent is stating that the disclosed  
5       technologies are either feasible or will become  
6       feasible, correct?

7               MS. SHAH:  Objection.  Vague.  Asked and  
8       answered.

9               THE WITNESS:  Yeah, I think that's a  
10       summary of that sentence.  That's an accurate  
11       description from the sentence.

12  BY MR. FITZSIMMONS:

13  Q.    So the '029 patent isn't limiting its disclosure to  
14       commercially viable embodiments, correct?

15               MS. SHAH:  Objection.  Vague.

16               THE WITNESS:  I don't know if it's doing  
17       that or not.

18  BY MR. FITZSIMMONS:

19  Q.    To your recollection, is there anything in the '029  
20       patent that states that its inventions are  
21       commercially feasible?

22               MS. SHAH:  Objection.  Vague.  Relevance.

23               THE WITNESS:  I don't recall the word  
24       "commercial," "commercially" at all in the patent,  
25       but it might be in there.



1 BY MR. FITZSIMMONS:

2 Q. The '029 patent discusses adaptive frontal lighting  
3 systems or AFS, correct?

4 A. I don't remember it using that phrase, but it may  
5 well have, but in general, that seems correct.

6 Q. I'll point you to column 51, lines 54 to 55.

7 A. Which lines?

8 Q. Column 50, lines 54 and 55. You see it says  
9 "adaptive frontal lighting systems" there. Excuse  
10 me. It's 51. Maybe I misspoke. Column 51,  
11 lines 54 to 55.

12 A. Got it. I see that.

13 Q. So the '029 patent discusses adaptive frontal  
14 lighting systems, correct?

15 A. It does use that term, yes.

16 Q. What are adaptive frontal lighting systems?

17 MS. SHAH: Objection. Vague.

18 THE WITNESS: As discussed here, they're  
19 systems that aid in seeing around curves and other  
20 features in the road.

21 BY MR. FITZSIMMONS:

22 Q. Before being engaged in this proceeding, had you  
23 heard of the term "adaptive frontal lighting  
24 systems" previously?

25 A. I don't recall hearing that term specifically, but

1 I could have.

2 Q. Do you know if adaptive frontal lighting systems  
3 were known prior to the '029 patent?

4 A. I don't know offhand.

5 Q. Let's turn to column 52 and really at the bottom of  
6 51, last line there, up on to the top of column 52,  
7 through line 2. Do you see where it says, "The  
8 '029 patent lighting can be adapted to the optimal  
9 operating regime"?

10 A. I see that.

11 Q. What does "optimal operating regime" mean?

12 MS. SHAH: Objection. Relevance.

13 THE WITNESS: I don't recall opining  
14 about that in my declaration, but here it just  
15 seems to me to be used generally as how a device  
16 should be operating ideally.

17 BY MR. FITZSIMMONS:

18 Q. "How a device should be operating ideally." It  
19 doesn't always mean the maximum amount of light at  
20 every point, correct, of the vehicle headlamps?

21 MS. SHAH: Objection.

22 MR. FITZSIMMONS: Please let me finish my  
23 question.

24 MS. SHAH: Sure. Are you done?

25 Objection. Vague. Relevance.

1 THE WITNESS: That general phrase you  
2 used here in the sentence, it's unclear whether it  
3 refers to that or not.

4 BY MR. FITZSIMMONS:

5 Q. Does an optimal operating regime as described in  
6 the '029 patent include high beams?

7 MS. SHAH: Objection. Vague.

8 THE WITNESS: I don't believe I  
9 thoroughly analyzed the phrase "optimal operating  
10 regime." I don't recall discussing that in my  
11 opinions in the declaration, so I really don't have  
12 an opinion on that.

13 BY MR. FITZSIMMONS:

14 Q. So sitting here today, you don't have an  
15 understanding of what the '029 patent means when  
16 it says an "optimal operating regime," is that  
17 correct?

18 MS. SHAH: Objection. Asked and  
19 answered.

20 THE WITNESS: No, it's not. I told you  
21 what I think that means here.

22 BY MR. FITZSIMMONS:

23 Q. And what do you think it means?

24 MS. SHAH: Objection. Asked and  
25 answered.

1 THE WITNESS: Can you read back what I  
2 said when you asked it earlier?

3 MR. FITZSIMMONS: I don't recall you  
4 specifically saying what that means.

5 THE WITNESS: I believe I did. Can we  
6 find that? I think I used the word "ideally" at  
7 the end.

8 BY MR. FITZSIMMONS:

9 Q. So I said, "What does 'optimal operating regime'  
10 mean?" And you said, "I don't recall opining on  
11 that in my declaration, but here it just seems to  
12 me to be used generally as how a device should be  
13 operating ideally." So that's your understanding?

14 A. That's my response to your question of what it  
15 seems to be referring to here in context.

16 Q. If we look just back over at column 51, line 63, do  
17 you see the '029 patent refers to a GPS system?

18 A. Sorry, is that a question?

19 Q. I said, do you see where it refers to a GPS system  
20 there?

21 A. I do. Sorry.

22 Q. And a GPS system will be a type of map data,  
23 correct?

24 A. It can be referred to as that; maybe it's not a  
25 very precise definition, but yes, it's

1           understandable.

2   Q.     Column 52 of the '029 patent, line 38, do you see  
3           where it says, "A possible control system for such  
4           purposes is described in US Patent No. 6,281,632,  
5           by Stam, et al, from August 28, 2001"?

6   A.     I see that.

7   Q.     Have you reviewed US Patent No. 6,281,632?

8   A.     I'm familiar with the name Stam, which makes me  
9           think I probably did review it, but I don't recall  
10          at the moment.

11   Q.     But here the '029 patent is acknowledging that the  
12          Stam patent discloses a known control system for  
13          continuously variable headlights, right?

14   A.     It says "for such purposes," so let me look to  
15          confirm what those purposes are. It's some kind of  
16          automatic control of headlamps, yes.

17   Q.     Let's turn to column 68, line 38. Can you read  
18          that --

19   A.     How far?

20   Q.     The two sentences there, starting with, "In a  
21          preferred..."

22   A.     "In a preferred embodiment, the LED light fixture  
23          system is provided with mechanical means 458 for  
24          changing the structural shape which affects the  
25          direction of the illumination produced by the LED

1 module 457. By re-aiming the light source, a new  
2 fixture 450 light distribution pattern is  
3 obtained."

4 Q. That's describing a mechanical means for changing  
5 the structural shape of the illumination, correct?

6 A. It is discussing that, yes.

7 MR. FITZSIMMONS: And can you now go to  
8 your first declaration? So this is Exhibit 2001.  
9 And we'll go to paragraph 23, please.

10 THE WITNESS: And by the way, I could use  
11 a quick bio break at some point.

12 BY MR. FITZSIMMONS:

13 Q. This is page 12. Paragraph 22 starts on page 11,  
14 goes on to page 12, and at the end of that  
15 paragraph there, you say that, "The '029 patent  
16 describes a non-mechanical and non-movable system.  
17 A non-mechanical and non-movable system as used in  
18 this context refers to a system with no moving  
19 parts or mechanisms to position the light beam."  
20 Do you see that?

21 A. I do.

22 Q. But what you just read in column 68, lines 38 to  
23 44, describes a mechanical system for changing the  
24 structural shape of the illumination, correct?

25 A. Correct.

1 Q. And so your statement that the '029 patent  
2 describes a non-mechanical and non-movable  
3 system isn't accurate in your first declaration,  
4 correct?

5 A. No, incorrect.

6 Q. How do you reconcile those two statements?

7 A. I did not say in my first declaration that a  
8 mechanical system is never mentioned in the '029.  
9 I say something declarative about what '029 does  
10 teach, which is a non-mechanical and non-movable  
11 system. I didn't list exhaustively everything that  
12 the patent mentions here.

13 Q. And so the patents we read in column 68, lines 38  
14 to 44, described a preferred embodiment where  
15 there's a mechanical means 458 for changing the  
16 structural shape of the illumination, though,  
17 correct?

18 A. Which lines again?

19 Q. 38 to 44.

20 A. It does discuss mechanical embodiment here, but  
21 this is not where it's talking about the vehicle  
22 scenario claims that this patent are discussing.  
23 This is about hallway lighting and similar kinds of  
24 things.

25 Q. So are you saying that passage in column 68 is not

1 applicable to the vehicle description in the '029  
2 patent?

3 MS. SHAH: Objection. Vague. Calls for  
4 a legal analysis and conclusion.

5 THE WITNESS: Yeah, I have no opinion of  
6 its applicability to the claims; I'm just saying  
7 the context in which -- this statement is not  
8 talking about the vehicle aspects of the patent.

9 BY MR. FITZSIMMONS:

10 Q. But the '029 patent describes both mechanical and  
11 non-mechanical systems, correct?

12 A. It does describe a non-mechanical system here in  
13 the context of -- I think it's hallway lighting and  
14 other non-vehicle related things. And it does  
15 describe non-mechanical as well, as we just pointed  
16 out from my first declaration.

17 Q. I think you meant to say mechanical in the context  
18 of hallway lighting, but you said non-mechanical,  
19 so in the context of hallway lighting at least,  
20 the '029 patent describes a mechanical system,  
21 correct?

22 A. That's what I meant to say. It may also describe  
23 non-mechanical, but here, as you pointed out, the  
24 passage I read does mention mechanical.

25 Q. And I'll wrap up here in a minute for a break.



Paragraph 41 of your second declaration,  
so this is Exhibit 2006.

A. Forty-eight?

Q. Paragraph 41.

A. Forty-one.

Q. You see where you say, "The direction of light  
exiting from the DLF as a whole were from each SLS  
individually is controllable by optical elements 6,  
such as reflective surfaces and/or refractors and  
maybe electronically variable optical elements"?

A. I do see that.

Q. And you cite the '029 patent at column 25, line 17  
to 21, right?

A. Yes.

Q. Are the elements you note in that quote movable?

A. Is your question are the elements in this quote  
movable?

Q. Right.

A. I don't think this quote states that they are  
movable or not movable.

Q. In your understanding of the '029 patent, do you  
have an understanding of whether they are movable  
or non-movable?

A. I'm sorry, now I've lost the quote. At the end of  
41? Is that where we were, paragraph 41?

1 Q. Yes.

2 A. I don't recall offhand if this quote is discussing  
3 a particular embodiment, but in general, the claims  
4 of the '029 patent refer to a non-movable --  
5 non-movable elements.

6 MR. FITZSIMMONS: Okay. Let's take a  
7 break.

8 (Whereupon a break was taken  
9 from 12:05 p.m. to 12:14 p.m.)

10 BY MR. FITZSIMMONS:

11 Q. Let's open up the '029 patent, Dr. Turk, and let's  
12 go to the claims. So starting at column 96.  
13 Sorry, they actually start on 95 at the bottom and  
14 go on to column 96. And you see claim 1 there of  
15 the '029 patent, Dr. Turk?

16 A. I do.

17 Q. So at the top of column 96 in claim 1, line 3, you  
18 see where it says "shaping light"?

19 A. Yes.

20 Q. What does "shaping light" mean in claim 1 of the  
21 '029 patent?

22 MS. SHAH: Objection. Calls for a legal  
23 conclusion.

24 THE WITNESS: The way I understand it in  
25 this context is modifying the shape of the light

1 coming out of the headlamp, as we had discussed  
2 earlier today.

3 BY MR. FITZSIMMONS:

4 Q. You said, "The way I understand it." What's that  
5 understanding based on?

6 A. All the things listed in my declaration in terms of  
7 background and prior art and such.

8 Q. And then claim 3, column 96, you see where it says  
9 "reshape light"?

10 A. Yes.

11 Q. What does "reshape light" mean in claim 3 of the  
12 '029 patent to you?

13 MS. SHAH: Same objection.

14 THE WITNESS: I think here it means to  
15 possibly change the shape of the light.

16 BY MR. FITZSIMMONS:

17 Q. You said "possibly change the shape of the light."  
18 So does claim 3 not require the shape of the light  
19 to change?

20 MS. SHAH: Objection. Calls for a legal  
21 conclusion.

22 THE WITNESS: Well, the context here is  
23 reshaping light based on the road curvature, and I  
24 would guess there might be some scenario in which  
25 that causes no change, but I think most of the time

1           that you would expect, in this scenario, the shape  
2           of the light to change.

3 BY MR. FITZSIMMONS:

4 Q.       What scenario would cause no change, in your  
5           opinion?

6 A.       Well, I haven't thought about this before, but off  
7           the top of my head, a very subtle road curve,  
8           perhaps, but I don't know.

9 Q.       In column 96 still, line 1 there, do you see the  
10          term "spatial distribution"?

11 A.       Yes.

12 Q.       What's your understanding of the term "spatial  
13          distribution" in claim 1 of the '029 patent?

14                   MS. SHAH: Objection. Calls for a legal  
15                   conclusion.

16                   THE WITNESS: In this context, I think it  
17                   means a possible change in the brightness levels at  
18                   various points of the light shape that's coming out  
19                   of the headlamp.

20 BY MR. FITZSIMMONS:

21 Q.       Did you consider the meaning of the term "spatial  
22          distribution" in claim 1 of the '029 patent before  
23          providing your opinions in your second declaration?

24 A.       Yes.

25 Q.       And same line, column 96, line 1, you see the term

1 "intensity"?

2 A. Yes.

3 Q. What's your understanding of the term "intensity"  
4 in claim 1 of the '029 patent?

5 A. I think it means what intuitively we think of as  
6 brightness.

7 Q. Is there a difference between intensity and  
8 brightness?

9 A. There can be in different contexts. These words  
10 can be very technical, can be more colloquially  
11 applied, so yes, there can be.

12 Q. And what would that difference be?

13 MS. SHAH: Objection. Vague.

14 THE WITNESS: In general, when people use  
15 those two terms, they can have subtly different  
16 implications regarding whether it's purely physics  
17 or physics and human perception or other aspects of  
18 this kind of very complicated set of physical  
19 energy and human perception when they use these  
20 terms, so they can have different implications at  
21 times.

22 BY MR. FITZSIMMONS:

23 Q. As it's used in the '029 patent, claim 1, is it  
24 your opinion that intensity means the same thing as  
25 brightness?

1 MS. SHAH: Objection. Calls for a legal  
2 conclusion.

3 THE WITNESS: I would say they used the  
4 word intensity, they mean intensity. Again, I  
5 think it's reasonable to think about that as  
6 brightness here, but there could be some  
7 distinctions that people would make between the  
8 term brightness and between intensity and how it's  
9 used here.

10 BY MR. FITZSIMMONS:

11 Q. What are some of the distinctions that people could  
12 make between the term brightness and intensity as  
13 it's used here?

14 A. Well, for example, if you were to replace the word  
15 intensity with the word brightness, that could  
16 bring in human perception aspects of this that  
17 might have not been intended originally.

18 Q. Still claim 1, column 96, lines 1 to 2, do you see  
19 the term "increase light in a direction"?

20 A. Yes.

21 Q. Is that a term that you considered when providing  
22 your opinions in your second declaration?

23 A. Yes.

24 Q. And what does the term "increase light in a  
25 direction" of claim 1 of the '029 patent mean to

1           you?

2   A.     It means what it says, to increase the amount of  
3           light in a certain direction. That has something  
4           to do with the road curvature ahead.

5   Q.     How do you increase the amount of light in a  
6           certain direction with a vehicle headlamp?

7   A.     In this context, you determine a change and that  
8           may be a change in color or change in intensity or  
9           change in spatial distribution and then you effect  
10          that change.

11   Q.    And any one of those three things you listed,  
12          color, intensity or spatial distribution, can cause  
13          an increase in light and direction; is that  
14          correct?

15                   MS. SHAH: Objection. Vague.

16                   THE WITNESS: Any of those three can  
17          cause increase in light and direction, yes.

18   BY MR. FITZSIMMONS:

19   Q.     Let's turn back to your second declaration now,  
20          Exhibit 2006, paragraph 52. You state that Beam  
21          provides a non-movable AABH system; is that  
22          correct?

23   A.     Yes.

24   Q.     And AABH stands for adaptive anti-blinding  
25          headlights; is that right?

1 A. I believe that's correct.

2 Q. And does your statement about being non-movable  
3 pertain to Beam's Optical System 106?

4 THE WITNESS: I don't know offhand what  
5 106 specifically is referring to. May I see that?

6 MR. FITZSIMMONS: Yeah, let's grab it.  
7 Beam is Exhibit No. 1005.

8 (Marked for identification:

9 Deposition Exhibit No. 1005.)

10 BY MR. FITZSIMMONS:

11 Q. And are you familiar with the Beam Patent  
12 No. 6,144,158, which is Exhibit 1005, Dr. Turk?

13 A. Yes.

14 Q. And you reviewed this document previously?

15 A. Yes.

16 Q. And you reviewed it before providing your opinions  
17 in your second declaration; is that right?

18 A. Yes.

19 Q. So I'll go back to your statement in paragraph 52  
20 of your declaration about Beam providing a  
21 non-movable AABH system. Does that statement about  
22 non-movable pertain to Beam's Optical System 106?

23 A. I believe it includes the optical system 106.

24 Q. Does that statement of non-movable also include the  
25 spatial light modulator or SLM203 in Beam?



1 A. As a device, yes.

2 Q. What do you mean "as a device"?

3 A. Some spatial light modulators have tiny movable  
4 mirrors, but the device itself, the fixture, does  
5 not move.

6 Q. So when you say "tiny movable mirrors," that would  
7 be a device like a digital mirror device, also  
8 known as a DMD; is that correct?

9 A. That sounds right. I'm not as familiar with that  
10 term.

11 Q. Okay. So you consider a digital mirror device to  
12 be non-movable?

13 A. As described in my quote in my declaration that you  
14 pointed to, yes.

15 Q. Were digital mirror devices known prior to the '029  
16 patent?

17 A. Again, I'm not too familiar with that particular  
18 phrase, but spatial light modulators were known.

19 Q. Is there another phrase that you're more familiar  
20 with as it relates to, I think you said, "tiny  
21 movable mirrors"? Is there another term that you  
22 are more familiar with?

23 A. Spatial light modulator -- one kind of spatial  
24 light modulator is a good way -- that's what I'm  
25 most familiar with.

1 Q. You're most familiar with the term "spatial light  
2 modulator," is that right?

3 A. Yes.

4 Q. There are different kinds of spatial light  
5 modulators; is that fair?

6 A. That's correct.

7 Q. Okay. And one of those types, as you characterized  
8 it, are tiny movable mirrors; is that accurate?

9 A. That's accurate.

10 Q. And you saw the Beam reference there in front of  
11 you, right?

12 A. Yes.

13 Q. Let's go to the claims of Beam. If you go toward  
14 the end of the document. Have you seen column 8,  
15 claim 4 of the Beam patent?

16 A. Yes.

17 Q. Claim 4 recites, "Said light source includes an  
18 array of individual independently controllable  
19 microbeam sources," correct?

20 A. Yes.

21 Q. And claim 4 recites that those microbeam sources  
22 can be light-emitting diodes, correct?

23 A. It says that, yes.

24 Q. Claim 4 also recites a spatial light modulator,  
25 correct?

1 A. Yes.

2 Q. And claim 4 recites that digital mirrored devices  
3 are a type of spatial light modulator that could be  
4 used, correct?

5 A. Yes.

6 Q. So claim 4 recites a system that can include both  
7 an array of light-emitting diodes and a spatial  
8 light modulator, correct?

9 A. Claim 4 does say that, but the patent does not  
10 teach that, I would say. There's no teaching that  
11 I found in the patent that shows how all of those  
12 combinations can work.

13 Q. By that, do you mean there's no figure showing that  
14 combination?

15 A. I mean there's no discussion of that in the patent,  
16 in the specification.

17 Q. But you agree that claim 4 recites a system that  
18 includes both an array of LEDs and a spatial light  
19 modulator, correct?

20 A. Claim 4 does seem to recite that, which I find,  
21 again, puzzling since the patent itself does not  
22 discuss those combinations.

23 Q. Let's be clear. You agree that claim 4 recites a  
24 system that includes both an array of LEDs and a  
25 spatial light modulator, correct?

1 MS. SHAH: Objection. Asked and  
2 answered.

3 THE WITNESS: Well, it does not say  
4 specifically LEDs.

5 BY MR. FITZSIMMONS:

6 Q. It says light-emitting diodes, correct?

7 A. There you go. I'm sorry. I missed that. It does,  
8 yes.

9 Q. Can you turn to the abstract of Beam, which is on  
10 the first page there? The abstract describes that  
11 the invention determines "the location of light  
12 sources forward of the apparatus and using that  
13 information to control the intensity and/or the  
14 angular position of one or more narrow-angle  
15 microbeams." Do you see that?

16 A. Yes.

17 Q. And in the context of Beam, the reference Beam, a  
18 microbeam can be an LED, correct?

19 A. I believe so, in one of their embodiments.

20 Q. What does it mean to control the angular position  
21 of a microbeam as disclosed in this passage of the  
22 abstract?

23 A. It means to effect the direction that the beam  
24 emits from the headlamp.

25 Q. How does Beam control the angular position of the

1 microbeams?

2 A. Well, in one of the two Beam embodiments, it  
3 controls those angles based on where the light  
4 source is, where the spatial light modulator is,  
5 the tiny mirrors on the spatial light modulator and  
6 the optics in front. The other embodiment, it  
7 controls that just by the positions of the LEDs.

8 Q. Referring to tiny mirrors on the spatial light  
9 modulator, how do those tiny mirrors of a spatial  
10 light modulator work?

11 A. There may be different versions that work somewhat  
12 differently, but what I'm most familiar with is a  
13 mirror that very quickly goes from one set position  
14 where it reflects light into typically a lens and  
15 another set position where it reflects light away  
16 from the lens, typically into the body of the SLM.

17 Q. So the SLM, using these tiny mirrors or digital  
18 mirrors, can change the direction of output of  
19 light; is that correct?

20 A. No, not really. The output will only go in one  
21 direction.

22 Q. What do you mean by "The output will only go in one  
23 direction"?

24 A. There are only two settings of the mirror. One  
25 setting will make the light go out, another will

1 keep the light -- will divert the light and keep it  
2 inside and will never go out.

3 Q. So is it your understanding that those digital  
4 mirrors only have two positions?

5 A. Generally, yes, and I think particularly in this  
6 timeframe.

7 Q. If we're looking at the Beam reference, column 4,  
8 line 46 to 48, do you see where it says, "The  
9 angular position or attenuation of each of these  
10 microbeams is independently set by the  
11 controller 108"?

12 A. Yes.

13 Q. And so this passage in Beam is describing that both  
14 angular position and attenuation are independently  
15 set by the controller, right?

16 MS. SHAH: Objection. Vague.

17 THE WITNESS: No, it says "or  
18 attenuation," not "and."

19 BY MR. FITZSIMMONS:

20 Q. So this passage describes that the angular position  
21 of the microbeam can be independently set by the  
22 controller; is that correct?

23 A. That's right, set to either of those two positions.

24 Q. And this is also saying that the attenuation of  
25 the microbeam can be independently set by the

1 controller; is that correct?

2 A. It's the same thing, so yes.

3 Q. What's the same thing? I'm sorry.

4 A. Moving the position from one mirror setting to the  
5 other can attenuate the light. These aren't  
6 describing two different processes; it's two words  
7 for the same process.

8 Q. So your understanding is that angular position --  
9 the term "angular position" and the term  
10 "attenuation" are the same thing --

11 MS. SHAH: Objection.

12 Mischaracterizes --

13 MR. FITZSIMMONS: -- as described here?

14 MS. SHAH: Go ahead.

15 MR. FITZSIMMONS: I want to -- I want to  
16 make sure my question is clear on the record.

17 BY MR. FITZSIMMONS:

18 Q. So your understanding from this passage of Beam is  
19 that the angular position -- excuse me. Let me  
20 strike that.

21 So your understanding from this passage of  
22 Beam is that the term "angular position" and the  
23 term "attenuation" are the same thing; is that  
24 correct?

25 MS. SHAH: Objection. Vague.

1 Mischaracterizes the witness' prior testimony.

2 THE WITNESS: In the context of this  
3 sentence, the angular position of each microbeam is  
4 equated to the attenuation of each microbeam.

5 BY MR. FITZSIMMONS:

6 Q. How is the angular position equated to the  
7 attenuation of each microbeam?

8 A. It's what I just described. There are two angular  
9 positions that either can provide output or not.  
10 If you provide output, you are at full strength; if  
11 you don't, you have attenuated that signal.

12 Q. So what does "attenuation" mean in this context?

13 MS. SHAH: Objection. Asked and  
14 answered.

15 THE WITNESS: Generally, it means  
16 decreased.

17 BY MR. FITZSIMMONS:

18 Q. And what's decreased?

19 A. Each of the microbeams in this case.

20 Q. What about the microbeams is decreased?

21 A. The output -- the light output associated with a  
22 microbeam is decreased if it is directed into the  
23 device rather than going out.

24 Q. Just below the passage that we were looking at,  
25 still column 4 -- I believe we're at column 4,



1 lines 48 to about 54 -- 48 to 50 or so. It says,  
2 "Controller 108 selectively commands reduction of  
3 the energy of the microbeams falling on a  
4 particular object or objects." Do you see that?

5 A. Yes.

6 Q. How does the angular position of a microbeam relate  
7 to it falling on a particular object or objects for  
8 a headlamp beam pattern?

9 MS. SHAH: Objection. Vague.

10 THE WITNESS: The geometry between the  
11 source and the mirror and the object of interest  
12 here defines the angular position.

13 BY MR. FITZSIMMONS:

14 Q. So for a particular detected object within the  
15 headlamp beam pattern, how would its location be  
16 determined?

17 A. What do you mean by its location?

18 Q. Where it is in the field of view.

19 A. Its 3D location?

20 Q. If that's how you would define it.

21 A. The question is to me, so ask me what you want.

22 Q. How would you determine -- excuse me. How would  
23 Beam's system determine the location of an object  
24 within its field of view?

25 MS. SHAH: Objection. Vague.

1 THE WITNESS: I believe I give some  
2 detail about that in my declaration, so it would be  
3 easiest for me to look at that right now.

4 MR. FITZSIMMONS: Sure.

5 THE WITNESS: If I can find it.

6 I'm not remembering how much detail I put  
7 in there about it, but in paragraph 55 of my  
8 declaration.

9 MR. FITZSIMMONS: And just again, this is  
10 Exhibit 2006, your second declaration?

11 THE WITNESS: That's correct.

12 MR. FITZSIMMONS: And paragraph 55, you  
13 said?

14 THE WITNESS: Yes. The second sentence  
15 there describes this process. "Headlights of an  
16 oncoming vehicle 102 and/or taillights of a  
17 preceding vehicle 103 are transmitted through  
18 optical system 106 and detected by a sensor  
19 (camera)." That data then is used by the  
20 controller to map the angular position of vehicles  
21 ahead, which I believe is what you were asking.

22 BY MR. FITZSIMMONS:

23 Q. Okay. And right above paragraph 55, there's a  
24 figure -- an annotated figure that includes  
25 Figures 1C and 1D. And do you see there's vehicles

1 102 and 103 in what is that field of view?

2 A. I do.

3 Q. And in that field of view, would those vehicles 102  
4 and 103 generally be moving within the field of  
5 view?

6 MS. SHAH: Objection. Vague.

7 THE WITNESS: I can't speak for that  
8 figure and what went behind its creation, but in  
9 general, when I look at the figure, that seems to  
10 make sense.

11 BY MR. FITZSIMMONS:

12 Q. Generally, in the field of view of Beam's system,  
13 when it's detecting vehicles, would they be moving  
14 along the road?

15 MS. SHAH: Objection. Vague.

16 THE WITNESS: I don't know if they would  
17 be in all cases, but it seems like generally they  
18 would be, yes.

19 BY MR. FITZSIMMONS:

20 Q. And if those vehicles were moving along the road,  
21 the shaded areas, which are indicated in the  
22 annotated figure arrows that have a label "Reduced  
23 intensity," that shaded area would track those  
24 vehicles; is that right?

25 MS. SHAH: Objection. Vague.

1 THE WITNESS: The camera sensor system  
2 would be locating the vehicles, so the shaded area  
3 wouldn't be tracking anything on its own.

4 BY MR. FITZSIMMONS:

5 Q. Would the sensors be tracking the location of  
6 those -- the vehicles within the field of view?

7 A. In Beam, not necessarily. I think the goal of  
8 Beam is to try do that, but it's doing it by  
9 looking for lights, not by identifying vehicles, so  
10 it's not necessarily a vehicle that Beam is  
11 responding to.

12 Q. In the example here in the annotated drawing above  
13 paragraph 55, it's showing an example of the  
14 detected objects being vehicles, correct?

15 A. That's correct.

16 Q. Let's look into Beam, column 7 now. Sorry, I think  
17 I have the wrong column number. Column 5, lines 61  
18 to 64. Do you see where it says, "The AABH  
19 produces a multiplicity of individually directed  
20 narrow angle beams which are herein referred to as  
21 microbeams, each being controlled by a processor  
22 responsive to incoming data from an imaging  
23 sensor"?

24 A. Yes.

25 Q. So microbeams are narrow angled beams as described

1 here in the Beam reference, correct?

2 A. That's correct.

3 Q. What does "narrow angle" mean?

4 A. In this context here, I believe it means not widely  
5 disbursed.

6 Q. What do you mean "by not widely disbursed"?

7 A. I guess I mean narrow angle.

8 Q. Is there a threshold for determining whether  
9 something is a narrow angle beam?

10 MS. SHAH: Objection. Vague.

11 THE WITNESS: In general, I'm not aware  
12 of any such thing.

13 BY MR. FITZSIMMONS:

14 Q. This passage also describes that the microbeams are  
15 individually directed, right?

16 A. Yes.

17 Q. What is "directed" in this context?

18 A. I believe this, in this context, it's describing  
19 the modulator embodiment and so direction of the  
20 microbeams refers to as -- either the mirror  
21 positioned to send the light out or the mirror  
22 positioned to not send the light out.

23 Q. Each of the microbeams can be directed, correct?

24 A. That's right.

25 MS. SHAH: Objection. Vague.

1 THE WITNESS: That's correct, in one of  
2 those two directions.

3 BY MR. FITZSIMMONS:

4 Q. Okay. Let's go to column 4 in Beam, lines 41  
5 through 44. Can you read those for me, please?

6 A. Starting with "Thus"?

7 Q. Yes. Thanks.

8 A. "Thus we produced an overall beam pattern  
9 comprising many (in this embodiment, about 300,000)  
10 individual narrow angle microbeams of light as  
11 contrasted with conventional headlights, which  
12 produce only a single beam."

13 Q. Does this passage mean that there will be 300,000  
14 LEDs in the headlamp?

15 A. No, I believe this passage is describing the SLM  
16 embodiment, spatial light modulator.

17 Q. And how would -- so what is your understanding of  
18 what this passage you just read is describing?

19 MS. SHAH: Objection. Vague.

20 THE WITNESS: In general, my  
21 understanding is how we've described how spatial  
22 light modulators work; that's what this is  
23 describing.

24 BY MR. FITZSIMMONS:

25 Q. Based on your understanding, how would a beam

1 pattern comprising of about 300,000 individual  
2 narrow angle microbeams be achieved?

3 A. With a spatial light modulator.

4 Q. And how does that spatial light modulator achieve  
5 300,000 narrow angle microbeams?

6 A. From its 300,000 small mirrors and the light source  
7 shining on them.

8 Q. So in your understanding, the spatial light  
9 modulator would have approximately 300,000 small  
10 mirrors?

11 A. That's correct.

12 Q. And according to your understanding, each of those  
13 300,000 small mirrors can change position, correct?

14 A. That's right; they can either point the reflection  
15 in one direction or another direction.

16 MS. SHAH: Is this a good breaking point?

17 MR. FITZSIMMONS: Almost, yeah.

18 BY MR. FITZSIMMONS:

19 Q. In your opinion, does diverting a microbeam mean  
20 the same thing as attenuating a microbeam?

21 MS. SHAH: Objection. Asked and  
22 answered.

23 THE WITNESS: In general, the words don't  
24 mean exactly the same thing; in this context, they  
25 are used to describe the same process.

1 MR. FITZSIMMONS: Let's take a lunch  
2 break.

3 (Whereupon a break was taken  
4 from 1:01 p.m. to 2:05 p.m.)

5 MR. FITZSIMMONS: Welcome back, Dr. Turk.

6 BY MR. FITZSIMMONS:

7 Q. Let's go to Exhibit 2006, your second declaration,  
8 paragraph No. 52. And you're referring to the Beam  
9 reference. And do you see where you indicate that  
10 Beam has a multiplicity of microbeams that "will  
11 operate at maximum intensity at all times"?

12 A. Yes.

13 Q. What does "maximum intensity" mean in the context  
14 of automotive lighting?

15 MS. SHAH: Objection. Vague. Calls for  
16 speculation.

17 THE WITNESS: In general, I don't know.  
18 In this context, I think it means you can't make  
19 it any brighter, any higher in terms of its  
20 intensity.

21 BY MR. FITZSIMMONS:

22 Q. You said, though, that you don't know in general  
23 what "maximum intensity" means in the context of  
24 automotive lighting?

25 A. Not as a general term in all circumstances, no.



1 Q. So you don't know if there are standards that apply  
2 to the maximum intensity of automotive headlamps?

3 MS. SHAH: Objection. Vague.

4 THE WITNESS: I think there probably are.

5 BY MR. FITZSIMMONS:

6 Q. But you don't know what those standards for maximum  
7 intensity in automotive headlamps would be; is that  
8 fair?

9 A. I certainly don't opine about them here.

10 Q. How would maximum intensity be measured for  
11 automotive headlamps?

12 MS. SHAH: Objection. Vague.

13 THE WITNESS: In general, I don't know if  
14 there's one specific technique that they're all  
15 measured for. Any kind of measurement would be  
16 some sort of light energy measurement regarding the  
17 intensity.

18 BY MR. FITZSIMMONS:

19 Q. What do you mean by "light energy measurement"?

20 A. Using some kind of sensor that reacts to light  
21 energy.

22 Q. Can you give me an example of a kind of sensor that  
23 reacts to light energy?

24 A. Well, I don't opine on that here in my report, but  
25 just off the top of my head, a room like this might

1 have a sensor that turns the lights on or turns  
2 lights on at particular time of day when it gets  
3 dark outside. That would be an example of  
4 responding to light intensity.

5 Q. As it pertains to automotive headlamps, does the  
6 maximum intensity depend on an angle of the beam  
7 spread?

8 MS. SHAH: Objection. Vague.

9 THE WITNESS: That is a hard question to  
10 answer because it does seem very vague to me. I'd  
11 need a more specific question.

12 BY MR. FITZSIMMONS:

13 Q. So sitting here, you can't answer my question, does  
14 maximum intensity depend on an angle of the beam  
15 spread?

16 MS. SHAH: Objection. Vague.

17 THE WITNESS: I can't answer that because  
18 it's not specific enough to require a specific  
19 answer.

20 BY MR. FITZSIMMONS:

21 Q. What's not specific enough about it?

22 A. Can you repeat the question, please?

23 Q. What's not specific enough about it?

24 A. Can you repeat the former question, the "it"?

25 Q. Does maximum intensity depend on angular beam

1 spread -- depend on the angle of beam spread?

2 A. I don't know maximum intensity of what, I don't  
3 know which angle, what kind of beam. There's  
4 several terms in there that can be fairly broad,  
5 can be specific, depends in what context one  
6 asks it, so it's hard to answer just out of  
7 context.

8 Q. And so then in different contexts, maximum  
9 intensity can mean different things; is that  
10 correct?

11 A. Yes.

12 Q. Let's turn to paragraph 115 of your second  
13 declaration. And it starts on page 76 and carries  
14 on to page 77, and we'll look at page 77.

15 And you state that, "Beam is already  
16 putting high beam or brighter light everywhere  
17 light could be needed." Do you see that?

18 A. Yes.

19 Q. What do you mean by "high beam or brighter light"?

20 A. Well, in the context of general automobile  
21 lighting, people tend to think of high beams and  
22 low beams as two main categories, and high beam is  
23 the brighter of the two, so basically I mean bright  
24 light by that phrase.

25 Q. Bright light as compared to what?

1 MS. SHAH: Objection. Vague.

2 THE WITNESS: I guess as compared to  
3 lesser amounts of light, particularly as an example  
4 of that, light that could be considered a low-beam  
5 light.

6 BY MR. FITZSIMMONS:

7 Q. Is it your understanding that automotive headlamps  
8 can output light that can be brighter than  
9 high-beam light?

10 MS. SHAH: Objection. Vague. Calls for  
11 speculation.

12 THE WITNESS: I imagine there are  
13 situations where light sources could be overdriven  
14 to produce a scenario like that, at least for a  
15 period of time until they burn out quickly, but I'm  
16 not really sure.

17 BY MR. FITZSIMMONS:

18 Q. Would a headlamp that outputs light that is  
19 brighter than high-beam lights comply with  
20 government regulations?

21 MS. SHAH: Objection.

22 THE WITNESS: In general, I don't know.  
23 It depends on a lot of things, like which  
24 regulations you might be talking about.

25 MS. SHAH: Sorry. Objection. Vague.

1           Calls for speculation.

2 BY MR. FITZSIMMONS:

3 Q.       Before we discussed the FMVSS regulations, correct?

4 A.       Yes.

5 Q.       Would a headlamp that outputs light that is  
6           brighter than high-beam lights comply with the  
7           FMVSS regulations?

8 A.       I don't know specifically.

9 Q.       How would light that -- headlamp light that is  
10          brighter than high-beam light affect the headlamp  
11          beam pattern?

12 A.       You know, I've never really thought about light  
13          that is brighter than high-beam light coming from  
14          headlights, so I have no idea really.

15 Q.       Right here in your declaration, paragraph 115, you  
16          say that, "Since Beam is already putting high beam  
17          or brighter light everywhere light could be  
18          needed....," correct?

19 A.       Yeah, and then I explained what that means.

20 Q.       So what did you mean by brighter light? You're  
21          saying you didn't -- you said, "I've never really  
22          thought about light that is brighter than high-beam  
23          light coming from headlights."

24 A.       That's right. And this doesn't describe light that  
25          is brighter than high-beam light.

1 Q. What does this describe?

2 A. As I said before, it's high beam, which can also be  
3 thought of as brighter, compared to, for example,  
4 low beams.

5 Q. So your sentence here, you're saying, does not  
6 refer to light that is brighter than high beam,  
7 right? Is my understanding correct?

8 MS. SHAH: Objection. Mischaracterizes  
9 the witness' testimony. Vague.

10 THE WITNESS: It is not intended to  
11 describe just light that is brighter than high-beam  
12 lights.

13 BY MR. FITZSIMMONS:

14 Q. If it's not intended to describe just light that is  
15 brighter than high-beam lights, what else does it  
16 include?

17 A. Like I said originally, that phrase is essentially  
18 referring to bright light.

19 Q. What do you consider to be bright light?

20 A. In this context, lights that are similar to the  
21 high-beam light would be considered bright.

22 Q. Do you consider light that is somewhere between  
23 low-beam and high-beam light to be brighter light?

24 MS. SHAH: Objection. Vague.

25 THE WITNESS: Brighter than what? It

1 depends on the frame of reference, I guess, for a  
2 question like that.

3 MR. FITZSIMMONS: Brighter than low beam.

4 THE WITNESS: So yes, I do think that  
5 light that is brighter than low-beam light would be  
6 considered brighter than low beam, if I understand  
7 your question.

8 BY MR. FITZSIMMONS:

9 Q. Does your term here, "brighter light," encompass  
10 light that is between low-beam and high-beam light?

11 MS. SHAH: Objection. Vague.

12 THE WITNESS: This phrase is not  
13 dictating a specific level of light. As I said,  
14 the phrase "high beam" or "brighter light"  
15 describes bright light, as intended here.

16 BY MR. FITZSIMMONS:

17 Q. So you can't quantify bright light; is that  
18 correct?

19 MS. SHAH: Objection. Mischaracterizes  
20 the witness' testimony. Vague.

21 THE WITNESS: Offhand, I can't  
22 specifically quantify it, no.

23 BY MR. FITZSIMMONS:

24 Q. So you can't put a bound on what you mean by bright  
25 light; is that correct?

1 A. I am not here putting a bound specifically; I'm not  
2 referring to an exact level of light, so no, I'm  
3 talking about bright light as understood in the  
4 context of this declaration.

5 Q. So your statement here, "Beam is already putting  
6 high beam or brighter light everywhere" -- so is it  
7 your understanding that Beam did not provide  
8 low-beam light?

9 MS. SHAH: Objection. Vague.

10 THE WITNESS: Are you asking if this  
11 statement is saying that, stating that, or separate  
12 from the statement, if I have an understanding  
13 about that?

14 BY MR. FITZSIMMONS:

15 Q. Is there a distinction in your mind between those  
16 two?

17 A. Yes.

18 Q. What would that be? Let's start with the statement  
19 here.

20 A. Your question was about low-beam light, I believe,  
21 and the statement doesn't say anything about  
22 low-beam light, so it doesn't restrict that, so  
23 that's the specific response about the statement.

24 And about Beam in general, I don't believe  
25 that I provide any opinions in here about Beam and



1 low-beam beam, the reference on low-beam light, so  
2 I have no real opinion about it.

3 Q. You've reviewed the Beam reference, correct?

4 A. I have, yes.

5 Q. And you can't tell me whether the Beam reference  
6 can provide low-beam light; is that what you're  
7 telling me?

8 A. I don't recall offhand right now if Beam refers to  
9 low-beam lights. If there's someplace here where I  
10 discuss it, let's go to it.

11 Q. In your opinion, is Beam also providing light that  
12 is equivalent to high-beam light?

13 A. Beam says it will operate in maximum intensity at  
14 all times. I don't recall if Beam itself equates  
15 that to high-beam light or not, so I'm not sure.

16 Q. So is it your position that Beam never operates at  
17 something lower than maximum intensity?

18 MS. SHAH: Objection. Asked and  
19 answered.

20 THE WITNESS: There are aspects of Beam  
21 that do because of the anti-glare capability of  
22 Beam, but otherwise, it operates at maximum  
23 intensity at all times.

24 BY MR. FITZSIMMONS:

25 Q. "There are aspects of Beam that do." That do

1           what?

2   A.     Can you repeat your question to me that that was in  
3           response to, please?

4   Q.     My question was, "Is it your position that Beam  
5           never operates at something lower than maximum  
6           intensity?"

7   A.     And then that's the "do," operating at lower than  
8           maximum intensity in the anti-glare regions.

9   Q.     And so then is your opinion that Beam operates at  
10          lower than maximum intensity in the anti-glare  
11          regions? Is that correct?

12   A.     Yeah, Beam blanked is lower than maximum intensity,  
13          so I would agree with that yeah.

14   Q.     So when you were considering the term "maximum  
15          intensity," you believed that to be a regional term  
16          where certain regions of the beam pattern can be at  
17          maximum intensity and other regions of the beam  
18          could not be at maximum intensity?

19                   MS. SHAH: Objection. Vague.

20                   THE WITNESS: I think those are two  
21          different things, what maximum intensity is and  
22          what various things can do. So maybe could you  
23          restate the question?

24   BY MR. FITZSIMMONS:

25   Q.     What do you mean, those are two different things?

1 A. I believe your question started with something  
2 about maximum intensity, then I believe your  
3 question went on to talk about some things doing  
4 one thing and some things doing another, so maybe  
5 you can just re-read the question.

6 Q. Sure. So when you're considering the term "maximum  
7 intensity," do you believe there are parts of the  
8 beam pattern that can be a maximum intensity and  
9 other parts of the beam pattern that can be at  
10 lower than maximum intensity?

11 A. Yes, the part of the beam that is doing the  
12 anti-glare is not at maximum intensity, it's  
13 blanked.

14 Q. So when you're considering the term "maximum  
15 intensity," it's not with respect to the entire  
16 beam pattern, correct?

17 MS. SHAH: Objection. Vague.

18 THE WITNESS: The term is with respect to  
19 the whole pattern. The whole pattern may not be  
20 issuing beams that are maximum intensity if some of  
21 it is being used for anti-glare.

22 BY MR. FITZSIMMONS:

23 Q. And so it's your position that the whole beam  
24 pattern can be at maximum intensity even if there  
25 are beams within that pattern that are not at

1 maximum intensity; is that correct?

2 MS. SHAH: Objection. Vague.

3 THE WITNESS: I don't think I said that.

4 BY MR. FITZSIMMONS:

5 Q. You agree -- or you stated that the term "maximum  
6 intensity" is with respect to the whole beam  
7 pattern, correct?

8 MS. SHAH: Objection. Mischaracterizes  
9 the witness' testimony.

10 THE WITNESS: I don't remember exactly  
11 what I said, but the term itself can be applied to  
12 anything related to the beam. You can talk about  
13 any part of the beam being at maximum intensity or  
14 not.

15 BY MR. FITZSIMMONS:

16 Q. Still in paragraph 115 of your declaration, again,  
17 when you say, "Since Beam is already putting high  
18 beam or brighter light everywhere" --

19 A. Excuse me, can you tell me where you are?

20 Q. That same sentence, paragraph 115 of your  
21 declaration.

22 A. How far down?

23 Q. Page 77, a couple sentences down.

24 A. Okay. Thank you.

25 Q. So, "Since Beam is already putting high beam or

1 brighter light everywhere..." Do you see that?

2 A. Yes.

3 Q. What do you mean in that sentence by "light  
4 everywhere"?

5 A. I mean everywhere that Beam's device can shine  
6 light.

7 Q. Would that shine light outside of a typical  
8 high-beam pattern?

9 MS. SHAH: Objection. Vague. Calls for  
10 speculation.

11 THE WITNESS: Do you mean outside  
12 geometrically, physically? Maybe I'm not clear on  
13 your question.

14 BY MR. FITZSIMMONS:

15 Q. Do you draw a distinction between geometrically and  
16 physically disposing the light?

17 A. In general, out of context, out of any particular  
18 context, I think there are two ways to describe the  
19 same thing.

20 Q. So when you say that Beam puts light everywhere,  
21 would that shine light geometrically outside of a  
22 typical high-beam pattern?

23 MS. SHAH: Objection. Vague. Calls for  
24 speculation.

25 THE WITNESS: Yeah, I don't know what

1 typical high-beam pattern you're referring to. I  
2 know about Beam's system.

3 BY MR. FITZSIMMONS:

4 Q. So you're not familiar with what a typical  
5 high-beam pattern would entail for vehicle  
6 headlamps?

7 MS. SHAH: Objection. Mischaracterizes  
8 the witness' testimony.

9 THE WITNESS: That's not what I said. I  
10 do have some understanding of that, but I thought  
11 your question was about Beam. I'm just trying to  
12 understand it.

13 BY MR. FITZSIMMONS:

14 Q. My question was, was Beam relative to a typical  
15 high-beam pattern? So let's start with that.  
16 What's your understanding of a typical high-beam  
17 pattern?

18 MS. SHAH: Objection. Vague.

19 MR. FITZSIMMONS: For vehicle headlamps.

20 MS. SHAH: Objection. Vague.

21 THE WITNESS: I didn't opine on typical  
22 high-beam patterns. I have a general sense of, you  
23 know, outside of the context of this case, if there  
24 are such patterns, regulations and such, but I  
25 don't know them in detail offhand.

1 BY MR. FITZSIMMONS:

2 Q. Okay. So your understanding is that there are  
3 regulations which govern high-beam patterns; is  
4 that correct?

5 A. I expect that some of the regulations we've already  
6 discussed touch on those, but again, I just -- I've  
7 not opined on that, so I'm not 100 percent sure at  
8 this moment.

9 Q. So you're not sure if there is regulations which  
10 govern high-beam patterns then; is that correct?

11 MS. SHAH: Objection. Asked and  
12 answered.

13 THE WITNESS: I'm not sure of any  
14 specific ones at the moment, no.

15 BY MR. FITZSIMMONS:

16 Q. At the end of paragraph 115 and before  
17 paragraph 116, page 78 of your declaration, you  
18 see you provide an annotated drawing there of  
19 Beam's Figure 1 with your -- are those your  
20 annotations?

21 A. This is from Exhibit 105 and I would need to remind  
22 myself what that exhibit is.

23 MR. FITZSIMMONS: That is the Beam  
24 reference.

25 THE WITNESS: My exhibits start with two,

1 so...

2 MR. FITZSIMMONS: You have the Beam  
3 reference over there, I believe. You can check and  
4 you'll see that's Exhibit 1005.

5 THE WITNESS: Okay. Gotcha. So I'm  
6 sorry, what was the question?

7 BY MR. FITZSIMMONS:

8 Q. So the drawing that's here before paragraph 116,  
9 that's an annotated version of Beam's Figure 1,  
10 correct?

11 A. That's correct.

12 Q. And you provided those annotations, correct?

13 A. Yes.

14 Q. Those aren't in the Beam reference, correct?

15 A. They are not; that's correct.

16 Q. 101 in that annotated drawing, is that the field of  
17 view in Beam's Figure 1?

18 A. It is the field of view of the headlamp, yes.

19 Q. Could you light outside of that field of view to  
20 light a curve?

21 A. With Beam? No.

22 Q. So your opinion is that Beam can -- is not capable  
23 of lighting anything outside of that field of view;  
24 is that correct?

25 A. That's correct.



1 Q. But you could modify Beam to light outside of that  
2 field of view, correct?

3 MS. SHAH: Objection. Vague. Calls for  
4 speculation.

5 THE WITNESS: I suppose there are some  
6 modifications that could do that.

7 BY MR. FITZSIMMONS:

8 Q. What does the term "forward illumination" mean to  
9 you?

10 A. To me, it means illuminating generally in front of  
11 the vehicle.

12 Q. Does forward illumination include low beams?

13 A. I don't think that I discussed that here and  
14 haven't thought much about it, but I would expect  
15 generally, yes.

16 Q. Does forward illumination include high beams?

17 A. Again, I don't think I've thought too much about  
18 the term in the context of this, but I think in  
19 general, yes.

20 Q. Does forward illumination include fog lamps?

21 MS. SHAH: Objection. Relevance.

22 THE WITNESS: I don't say anything about  
23 fog lamps here and I've not really considered fog  
24 lamps in much detail in this, so I just don't  
25 know.

1 BY MR. FITZSIMMONS:

2 Q. So you don't know whether forward illumination  
3 would include fog lamps?

4 MS. SHAH: Objection. Asked and  
5 answered.

6 MR. FITZSIMMONS: Is that correct?

7 THE WITNESS: Again, I've not really  
8 considered fog lamps in any detail or that term in  
9 too much detail, so I don't really have an opinion  
10 about it.

11 BY MR. FITZSIMMONS:

12 Q. Which term have you not considered in too much  
13 detail?

14 A. Forward illumination.

15 Q. Can you go to paragraph 124 of your second  
16 declaration, please? Are you there?

17 A. Yes.

18 Q. Do you see the second sentence there where you  
19 state, "Beam's AABH system is directed to  
20 high-intensity forward illumination"?

21 A. Yes.

22 Q. You just told me, "I don't think I've thought too  
23 much about the term in the context of this,"  
24 referring to forward illumination; is that correct?

25 A. Yeah, and here it's used as just a general phrase.

1           It's illuminating and it's illuminating forward;  
2           it's not used as a particular phrase of art.

3 Q.       So to you, forward illumination in this context  
4           means illuminating forward; is that correct?

5 A.       Yes, in a sense, that's what I mean by it.

6 Q.       Is there a difference between forward illumination  
7           and intense forward illumination?

8                       MS. SHAH: Objection. Vague. Calls for  
9           speculation.

10                      MR. FITZSIMMONS: Let me rephrase that.

11 BY MR. FITZSIMMONS:

12 Q.       You used the term here or you state here, "Beam is  
13           directed to high-intensity forward illumination,"  
14           correct?

15 A.       Yes.

16 Q.       Is high-intensity forward illumination, as you use  
17           it here in your declaration at paragraph 124,  
18           different than forward illumination?

19 A.       As used here, high intensity is modifying forward  
20           illumination, so yes, there could be extremely low  
21           intensity forward illumination, for example.

22 Q.       How do you characterize high-intensity forward  
23           illumination as you refer to it here in your  
24           declaration?

25 A.       Illumination that is generally in a forward

1 direction that is of generally high intensity.

2 Q. What does "high intensity" mean to you?

3 A. It means something that is likely to be perceived  
4 as bright.

5 Q. How do you determine what is perceived as bright?

6 MS. SHAH: Objection. Asked and  
7 answered.

8 THE WITNESS: That's generally a human  
9 judgment.

10 BY MR. FITZSIMMONS:

11 Q. So what's perceived as bright could vary from  
12 person to person, is that correct?

13 A. In general, brightness is subjective and so by  
14 definition it does vary from person to person  
15 somewhat.

16 Q. Going back to the concept of forward illumination.  
17 Does forward illumination include light from  
18 cornering lamps?

19 A. As a general phrase, I think it could.

20 Q. In what context can it?

21 MS. SHAH: Objection. Calls for  
22 speculation.

23 THE WITNESS: I suppose if some of the  
24 light goes forward of the vehicle, then it would  
25 be appropriate to consider it as forward

1 illumination.

2 BY MR. FITZSIMMONS:

3 Q. What do you mean by "forward of the vehicle"?

4 A. In front of the vehicle.

5 (Marked for identification:

6 Deposition Exhibit No. 1012.)

7 BY MR. FITZSIMMONS:

8 Q. Dr. Turk, I'm going to take you to the Gotou  
9 records. It's Exhibit 1012, US Patent  
10 No. 5,588,733. Are you familiar with this exhibit?

11 A. Yes, I am.

12 Q. And Gotou is used as the primary reference in one  
13 of the petition combinations, correct?

14 A. I believe that's right.

15 Q. And Gotou discloses using mapped information to  
16 direct the light from the headlamps to light curves  
17 along a road, correct?

18 MS. SHAH: Objection. Vague.

19 THE WITNESS: I think that's a reasonable  
20 general explanation of it.

21 BY MR. FITZSIMMONS:

22 Q. And let's go to column 8 of Gotou and lines 15 or  
23 16 through, say, 19 there. Could you read those?

24 A. "There is also another method in which two bulbs  
25 are installed in one headlight and the light

1 distribution is changed by separately using  
2 one-bulb illumination and two-bulb illumination,  
3 respectively."

4 Q. And so this section in Gotou expressly discloses  
5 using one or two bulbs, correct?

6 A. Yes.

7 Q. And whether you use one or two bulbs in a headlamp  
8 would change the shape of the beam pattern,  
9 correct?

10 MS. SHAH: Objection. Vague. Calls for  
11 speculation.

12 THE WITNESS: I think that would depend  
13 on the design of the headlamp.

14 BY MR. FITZSIMMONS:

15 Q. What do you mean by, "It would depend on the design  
16 of the headlamp"?

17 A. I could imagine a design where the two bulbs are  
18 essentially redundant and end up producing the same  
19 output as a single bulb of brighter illumination  
20 might have.

21 Q. In your opinion, do you think Gotou is disclosing  
22 two bulbs that are essentially redundant here?

23 A. I don't have an opinion about that.

24 Q. You've reviewed Gotou previously, correct?

25 A. Yes.

1 Q. And you reviewed Gotou before this deposition  
2 today?

3 A. Yes.

4 Q. And you just reviewed column 8, lines 15 to 19,  
5 correct?

6 A. That's right.

7 Q. And you don't have an opinion about whether Gotou  
8 is disclosing two bulbs that are essentially  
9 redundant in that passage; is that correct?

10 A. I don't recall if Gotou talks more about this  
11 possible two-bulb configuration, so off the top of  
12 my head, I don't know.

13 Q. This sentence right here says, "The light  
14 distribution is changed by separately using  
15 one-bulb illumination and two-bulb illumination,  
16 correct?

17 MS. SHAH: Objection. Vague.

18 THE WITNESS: This passage says there's  
19 another method in which what you just said happens.  
20 I don't know if there's any detail of that method  
21 or if that's even what Gotou is claiming offhand.  
22 I would have to refresh myself on that.

23 BY MR. FITZSIMMONS:

24 Q. You agree Gotou discloses right here that, "There  
25 is also another method in which two bulbs are

1 installed in one headlight and the light  
2 distribution is changed by separately using  
3 one-bulb illumination and two-bulb illumination,  
4 respectively," correct?

5 A. Gotou does state that sentence, yes.

6 Q. And so Gotou states that there's another method  
7 where there are two bulbs installed, correct?

8 A. That's what that first sentence says, yes.

9 Q. And in that method, Gotou states that the light  
10 distribution is changed by separately using  
11 one-bulb illumination and two-bulb illumination,  
12 correct?

13 A. That's what the sentence says, yes.

14 Q. So according to Gotou, light distribution is  
15 different when using one-bulb illumination versus  
16 using two-bulb illumination, correct?

17 A. Gotou says that there is a method in which that can  
18 be the case.

19 Q. When going from one bulb to two bulbs, that would  
20 increase light in certain directions, correct?

21 MS. SHAH: Objection. Vague. Calls for  
22 speculation.

23 THE WITNESS: Are you asking what Gotou  
24 teaches about that or in general independent of  
25 Gotou?



1 MR. FITZSIMMONS: What's your  
2 understanding?

3 THE WITNESS: Independent of Gotou? It  
4 would depend on the brightnesses of the bulbs.

5 BY MR. FITZSIMMONS:

6 Q. What about with respect to Gotou?

7 A. I don't think Gotou says anything about that.

8 Q. If you have two lightbulbs in a headlamp side by  
9 side and one is lit and one is off and then you  
10 light the second one, would that -- that would  
11 increase light in a certain direction, correct?

12 MS. SHAH: Objection. Vague.

13 THE WITNESS: In that hypothetical  
14 situation and if they're side by side, as you  
15 described, which they wouldn't have to be, but  
16 that probably would -- I forget how you ended it --  
17 but brighten, increase illumination, with some  
18 caveats, depending on how the optics is designed  
19 and other things, so it somewhat depends, but  
20 probably.

21 MR. FITZSIMMONS: Let's take a break.

22 (Whereupon a break was taken

23 from 3:00 p.m. to 3:19 p.m.)

24 (Marked for identification:

25 Deposition Exhibit No. 1010.)

1 BY MR. FITZSIMMONS:

2 Q. Dr. Turk, I'm going to now hand you Exhibit 1010.  
3 This is the Karlsson reference. It's International  
4 Publication No. WO 98/54030.

5 Are you familiar with Exhibit 1010?

6 A. Yes, I am.

7 Q. Okay. Page 14 at the top in Karlsson. Can you  
8 read lines 1 through 4, the first paragraph for me,  
9 please?

10 A. "The spotlight beams 34 can be obtained, for  
11 example, by using a light source 2 which is  
12 composed of a grid of separate light sources such  
13 as LEDs, which can preferably be controlled either  
14 individually or in groups."

15 Q. So Karlsson discloses using LEDs for its headlamps,  
16 correct?

17 A. Not in all of its embodiments, but it does have  
18 such a disclosure, yes.

19 Q. So Karlsson discloses that you can use LEDs for its  
20 headlamps, correct?

21 A. Yes.

22 Q. And Karlsson also discloses that those LEDs can be  
23 controlled individually or in groups, correct?

24 MS. SHAH: Objection. Vague. Calls for  
25 speculation.

1 THE WITNESS: Yes, in the sentence, yes.

2 BY MR. FITZSIMMONS:

3 Q. Let's go to page 4 of Karlsson, and starting on  
4 page 4, line 17, where it says, "In a preferred  
5 embodiment..." Do you see that paragraph?

6 A. Yes.

7 Q. Could you read that first sentence for me, please?

8 A. "In a preferred embodiment of the invention, the  
9 average intensity of the light emitted by the  
10 lighting means is controlled such to provide a  
11 light beam, the intensity of which is optimally  
12 adapted to the road and to the ambient light,  
13 thereby increasing the driving comfort and road  
14 safety."

15 Q. And so Karlsson discloses that its headlamp has an  
16 intensity which is optimally adapted to the road  
17 and to the ambient light, correct?

18 A. Karlsson discloses different headlights, and in a  
19 preferred embodiment as described here, it says it  
20 can be controlled that way.

21 Q. And by "controlled that way," you mean that the  
22 intensity is optimally adapted to the road and to  
23 the ambient light, correct?

24 A. Yes.

25 Q. And so in a preferred embodiment of Karlsson,

1 the intensity of the light beam is optimally  
2 adapted to the road and to the ambient light,  
3 correct?

4 A. That's what that statement says, yes. I don't  
5 believe Karlsson gives any teaching of how that  
6 would be accomplished, but that's what that  
7 statement says, yeah.

8 Q. And that concept, that's similar to the concept  
9 we discussed earlier in the day with respect to  
10 the '029 patent having an optimal operating regime,  
11 correct?

12 MS. SHAH: Objection. Calls for  
13 speculation. Vague.

14 THE WITNESS: It uses the word optimal or  
15 a deviation of that word. I'm not sure exactly how  
16 similar those two are otherwise.

17 BY MR. FITZSIMMONS:

18 Q. In your opinion, is there a distinction between  
19 those two concepts?

20 A. I haven't compared those two concepts before, so I  
21 don't really have an opinion offhand about it.

22 Q. In your declaration, Exhibit 2006, your second  
23 declaration, paragraph 83. In paragraph 83, you're  
24 discussing Karlsson's Figure 14, correct?

25 A. Yes.

1 Q. And towards the bottom of the page there, you cite  
2 Exhibit 1010, which is Karlsson, column 19,  
3 lines 29 through 33, correct?

4 A. Yes.

5 Q. Let's go to Karlsson to page 19, lines 29 to 33,  
6 please. And can you read those lines for me?  
7 Again, that's page 19, lines 29 through 33.

8 A. "The emitted light beam 50 is represented as a  
9 window which can shift in the plane of the drawings  
10 from left to the right and from the top to the  
11 bottom, if desired, and vice versa, and which may  
12 vary as regards its shape and dimensions and  
13 dependence on the desired pattern and direction of  
14 the beam."

15 Q. And so Karlsson is disclosing here that that window  
16 can vary as regards to its shape and dimension,  
17 correct?

18 A. Yes.

19 Q. And so Karlsson's describing the shape can vary  
20 depending on the desired pattern and direction of  
21 the beam, correct?

22 A. That's what it says there, yes.

23 Q. And Karlsson's describing that the dimension can  
24 vary depending on the desired pattern and direction  
25 of the beam, correct?

1 MS. SHAH: Objection. Asked and  
2 answered.

3 THE WITNESS: It says it may vary in --  
4 sorry, did you say direction or dimension?

5 MR. FITZSIMMONS: Dimension.

6 THE WITNESS: Okay. It says it can vary  
7 in dimension, yes.

8 BY MR. FITZSIMMONS:

9 Q. And so Figure 14 of Karlsson, that window 50 is an  
10 example of the emitted light beam from Karlsson's  
11 headlamp, correct?

12 MS. SHAH: Objection. Vague.

13 THE WITNESS: In my view, it's a  
14 conceptual diagram of some light coming from  
15 Karlsson in some situation.

16 BY MR. FITZSIMMONS:

17 Q. And what Karlsson's disclosing here -- we're  
18 talking page 19, lines 29 through 33 -- that window  
19 50, that can shift in the plane from the left to  
20 the right, correct?

21 MS. SHAH: Objection. Vague.

22 THE WITNESS: Yes, that's what it states  
23 here in that -- in these few lines, which is the  
24 only time in Karlsson that the window 50 is  
25 mentioned.

1 BY MR. FITZSIMMONS:

2 Q. And it also states that it can shift in the plane  
3 from the top to the bottom, correct?

4 A. That's what it says there, yes.

5 Q. And it also says that window 50 can vary in its  
6 shape and dimension, correct?

7 A. That's what it says, yes.

8 Q. So that window 50, will it always be a square as  
9 represented there in Karlsson?

10 MS. SHAH: Objection. Calls for  
11 speculation. Vague.

12 THE WITNESS: Karlsson does not teach  
13 directly, but my best understanding of this window  
14 given what Karlsson does say, is that it wouldn't  
15 necessarily always be square.

16 BY MR. FITZSIMMONS:

17 Q. Could it be a rectangle?

18 MS. SHAH: Objection. Calls for  
19 speculation.

20 THE WITNESS: Well, a square is a  
21 rectangle, so yes.

22 BY MR. FITZSIMMONS:

23 Q. Could it be a non-regular quadrilateral?

24 MS. SHAH: Objection. Vague. Calls for  
25 speculation.

1 THE WITNESS: I'm not sure what that --  
2 what you mean by that, "non-regular quadrilateral."

3 BY MR. FITZSIMMONS:

4 Q. So a square would be a regular quadrilateral with  
5 all equal sides, correct?

6 A. Okay.

7 Q. So could it be a rectangular -- could it be a  
8 rectangle without equal sides?

9 A. A non-square rectangle, for example?

10 Q. Sure, a non-square rectangle, however you would  
11 like to term it. Could that window 50 be a  
12 non-square rectangle?

13 A. I think this one sentence about the window 50 is  
14 intended to include that, yes.

15 Q. Could window 50 be some other polygon shape?

16 MS. SHAH: Objection. Calls for  
17 speculation.

18 THE WITNESS: I don't think this one  
19 sentence where Karlsson discusses the window says  
20 anything about that, so I don't know.

21 BY MR. FITZSIMMONS:

22 Q. Could there be a hole in the center of that  
23 window 50 where there's LEDs that aren't emitting  
24 light?

25 MS. SHAH: Objection. Calls for



speculation. Vague.

THE WITNESS: Given that Karlsson just has one sentence, which we've already read, about that light beam 50, Karlsson does not say anything about the subject of your question, so I don't know.

BY MR. FITZSIMMONS:

Q. So in your declaration, Exhibit 2006, between paragraphs 77 and 78, you include an annotated figure, page 61 of your declaration. Do you see that?

A. Yes.

Q. That's an annotated version of Figure 14, correct?

A. Correct.

Q. And you've drawn a red box around an area sort of in the upper half of that diagram and you have a label that says, "'I' marked LEDs," there, do you see that?

A. Yes.

Q. And in towards the bottom half of the annotated drawing, you have a box and that's labeled "'D' marked LEDs," correct?

A. Yes.

Q. Is it your understanding that Karlsson can light only the LEDs in the box that you have marked "I"?

1 MS. SHAH: Objection. Calls for  
2 speculation.

3 THE WITNESS: I don't believe Karlsson  
4 states that specifically. There's a lot of things  
5 Karlsson doesn't state specifically, so I'm not  
6 really sure -- I'm not 100 percent sure what  
7 Karlsson would say about that.

8 BY MR. FITZSIMMONS:

9 Q. Would a person of ordinary skill in the art  
10 understand that only the LEDs in the box you have  
11 labeled as "I" could be lit in a headlamp?

12 A. In Karlsson's embodiments that this figure  
13 represents, I don't think there's any detail about  
14 what the possible lighting options are, so I don't  
15 know if a person of ordinary skill in the art would  
16 be able to conclude for sure if Karlsson's system  
17 could do that or not.

18 Q. In your opinion, would a person of ordinary skill  
19 in the art understand that only the LEDs in the box  
20 you have labeled "D" could be lit in the headlamp?

21 MS. SHAH: Objection. Calls for  
22 speculation. Vague.

23 THE WITNESS: Yeah, I would respond the  
24 same way to your last question. I don't believe  
25 there's any detail about that in Karlsson and also

1 about how they're connected specifically in  
2 Karlsson, so I don't think a person of ordinary  
3 skill in the art would know how to interpret that  
4 according to Karlsson.

5 BY MR. FITZSIMMONS:

6 Q. Let's turn to paragraph 80 of your declaration. On  
7 page 62, there's a diagram labeled 1A. Do you see  
8 that?

9 A. Yes.

10 Q. And that's a diagram that you created?

11 A. I don't think I created the original, but I  
12 certainly collaborated on the creation of the final  
13 version of this diagram.

14 Q. That's not a diagram from Karlsson, though,  
15 correct?

16 A. Not directly; not the whole diagram.

17 Q. What portion of the diagram is not from Karlsson?

18 A. The portions aside from all of the dots in the  
19 rectangle is not from Karlsson.

20 Q. And where you're talking about dots and the  
21 rectangle, that's labeled 7, correct?

22 A. Yes.

23 Q. And that's similar to Figure 14 of Karlsson,  
24 correct?

25 A. Yes.

1 Q. But that removes the window 50 from Karlsson's  
2 Figure 14, correct?

3 A. That's correct.

4 Q. And below that there's a diagram labeled 2A. Do  
5 you see that?

6 A. Yes.

7 Q. And that diagram is not in Karlsson, correct?

8 A. That's right.

9 Q. Okay. No portion of that diagram is in Karlsson,  
10 correct?

11 A. That's correct.

12 Q. That's your speculation as to what Karlsson's  
13 disclosing; is that fair?

14 MS. SHAH: Objection.

15 THE WITNESS: It's my speculation as to  
16 how the LED array in Karlsson can be similar to the  
17 incandescent headlamp.

18 BY MR. FITZSIMMONS:

19 Q. If we go down to page 64, there's a diagram  
20 labeled 1B right before paragraph 85. Do you see  
21 that?

22 A. Yes.

23 Q. And it's a diagram that you created?

24 A. Similar to the other one, I collaborated in the end  
25 result of this diagram, but I didn't provide the

1 first draft.

2 Q. So this diagram is not in the Karlsson reference  
3 itself, correct?

4 A. The full figure there is not; that's correct.

5 Q. What portion of this diagram 1B is from Karlsson?

6 A. The dots, again, come from Figure 14, Karlsson, the  
7 array of dots.

8 Q. And the box that's outlined on the right-hand side  
9 with the number 50 pointing to it, do you see that?

10 A. Yes.

11 Q. That's not where the window 50 in Karlsson's  
12 Figure 14 is shown, correct?

13 A. That's right. That's showing my understanding of  
14 where the window would be in the scenario to the  
15 left.

16 Q. And so for this diagram, 1B, this is your  
17 speculation as to Karlsson's -- where the window  
18 would be in Karlsson's scenario shown on the left;  
19 is that correct?

20 A. It's my expectation, my best guess, given that  
21 Karlsson says very little about the window. It's  
22 my understanding of how putting together various  
23 aspects of Karlsson would make sense for that.

24 Q. On the next page, page 65, there's a diagram  
25 labeled 1C right above paragraph 86. Do you see

1           that one?

2   A.     Yes.

3   Q.     And again, this is a diagram that you or counsel  
4           have collaborated on to create; is that correct?

5   A.     That's correct.

6   Q.     And the box 50 noted on the right-hand side. Do  
7           you see that?

8   A.     I do, yes.

9   Q.     And that's not where the window 50 in Karlsson's  
10          Figure 14 is shown, correct?

11   A.     That's correct. Like before, it's my best estimate  
12          of where the window would be in the scenario shown  
13          to the left.

14   Q.     If you go back up to the diagram 1B. And this  
15          illustrates a vehicle taking a right-hand turn; is  
16          that correct?

17   A.     I would call it a curve to the right.

18   Q.     So this illustrates a vehicle taking a  
19          right-hand -- scratch that.

20                 So your diagram 1B illustrates a vehicle  
21          taking a curve to the right; is that fair?

22   A.     Yes, and that's what I say in paragraph 84.

23   Q.     And your diagram shows what you believe to be the  
24          beam pattern from the left headlamp; is that  
25          correct?

1 A. Yes.

2 Q. And can you describe for me what the dotted red  
3 line is in that drawing 1B?

4 A. On the left side?

5 Q. Correct.

6 A. The dotted red curve is where -- approximately  
7 where the light would hit the road or ground in  
8 front of the car, the headlamp.

9 Q. And what is the portion shown in yellow?

10 A. That is the portion that the window 50 on the right  
11 would be illuminating.

12 Q. So in your opinion, the portion of that dotted red  
13 cone would not be lit to the left of that yellow  
14 area; is that correct?

15 A. Not by that headlamp; that's correct.

16 MR. FITZSIMMONS: This is an exhibit we  
17 can mark as Deposition Exhibit A, please.

18 (Marked for identification:

19 Deposition Exhibit No. A.)

20 BY MR. FITZSIMMONS:

21 Q. And I'm handing you the exhibit that's marked as  
22 Exhibit A. And this exhibit is a reproduction of  
23 your drawing 1B and it adds a second red dotted  
24 line for a potential beam pattern for the right  
25 headlamp like the one that you have for the left

1 headlamp. Is that a fair representation of what  
2 this Exhibit A shows, Dr. Turk?

3 A. It looks right, yes.

4 Q. I would like you to shade in blue -- here's a blue  
5 marker. I would like you to shade in blue where  
6 you believe Karlsson's right headlight would  
7 project onto the road in the hypothetical vehicle  
8 in your Figure -- your drawing 1B, please.

9 MS. SHAH: Objection. Incomplete  
10 hypothetical. Calls for speculation.

11 THE WITNESS: This Figure 1B here is not  
12 intended to be technically accurate, it's an  
13 example, sort of a -- yeah, just an example, and so  
14 similarly, I don't know if that's exactly where it  
15 would be, but that would be a reasonable guess from  
16 my perspective.

17 BY MR. FITZSIMMONS:

18 Q. Can you describe for me in words the area that you  
19 shaded there, outlined it with the blue marker and  
20 have blue cross lines there?

21 A. It's similar to the shading in Figure 1B, just  
22 shifted over into the right headlamp and perhaps  
23 oriented a little more towards the centerline  
24 ahead.

25 Q. What do you mean by the centerline?



1 A. The imaginary line that goes through the center of  
2 the car from behind to forward.

3 Q. Could you draw the centerline for me here in pen?

4 A. Something like that.

5 Q. Okay. I'll ask you to use that pen, Dr. Turk, and  
6 please sign and date that for me.

7 A. (The witness complies.)

8 Q. And so what you've annotated here, Dr. Turk, is  
9 what you believe to be a representation of the  
10 right headlamp beam pattern in this scenario of  
11 drawing 1B; is that fair?

12 A. I think that would be a reasonable thing for the  
13 right headlamp to do. I don't know exactly what it  
14 would do, and again, it's not meant to be  
15 technically precise, but yes.

16 Q. Now I would like you to take back out your first  
17 declaration that was Exhibit 2001, and if you could  
18 please turn to paragraphs 84 and 85. And you see  
19 between 84 and 85 on page 49 -- again, this is  
20 Exhibit 2001 this time -- there is an annotated  
21 drawing in the center of the page.

22 A. I see that.

23 Q. Did you create this annotated drawing?

24 A. I don't remember who created the first one, first  
25 draft, but I collaborated with my colleagues to

1           come up with it.

2   Q.     Can you describe what's shown here in the diagram  
3           right before paragraph 85?

4   A.     Yes, it was an attempt to show that there are  
5           differences in a beam coming out of an LED array --  
6           of a full LED array, which is what the blue dotted  
7           line is, and a less than full rectangular LED  
8           array, which is what the red dotted line is.

9   Q.     And is it your opinion still that this is an  
10           accurate representation of potential beam patterns  
11           in Karlsson?

12   A.     Well, it was never intended to be technically  
13           accurate, precise in terms of the optics and where  
14           the beam would go -- beam would go exactly; it's  
15           sort of a characterization that there would be  
16           different portions of the array illuminating  
17           forward, but to the -- for what it was intended  
18           for, it is accurate in the sense that it makes the  
19           point.

20   Q.     So you stand by your characterization here in your  
21           first declaration; is that correct?

22   A.     I stand by my general point in making this, which  
23           is the beams would be somewhat different as shown  
24           by the difference in the red dotted line and the  
25           blue dotted line.

1 Q. Let's take Karlsson back out. So Exhibit 1010, the  
2 Karlsson reference. Let's go to page 20. And I'll  
3 have you just refer to lines 16 through 32. I'll  
4 give you a moment to review that.

5 A. Okay.

6 Q. Do you see in lines 26 through 27 on page 20 there  
7 of Karlsson, it says, "...that the light beam 7 to  
8 be emitted is adapted to the respective regulations  
9 at all times"?

10 A. I see that line, yes.

11 Q. And so Karlsson is disclosing that it's taking into  
12 account regulations with respect to its emitted  
13 light beam 7, correct?

14 MS. SHAH: Objection. Vague. Calls for  
15 speculation.

16 THE WITNESS: I think Karlsson is stating  
17 that Karlsson would like to do that. There's no  
18 teaching of it or describing how it is done, so  
19 it's hard to say much beyond that statement is  
20 there.

21 BY MR. FITZSIMMONS:

22 Q. Okay. And the statement that's in Karlsson is that  
23 the light beam 7 to be emitted is adapted to the  
24 respective regulations at all time, correct?

25 A. Yeah, that's what it says without describing

1 anything about how that would happen.

2 Q. Would a person of ordinary skill in the art  
3 understand how to make that happen?

4 A. Not particularly, not for any given system. Some  
5 systems cannot be adapted to the regulations at the  
6 time.

7 Q. But Karlsson says that it intends for its light  
8 beam 7 to be adapted to the respective regulations  
9 at all times, correct?

10 A. It has a statement there which makes me think that  
11 it wants to be, but it doesn't say actually how  
12 that would happen.

13 Q. So you agree that a person skilled in the art  
14 reading this passage of Karlsson would understand  
15 that it wants to be in compliance with the  
16 respective regulations at all times, correct?

17 MS. SHAH: Objection. Mischaracterizes  
18 the witness' testimony. Vague.

19 THE WITNESS: A person would probably  
20 understand that and then would start to think  
21 about, "What kind of experimentation would I need  
22 to do in order to make that happen?"

23 BY MR. FITZSIMMONS:

24 Q. And a person skilled in the art would understand  
25 how to undertake that kind of experimentation,

1 correct?

2 MS. SHAH: Objection. Mischaracterizes  
3 the witness' testimony. Vague.

4 THE WITNESS: I think they would  
5 understand generally how to carry out that kind of  
6 thing, but a lot of it would depend on the details  
7 of the system -- there's not many details in  
8 here -- and there would be no guarantee of actually  
9 getting the result that is hoped for here.

10 MR. FITZSIMMONS: Let's take a short  
11 break.

12 (Whereupon a break was taken

13 from 4:06 p.m. to 4:29 p.m.)

14 (Marked for identification:

15 Deposition Exhibit No. 2017.)

16 BY MR. FITZSIMMONS:

17 Q. This is Exhibit 2017, the Flaaten reference,  
18 Dr. Turk. Are you familiar with this reference?

19 A. Yes, I am.

20 Q. If you go to paragraph 89 of your second  
21 declaration, Exhibit 2006, paragraphs 89 and 90,  
22 you discuss the Flaaten reference, correct?

23 A. Yes, yes.

24 Q. Does Flaaten use LEDs in its headlamps?

25 A. I don't recall stating that specifically in my

1 declaration, but to my recollection, Flaaten uses  
2 photoelectric sensors that are not necessarily the  
3 same thing as LEDs -- or I'm sorry, not electric  
4 sensors. I'm trying to find the right phrase.

5 Let me say I don't recall talking about  
6 this in my declaration, but I will look and provide  
7 you an answer if you want me to take the time to do  
8 that.

9 Q. No, that's okay.

10 Paragraphs 89 and 90 of your declaration  
11 discuss the Karlsson reference and the Flaaten  
12 reference, correct?

13 A. That's correct.

14 Q. And the Karlsson reference does disclose using LEDs  
15 for its headlamps, correct?

16 A. For one of the embodiments it does, yes.

17 Q. Doctor, are you familiar with the Eureka Project?

18 A. It does not ring a bell at the moment.

19 Q. Are you familiar with the Progress in Automobile  
20 Lighting Conference, also referred to as PAL?

21 MS. SHAH: Objection. Relevance.

22 THE WITNESS: I don't recall that  
23 conference at the moment, no.

24 BY MR. FITZSIMMONS:

25 Q. Can you please take back out the '029 patent, and

1 can you turn to claim 5, please? Can you read  
2 claim 5 for me, please?

3 A. "The system of claim 1, wherein the increase of  
4 light in the direction of the road curvature  
5 includes at least an increase of light emitted at a  
6 level below high-beam light and directed in the  
7 direction of the road curvature."

8 Q. What's your understanding of what claim 5 requires?

9 MS. SHAH: Objection. Calls for a legal  
10 conclusion.

11 THE WITNESS: My understanding off the  
12 top of my head at the moment is that it requires  
13 all of the elements of claim 1 and additionally the  
14 increase of light mentioned in claim 1 includes  
15 some that is at a level below the high-beam light  
16 and that increase being in the direction of the  
17 road curvature.

18 BY MR. FITZSIMMONS:

19 Q. What does it -- what's your understanding of what  
20 claim 5 means by "emitted at a level below  
21 high-beam light"?

22 MS. SHAH: Same objection.

23 THE WITNESS: My understanding is that  
24 the intensity of the light or some way of measuring  
25 the light energy or the rate of light energy or

1 something like that has a lower reading than  
2 typical high-beam light measurement.

3 BY MR. FITZSIMMONS:

4 Q. What do you mean by "a lower reading than typical  
5 high-beam light measurement"?

6 A. A measurement would typically return a numeric  
7 value and so a lower numeric value.

8 Q. And so are you saying that high-beam light would  
9 have a numeric value associated with it?

10 A. I'm saying one could measure a high-beam light at a  
11 particular location and that would result in a  
12 numeric value.

13 Q. How would you know what location to measure the  
14 high beam light at?

15 A. In order to do what?

16 Q. To determine what the typical high-beam light  
17 measurement is, as you refer to it.

18 MS. SHAH: Objection. Vague.

19 THE WITNESS: I don't think I referred to  
20 a typical -- specific typical high-beam level  
21 measurement.

22 BY MR. FITZSIMMONS:

23 Q. You said "typical high-beam light measurement."  
24 What did you mean by "typical high-beam light  
25 measurement"?



1 A. To me, that means take a typical high-beam light  
2 from some automobile, perhaps, and measure that.

3 Q. What is a typical high-beam light?

4 A. What I mean by typical high-beam light is finding a  
5 common car, for example, that has commonly used  
6 headlamps and uses high beams.

7 Q. Are there atypical high-beam lights?

8 A. In the way I was using the word typical, yes, I  
9 guess a car that -- it's a hypothetical, but a car  
10 that was not meeting standards, for example, would  
11 be an atypical high-beam light.

12 Q. So for the typical high-beam light measurement that  
13 you described, how would you know where to take  
14 that measurement to measure the high-beam light?

15 A. It depends on what my purpose in the measurement  
16 is. Can you clarify what that would be?

17 Q. I'm trying to understand how you would determine  
18 where to measure high beam -- the high-beam light.

19 A. I'm trying to remember how that came up in our  
20 string of questions and answers, but I believe I  
21 was saying that one could measure, and that if one  
22 did measure a level below high-beam light that it  
23 would be smaller, but that's sort of general. I  
24 don't know what context in particular you're  
25 referring to in terms of measurement.

1 Q. I'm trying to understand what you mean by that.  
2 You used the term "measurement," so I'm trying to  
3 understand how you would go about measuring a  
4 high-beam light.

5 MS. SHAH: Objection. Calls for  
6 speculation.

7 THE WITNESS: I don't know in general how  
8 I would do it. I suppose I could walk outside my  
9 car, turn on the high beams, have some light meter  
10 with me, walk in front of that particular location  
11 and measure the reading of the light meter.

12 BY MR. FITZSIMMONS:

13 Q. Is there a unit of measurement that you would use  
14 for that?

15 A. Yeah, the measurement would be in some units.

16 Q. What units would it be in?

17 A. It depends on what the sensor is, I guess. It's a  
18 hypothetical situation, so I'm not sure.

19 Q. It's your hypothetical situation, so I'm trying to  
20 understand what you would do.

21 MS. SHAH: Objection. Calls for  
22 speculation. Objection. Relevance.

23 THE WITNESS: I've never said I would do  
24 this. You're saying, you know, describe what this  
25 phrase could be mean in a way to perhaps

1 distinguish levels of light, and so off the top of  
2 my head I'm saying that's perhaps a way, but I'm  
3 not proposing anything specific.

4 BY MR. FITZSIMMONS:

5 Q. So you don't have a specific understanding of what  
6 claim 5 of the '029 patent means when it says  
7 "light emitted at a level below high-beam light"?

8 MS. SHAH: Objection. Mischaracterizes  
9 the witness' testimony.

10 THE WITNESS: I didn't say I don't  
11 understand that phrase. What I said was that to  
12 determine that, you have to perhaps make a  
13 measurement, but it's not a specific technical  
14 suggestion or experiment that I was proposing.

15 BY MR. FITZSIMMONS:

16 Q. Is there a standard methodology that you're aware  
17 of for measuring high-beam light?

18 A. I think there is; I don't recall the details of  
19 it.

20 Q. Do you think a person of ordinary skill in the art  
21 would know what the standard methodology for  
22 measuring high-beam light is?

23 MS. SHAH: Objection. Calls for  
24 speculation.

25 THE WITNESS: I think a POSA could find

1           that out.

2 BY MR. FITZSIMMONS:

3 Q.       What would a POSA do to find that out?

4                   MS. SHAH: Objection. Calls for  
5 speculation.

6                   THE WITNESS: Off the top of my head,  
7 perhaps talk to people who have done it, perhaps  
8 look at some of the standards to see if they  
9 dictate specific ways to do it, but I'm not sure.

10 BY MR. FITZSIMMONS:

11 Q.       Which standards would a person skilled in the art  
12 look to?

13                   MS. SHAH: Objection. Calls for  
14 speculation.

15                   THE WITNESS: I don't know specifically.

16 BY MR. FITZSIMMONS:

17 Q.       In your declaration, you opine on certain things  
18 that a person of ordinary skill in the art would  
19 know, correct, Dr. Turk?

20 A.       Yes. And just to be clear, I would say would be  
21 likely to know.

22 Q.       But you don't know what standard a person skilled  
23 in the art would look to to measure high-beam  
24 light, correct?

25                   MS. SHAH: Objection. Calls for

speculation.

THE WITNESS: I don't know that  
specifically, no.

BY MR. FITZSIMMONS:

Q. If you go to paragraph 100 of your declaration.  
Exhibit 2006. You see you group claims 5 and 16  
together?

A. Yes.

Q. And if you go to paragraph 105, you discuss  
claim 27 separately, correct?

A. Yes.

Q. Do you see in paragraph 105 where you say  
"alternative language of claim 27"?

A. Yes.

Q. Can you explain to me what you believe to be the  
difference between claim 5 and claim 27 of the '029  
patent?

MS. SHAH: Objection. Calls for a legal  
conclusion.

THE WITNESS: There are various  
differences in the wordings of the two. I would  
say the main difference is that claim 27 builds off  
of independent claim 23, which is about a method,  
and claim 5 builds off independent claim 1, which  
is about a system.

1 BY MR. FITZSIMMONS:

2 Q. Other than that, are there any differences between  
3 claim 5 and claim 27 in your opinion?

4 MS. SHAH: Same objection.

5 THE WITNESS: There are several  
6 differences in terms of the words that are written  
7 to describe them. I've not compared them and  
8 studied a comparison to form my opinions in my  
9 declaration, but we can go through the wording  
10 differences if you'd like.

11 BY MR. FITZSIMMONS:

12 Q. What are the differences that you find?

13 A. Claim 5 talks about "increase of light in the  
14 direction of the road curvature" whereas claim 27  
15 talks about the "increase of light in the direction  
16 associated with a shape change."

17 Claim 5 talks about "at least an increase  
18 of light emitted," and claim 27 talks about "at  
19 least light output that increases the light  
20 emitted."

21 Claim 5 uses the phrase "emitted at a  
22 level below high-beam light" and claim 27 uses that  
23 same phrase.

24 And the last phrase, again, has this  
25 difference "associated with shape change" in

1 claim 27 and "in the direction of the road  
2 curvature" in claim 5.

3 Q. And do any of those differences in the wording  
4 affect your analysis with respect to the  
5 obviousness of claims 5 and 27?

6 MS. SHAH: Objection. Calls for a legal  
7 conclusion. Vague.

8 THE WITNESS: I would just say that since  
9 I have not compared these directly before that I  
10 can recall, and I did state in my declaration my  
11 rationale for claim 5 and separately for claim 27,  
12 I would just stick with the words that are there  
13 that are my opinion.

14 BY MR. FITZSIMMONS:

15 Q. Is a road curvature in claim 5 analogous to a shape  
16 change in 27, in your opinion?

17 MS. SHAH: Objection. Calls for a legal  
18 conclusion.

19 THE WITNESS: Again, I have not compared  
20 those claims and the language in them, so I can't  
21 really comment or don't have an opinion at the  
22 moment of whether those two are associated or not  
23 or how they're associated.

24 BY MR. FITZSIMMONS:

25 Q. Paragraph 105 of your declaration, though, refers

1 to alternative language of claim 27. Is that not  
2 in comparison to claim 5?

3 A. Yes, it is different language from claim 5.

4 Q. But you say you didn't compare claim 5 and 27  
5 directly, correct?

6 A. I noted that they're different and they use  
7 different language; I don't have a specific  
8 comparison word for word or point for point of  
9 them.

10 Q. If you look at claim 9 of the '029 patent, please.  
11 Do you see claim 9, column 97, and line 20 uses the  
12 term "non-camera sensor"?

13 A. Yes.

14 Q. As it pertains to claim 9 of the '029 patent, what  
15 is a non-camera sensor, according to your  
16 understanding?

17 MS. SHAH: Objection. Calls for a legal  
18 conclusion.

19 THE WITNESS: I don't recall stating any  
20 opinions about this in my declaration, but off the  
21 top of my head right now, I believe that a  
22 non-camera sensor would be some other sensor  
23 that's not a camera that could perhaps be  
24 associated with a steering wheel direction or some  
25 other thing that can be measured with a device



besides a camera.

BY MR. FITZSIMMONS:

Q. So it could be any sensor that's not a camera?

MS. SHAH: Objection. Mischaracterizes the witness' testimony. Calls for a legal conclusion.

THE WITNESS: I expect that it means something specific, but like I said, I don't believe that I made an opinion about this in my declaration, so I'm not sure at the moment how to best interpret this.

BY MR. FITZSIMMONS:

Q. You reviewed the claims of the '029 patent, correct?

A. Yes.

Q. And that includes claim 9?

A. Yes.

Q. And do you understand what claim 9 is reciting?

A. Yes, I believe so.

Q. And did you understand what the term "non-camera sensor" means when you were providing your obviousness analysis?

A. I did have a understanding of all of the terms in these, and the things that I thought were important to the matter at hand, I wrote down in my

1 declaration, but I don't remember right now, days,  
2 weeks, months afterwards, exactly what everything  
3 in there meant, so I wrote down the important  
4 parts.

5 Q. So in your opinion, the term "non-camera sensor" is  
6 not important to claim 9 of the '029 patent then?

7 MS. SHAH: Objection. Mischaracterizes  
8 the witness' testimony.

9 THE WITNESS: I didn't say it's not  
10 important to the claim; I said since I didn't write  
11 it down in my opinions about this matter, I  
12 probably didn't consider it important to those  
13 particular opinions.

14 BY MR. FITZSIMMONS:

15 Q. So then you did not consider the term "non-camera  
16 sensor" important to the particular opinions in  
17 your declaration, correct?

18 MS. SHAH: Objection. Mischaracterizes  
19 the witness' testimony.

20 THE WITNESS: That's not specifically  
21 correct. I did not think it was important to write  
22 about that in my opinions expressed in my  
23 declaration.

24 BY MR. FITZSIMMONS:

25 Q. Why wasn't it important to write about that?

1 A. I don't recall at this point.

2 Q. Is a GPS a non-camera sensor?

3 A. Generally, GPS is a term used to describe the  
4 satellites and not a sensing capability, but it  
5 sort of depends on the context into how someone  
6 uses it.

7 Q. Is a speed sensor a non-camera sensor?

8 MS. SHAH: Objection. Calls for a legal  
9 conclusion for this whole line of questioning.

10 THE WITNESS: A speed sensor can be a  
11 non-camera sensor.

12 BY MR. FITZSIMMONS:

13 Q. Is a rain sensor a non-camera sensor?

14 A. It can be.

15 Q. Is radar a non-camera sensor?

16 A. It can be.

17 Q. Is a steering angle sensor a non-camera sensor?

18 A. Can be.

19 Q. Is a range finder a non-camera sensor?

20 A. It would depend on how it works.

21 Q. Can a range sensor be a non-camera sensor?

22 A. It can be.

23 Q. Is an elevation sensor a non-camera sensor?

24 A. It can be.

25 MS. SHAH: I'll just maintain my

1 objection for those seven or eight different  
2 questions.

3 BY MR. FITZSIMMONS:

4 Q. To your recollection, does the '029 patent use the  
5 term "non-camera sensor" anywhere outside of its  
6 claims?

7 A. I don't recall offhand.

8 Q. Are you familiar with the term "optical control  
9 element," Dr. Turk?

10 A. In general, yes.

11 Q. Are reflectors an optical control element?

12 MS. SHAH: Objection. Vague. Calls for  
13 speculation.

14 THE WITNESS: I think different people  
15 would interpret that phrase differently, so some  
16 might include reflectors, some might not.

17 BY MR. FITZSIMMONS:

18 Q. Are lenses an optical control element?

19 MS. SHAH: Same objection.

20 THE WITNESS: I don't opine about optical  
21 control elements that I recall in my declaration,  
22 so I just don't have any opinion.

23 BY MR. FITZSIMMONS:

24 Q. Can you go to paragraph 154, please, of your  
25 declaration? Do you see where it says, "Claim 10

1 is representative of claims 21 and 32 and further  
2 requires one or more optical control elements"? Do  
3 you see that?

4 A. Yes.

5 Q. So you do discuss optical control elements in your  
6 declaration, correct?

7 A. I do discuss them, yes; I don't provide definitions  
8 or opine in that sense.

9 Q. Did you understand the term "optical control  
10 elements" in claims 10, 21 and 32?

11 A. Generally, yes.

12 Q. What does the term "optical control element" mean  
13 to you?

14 A. In those claims?

15 Q. Correct.

16 A. Generally, elements that control the direction of  
17 light through optics.

18 Q. So are lenses optical control elements?

19 MS. SHAH: Objection. Calls for a legal  
20 conclusion.

21 THE WITNESS: I think in this context,  
22 they can be.

23 BY MR. FITZSIMMONS:

24 Q. And are reflectors optical control elements in this  
25 context?

1 MS. SHAH: Same objection.

2 THE WITNESS: In this context, yes.

3 MR. FITZSIMMONS: Let's take maybe a  
4 five-minute break.

5 (Whereupon a break was taken  
6 from 5:05 p.m. to 5:17 p.m.)

7 MR. FITZSIMMONS: I have no further  
8 questions.

9 MS. SHAH: I have no redirect.

10  
11 (Deposition concluded at 5:17 p.m.)  
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1 STATE OF MICHIGAN)

2 COUNTY OF OAKLAND)

3  
4 Certificate of Notary Public

5 I do hereby certify the witness, whose attached  
6 testimony was taken in the above matter, was first duly  
7 sworn to tell the truth; the testimony contained herein  
8 was reduced to writing in the presence of the witness, by  
9 means of stenography; afterwards transcribed; and is a  
10 true and complete transcript of the testimony given. I  
11 further certify that I am not connected by blood or  
12 marriage with any of the parties, their attorneys or  
13 agents, and that I am not interested directly, indirectly  
14 or financially in the matter of controversy.

15 In witness whereof, I have hereunto set my hand  
16 this day at Clarkston, Michigan, State of Michigan.

17 I hereby set my hand this day, October 22, 2023.  
18  
19

20 *Karen Fortna*  
21

22 Karen Fortna, CRR/RMR/RPR/CSR-5067

23 Notary Public, Oakland County, Michigan

24 My Commission expires 4/30/2025  
25

<hr/> <p><b>Exhibits</b></p> <hr/>	<p><b>100</b> 12:3 31:16 118:7 137:6                      156:5</p>	<p><b>1A</b> 138:7</p>
<p><b>Exhibit 1001</b> 4:7 61:4,6 65:19</p>	<p><b>1001</b> 61:4,6 65:19</p>	<p><b>1B</b> 139:20 140:5,16 141:14,20                      142:3,23 143:8,11,21 144:11</p>
<p><b>Exhibit 1005</b> 4:8 87:7,9,12                      119:4</p>	<p><b>1005</b> 87:7,9,12 119:4</p>	<p><b>1C</b> 97:25 140:25</p>
<p><b>Exhibit 1010</b> 4:9 28:3 128:25                      129:2,5 132:2 146:1</p>	<p><b>101</b> 119:16</p> <p><b>1010</b> 28:3 128:25 129:2,5                      132:2 146:1</p>	<p><b>1D</b> 97:25</p>
<p><b>Exhibit 1012</b> 4:11 124:6,9</p>	<p><b>1012</b> 124:6,9</p>	<hr/> <p><b>2</b></p> <hr/>
<p><b>Exhibit 2001</b> 4:13 23:22,24                      25:23 26:18 77:8 144:17,20</p>	<p><b>102</b> 97:16 98:1,3</p>	<p><b>2</b> 29:25 37:12 70:19 73:7 85:18                      129:11</p>
<p><b>Exhibit 2006</b> 4:15 26:2,4,18                      27:21,24 29:17,25 32:18 44:15                      58:25 64:16,25 80:2 86:20                      97:10 103:7 131:22 136:8                      148:21 156:6</p>	<p><b>103</b> 97:17 98:1,4</p>	<p><b>20</b> 37:18 46:10 70:19 146:2,6                      159:11</p>
<p><b>Exhibit 2017</b> 4:17 28:4                      148:15,17</p>	<p><b>105</b> 118:21 156:9,12 158:25</p>	<p><b>2000</b> 17:7 18:18</p>
<p><b>Exhibit A</b> 4:5 142:17,19,22                      143:2</p>	<p><b>106</b> 87:3,5,22,23 97:18</p>	<p><b>2001</b> 23:22,24 25:23 26:18                      76:5 77:8 144:17,20</p>
<hr/> <p><b>\$</b></p> <hr/>	<p><b>108</b> 93:11 96:2</p>	<p><b>2002</b> 35:12,14 61:22,25</p>
<p><b>\$490</b> 13:12</p>	<p><b>10:48</b> 52:16</p>	<p><b>2006</b> 26:2,4,18 27:21,24                      29:17,25 32:18 44:15 58:25                      64:16,25 80:2 86:20 97:10                      103:7 131:22 136:8 148:21                      156:6</p>
<hr/> <p><b>0</b></p> <hr/>	<p><b>11</b> 65:19 77:13</p>	<p><b>2007</b> 33:16</p>
<p><b>029</b> 6:5 11:22 15:15,21 16:6                      25:2 30:6 33:19 36:1,3 51:16,                      19,25 52:2,9 59:24 61:7,13,17                      62:4,7,12 63:2,13,17 64:2,12,                      15,20 65:12,18 66:1,8,19 67:2,                      16,19 68:1,4,11,13,25 69:3,10,                      18,19 70:6,15 71:4,13,19 72:2,                      13 73:3,8 74:6,15 75:17 76:2,                      11 77:15 78:1,8,9 79:1,10,20                      80:12,21 81:4,11,15,21 82:12                      83:13,22 84:4,23 85:25 88:15                      131:10 149:25 154:6 156:16                      159:10,14 160:13 161:6 163:4</p>	<p><b>11,208,029</b> 6:1 30:5</p>	<p><b>2009</b> 33:22 34:1</p>
<hr/> <p><b>1</b></p> <hr/>	<p><b>115</b> 106:12 108:15 115:16,20                      118:16</p>	<p><b>2010</b> 34:21 59:10</p>
<p><b>1</b> 81:14,17,20 83:9,13,22,25                      84:4,23 85:18,25 118:19                      119:9,17 129:8 150:3,13,14                      156:24</p>	<p><b>116</b> 118:17 119:8</p>	<p><b>2012</b> 34:21 59:8</p>
<p><b>10</b> 163:25 164:10</p>	<p><b>11:02</b> 52:16</p>	<p><b>2013</b> 34:21</p>
	<p><b>11:5-7</b> 67:20</p>	<p><b>2014</b> 34:21</p>
	<p><b>12</b> 77:13,14</p>	<p><b>2015</b> 34:22</p>
	<p><b>120</b> 21:23</p>	<p><b>2017</b> 28:4 148:15,17</p>
	<p><b>124</b> 121:15 122:17</p>	<p><b>2019</b> 16:20</p>
	<p><b>12:05</b> 81:9</p>	<p><b>2023</b> 5:1</p>
	<p><b>12:14</b> 81:9</p>	<p><b>2023-00318</b> 34:2</p>
	<p><b>14</b> 37:13 129:7 131:24 133:9                      136:13 138:23 139:2 140:6,12                      141:10</p>	<p><b>21</b> 37:19,23 46:9,11,12 48:16                      80:13 164:1,10</p>
	<p><b>15</b> 124:22 126:4</p>	<p><b>22</b> 77:13</p>
	<p><b>154</b> 163:24</p>	<p><b>23</b> 37:15 58:25 77:9 156:23</p>
	<p><b>16</b> 37:17 44:15 50:12 124:23                      146:3 156:6</p>	<p><b>24</b> 37:15</p>
	<p><b>17</b> 5:1 80:12 130:4</p>	<p><b>25</b> 50:5,12 80:12</p>
	<p><b>19</b> 70:15,17 124:23 126:4                      132:2,5,7 133:18</p>	<p><b>257.698(4)</b> 46:14</p>
	<p><b>1949</b> 46:14 47:14</p>	<p><b>26</b> 37:16,17,25 40:8,15 42:10                      44:15 48:3 146:6</p>
	<p><b>1994</b> 18:18</p>	
	<p><b>1:01</b> 103:4</p>	



**27** 146:6 156:10,13,16,22  
 157:3,14,18,22 158:1,5,11,16  
 159:1,4

**28** 37:17 46:9,10 76:5

**29** 49:6 132:3,5,7 133:18

**2:05** 103:4

**2A** 139:4

---

**3**

---

**3** 81:17 82:8,11,18

**30** 58:24 59:1,4,7 64:25

**300** 46:13

**300,000** 101:9,13 102:1,5,6,9,  
 13

**32** 146:3 164:1,10

**33** 49:6 132:3,5,7 133:18

**34** 129:10

**365** 23:9

**37** 61:10,11

**38** 76:2,17 77:22 78:13,19

**3:00** 128:23

**3:19** 128:23

**3D** 96:19

---

**4**

---

**4** 89:15,17,21,24 90:2,6,9,17,  
 20,23 93:7 95:25 101:4 129:8  
 130:3,4

**41** 80:1,4,25 101:4

**42** 67:10,15,17

**44** 77:23 78:14,19 101:5

**450** 77:2

**457** 77:1

**458** 76:23 78:15

**46** 93:8

**47** 59:20,21

**48** 60:3,25 93:8 96:1

**49** 48:18,24 49:4 60:15 144:19

**4:06** 148:13

**4:29** 148:13

---

**5**

---

**5** 33:9 65:20 99:17 150:1,2,8,  
 20 154:6 156:6,16,24 157:3,  
 13,17,21 158:2,5,11,15 159:2,  
 3,4

**5,588,733** 124:10

**50** 72:8 96:1 132:8 133:9,19,24  
 134:5,8 135:11,13,15,23 136:4  
 139:1 140:9,11 141:6,9 142:10

**503** 16:14

**51** 72:6,10 73:6 75:16

**517.108** 49:4

**52** 73:5,6 76:2 86:20 87:19  
 103:8

**54** 72:6,8,11 96:1

**55** 72:6,8,11 97:7,12,23 99:13

**551** 16:11

**571.108** 48:19,24

**5:05** 165:6

**5:17** 165:6,11

---

**6**

---

**6** 33:10 80:8

**6,144,158** 87:12

**6,281,632** 76:4,7

**61** 99:17 136:10

**62** 138:7

**63** 70:17 75:16

**64** 70:17 99:18 139:19

**65** 140:24

**67** 27:23

**68** 28:6 76:17 77:22 78:13,25

---

**7**

---

**7** 29:5,8,10,25 32:18 35:16  
 99:16 138:21 146:7,13,23

147:8

**7(a)** 32:19

**7(b)** 36:5

**7(c)** 35:16,19,20

**76** 106:13

**77** 106:14 115:23 136:9

**78** 118:17 136:9

---

**8**

---

**8** 65:20 89:14 124:22 126:4

**80** 138:6

**83** 131:23

**84** 141:22 144:18,19

**85** 139:20 144:18,19 145:3

**86** 140:25

**89** 28:1 148:20,21 149:10

---

**9**

---

**9** 159:10,11,14 160:16,18  
 161:6

**90** 28:1 148:21 149:10

**91** 28:7 29:3

**92** 28:7 29:3

**95** 81:13

**96** 81:12,14,17 82:8 83:9,25  
 85:18

**97** 159:11

**98/54030** 129:4

**99** 68:18

**9:19** 5:3

---

**A**

---

**a.m.** 5:3 52:16

**AABH** 86:21,24 87:21 99:18  
 121:19

**able** 7:7 54:17 137:16

**about** 5:18 6:22 8:10,12,14,16  
 9:19 11:3,23 12:7 14:13,15

15:23 19:9 20:5 22:2,13 24:14  
25:5,19 27:7,8 29:15 32:7  
36:4,18 38:13 40:9,25 47:5  
50:13 53:9,11,16,21 54:15  
56:8,23 57:6 61:21 64:22 66:6  
67:6 68:21,25 69:18 73:14  
78:9,21,23 79:8 83:6 85:5  
87:2,20,21 95:20 96:1 97:2,7  
101:9 102:1 104:9 105:21,23  
107:24 108:12,22 111:3,13,20,  
21,23,24,25 112:2 114:2,3  
115:12 117:2,11 120:14,17,22  
121:10,23 125:23 126:7,10  
127:24 128:6,7 131:21 135:13,  
20 136:3,5 137:7,13,25 138:1,  
20 140:21 147:1,21 149:5  
153:3 156:23,25 157:13,15,17,  
18 159:20 160:9 161:11,22,25  
163:20

**above** 32:20 48:16 97:23  
99:12 140:25

**abstract** 91:9,10,22

**academic** 16:24

**accept** 60:19

**accepts** 60:16

**accidentally** 34:12

**accomplished** 131:6

**according** 12:25 102:12  
127:14 138:4 159:15

**account** 146:12

**accurate** 71:10 78:3 89:8,9  
143:12 145:10,13,18

**accurately** 6:11,15,18

**achieve** 65:2 102:4

**achieved** 102:2

**acknowledging** 76:11

**act** 37:22 46:13,16 47:22

**actually** 13:3 46:10 50:12  
81:13 147:11 148:8

**adapted** 73:8 130:12,16,22  
131:2 146:8,23 147:5,8

**adaptive** 52:21 72:2,9,13,16,  
23 73:2 86:24

**add** 41:22

**addition** 17:12

**additional** 32:22,25

**additionally** 150:13

**adds** 142:23

**affect** 108:10 158:4

**affects** 76:24

**AFS** 52:22 72:3

**after** 59:7 61:13

**afterwards** 161:2

**again** 10:4 57:25 66:17 78:18  
85:4 88:17 90:21 97:9 115:16  
118:6 120:17 121:7 132:7  
140:6 141:3 144:14,19 157:24  
158:19

**ago** 54:14

**agree** 6:25 7:13 49:21 52:9  
58:9,17 59:16 65:8,9,11 90:17,  
23 113:13 115:5 126:24  
147:13

**ahead** 50:6 86:4 94:14 97:21  
143:24

**aid** 72:19

**Alan** 5:13

**algorithms** 21:6

**alleged** 52:4 60:8

**allocate** 13:25

**almost** 39:10 53:25 102:17

**along** 98:14,20 124:17

**already** 18:23 64:11 70:12  
106:15 108:16 111:5 115:17,  
25 118:5 136:3

**also** 17:16 20:2,8,16 21:5,17,  
24 22:4,8 25:18 26:1 59:10  
60:19 62:23 65:11 79:22 87:24  
88:7 89:24 93:24 100:14 109:2  
112:11 124:24 126:25 129:22  
134:2,5 137:25 149:20

**alternative** 156:13 159:1

**always** 65:5,15 73:19 134:8,  
15

**am** 13:25 30:3 55:15 111:1  
124:11 129:6 148:19

**ambient** 130:12,17,23 131:2

**amended** 47:14

**among** 18:21 21:7 54:23

**amount** 27:13 73:19 86:2,5

**amounts** 107:3

**analogous** 158:15

**analysis** 39:18,21,24 40:4,7,  
14 49:10,11,19 61:1 79:4  
158:4 160:22

**analyze** 62:4

**analyzed** 52:6 74:9

**and/or** 80:9 91:13 97:16

**angle** 99:20 100:3,7,9 101:10  
102:2,5 105:6,14 106:1,3  
162:17

**angled** 99:25

**angles** 92:3

**angular** 91:14,20,25 93:9,14,  
20 94:8,9,19,22 95:3,6,8 96:6,  
12 97:20 105:25

**annotated** 97:24 98:22 99:12  
118:18 119:9,16 136:9,13,20  
144:8,20,23

**annotations** 118:20 119:12

**another** 9:4 16:14 32:16 45:1,  
4,11,14,21 88:19,21 92:15,25  
102:15 114:4 124:24 126:19,  
25 127:6

**answer** 5:17 6:25 43:1 44:3  
51:8 58:19,22 65:9 69:13,25  
105:10,13,17,19 106:6 149:7

**answered** 40:1 42:22 44:8  
68:16 69:7 70:10 71:8 74:19,  
25 91:2 95:14 102:22 112:19  
118:12 121:5 123:7 133:2

**answers** 7:5 152:20

**anti-blinding** 86:24

**anti-glare** 112:21 113:8,10  
114:12,21

**any** 6:10,13,17 8:24 9:16 10:2  
12:16 15:10,14,20 31:21 35:9  
38:22 46:1 47:24 51:19 55:24  
56:2,5 62:12,15 63:2,8,17,24  
64:2,18 66:2,9,20 86:11,16  
100:12 103:19 104:15 111:25  
115:13 116:17 118:13 121:8

126:20 131:5 137:13,25 147:4  
 157:2 158:3 159:19 160:3  
 163:22

**anyone** 8:17 9:5,7 14:17  
 25:15 27:6

**anything** 32:7 33:5 66:6 71:19  
 99:3 111:21 115:12 119:23  
 120:22 128:7 135:20 136:4  
 147:1 154:3

**anywhere** 163:5

**apparatus** 91:12

**applicability** 79:6

**applicable** 79:1

**applications** 50:15

**applied** 60:11,25 62:19 84:11  
 115:11

**apply** 104:1

**approach** 65:22

**approached** 14:13

**appropriate** 123:25

**approximately** 102:9 142:6

**area** 20:12 35:22,24 36:1,2  
 42:24 53:5 60:13 62:22 98:23  
 99:2 136:15 142:14 143:18

**areas** 17:24 18:23 21:21 22:2  
 57:2,4 98:21

**aren't** 94:5 119:14 135:23

**around** 6:23 19:21 21:23  
 54:21 61:22 62:1 72:19 136:15

**arrangements** 11:19

**array** 89:18 90:7,18,24 139:16  
 140:7 145:5,6,8,16

**arrows** 98:22

**art** 49:15 50:19 51:9 52:10  
 59:24 60:17,20 65:13 70:25  
 82:7 122:2 137:9,15,19 138:3  
 147:2,13,24 154:20 155:11,18,  
 23

**articles** 34:15,18,24 35:1,3,6  
 57:25 59:13

**artificial** 17:25 18:25 20:14

**arts** 17:12

**aside** 138:18

**ask** 7:9,13,15 26:22 65:18  
 96:21 144:5

**asked** 39:25 44:7 56:23 59:22  
 64:11 68:15 69:6 70:10 71:7  
 74:18,24 75:2 91:1 95:13  
 102:21 112:18 118:11 121:4  
 123:6 133:1

**asking** 6:24 15:23 36:17,23  
 68:25 97:21 111:10 127:23

**asks** 106:6

**aspects** 21:11 40:9 49:13  
 56:9 57:7 79:8 84:17 85:16  
 112:20,25 140:23

**associated** 14:24 19:3 39:7  
 50:14 95:21 151:9 157:16,25  
 158:22,23 159:24

**assume** 7:16

**astronomical** 19:20,21

**attempt** 145:4

**attenuate** 94:5

**attenuated** 95:11

**attenuating** 102:20

**attenuation** 93:9,14,18,24  
 94:10,23 95:4,7,12

**attorneys** 7:23 8:5,23 9:2  
 13:8 14:15 24:20 25:12 30:18,  
 24 35:4,7 47:9

**atypical** 152:7,11

**augmented** 22:8,9,11,12

**August** 46:25 47:6 76:5

**author** 32:11 58:1 59:14

**automated** 10:9

**automatic** 76:16

**automobile** 106:20 149:19  
 152:2

**automotive** 53:5 57:9 60:13  
 103:14,24 104:2,7,11 105:5  
 107:7

**autonomous** 21:9 53:10,18  
 54:7 56:8

**available** 64:19

**average** 130:9

**awards** 21:14 56:2,14,17

**aware** 30:10,12,14 38:7,9  
 57:15 100:11 154:16

**away** 41:16,21 42:3 92:15

**awhile** 11:24

---

## B

---

**bachelor's** 60:9

**back** 27:18 29:5,8 35:16 48:3  
 50:4 56:10 58:24 65:18 75:1,  
 16 86:19 87:19 103:5 123:16  
 141:14 144:16 146:1 149:25

**background** 22:19 49:11,12  
 82:7

**ballpark** 13:15

**Barbara** 17:5

**based** 35:21 51:8 63:1 70:18  
 82:5,23 92:3 101:25

**basically** 7:23 20:5 42:15  
 106:23

**Bay** 20:12

**beam** 40:18 42:9,14,15,21,23  
 43:3 64:3 77:19 86:20 87:7,11,  
 20,25 89:10,13,15 91:9,17,23,  
 25 92:2 93:7,13 94:18,22 96:8,  
 15 99:7,8,10,16 100:1,9 101:4,  
 8,12,25 103:8,10 105:6,14,25  
 106:1,3,15,16,19,22 108:11,16  
 109:2,6 110:3,6,14 111:5,6,7,  
 24,25 112:1,3,5,8,11,13,14,16,  
 20,22,25 113:4,9,12,16,17  
 114:8,9,11,16,23 115:6,12,13,  
 17,18,25 116:20 117:11,14  
 118:23 119:2,14,21,22 120:1  
 122:12 125:8 130:11 131:1  
 132:8,14,21,25 133:10 136:4  
 141:24 142:24 144:10 145:5,  
 10,14 146:7,13,23 147:8  
 151:14 152:18

**Beam's** 87:3,22 96:23 98:12  
 116:5 117:2 118:19 119:9,17  
 121:19

**beams** 43:7,12,21,24 44:5,12  
 74:6 99:20,25 106:21,22 109:4  
 114:20,25 120:12,16 129:10  
 145:23 152:6 153:9

**because** 23:5 105:10,17  
112:21

**become** 71:2,5

**been** 5:6 6:20 9:19 10:1,2,12,  
16 11:1,3,6 16:20 28:21 38:7,9  
46:25 47:9,14 59:22 61:21  
85:17

**before** 6:20 9:20 10:6 14:11  
28:14,18 31:18 46:21,25 47:5  
49:1 52:9 57:22 64:15 72:22  
83:6,22 87:16 108:3 109:2  
118:16 119:8 126:1 131:20  
139:20 141:11 145:3 158:9

**began** 13:16

**beginning** 45:6

**behalf** 10:11,13,18,20 30:25

**behind** 98:8 144:2

**being** 40:23 72:22 87:2 99:14,  
21 114:21 115:13 150:16

**believe** 9:3,4,18,22 11:16,20  
12:21 13:7 16:10 27:4 28:19  
30:8,23 31:15 32:3,20 33:8,21  
37:19 38:5 42:22 46:18 47:9,  
12 49:2 57:24 58:12 61:22  
68:18 71:1 74:8 75:5 87:1,23  
91:19 95:25 97:1,21 100:4,18  
101:15 111:20,24 114:1,2,7  
119:3 124:14 131:5 137:3,24  
141:23 143:6 144:9 152:20  
156:15 159:21 160:9,19

**believed** 113:15

**bell** 15:7 149:18

**below** 35:22 95:24 139:4  
150:6,15,20 152:22 154:7  
157:22

**besides** 160:1

**best** 26:20 134:13 140:20  
141:11 160:11

**between** 42:9,14,18 84:7  
85:7,8,12 96:10 109:22 110:10  
111:15 116:15 122:6 131:18  
136:8 144:19 156:16 157:2

**beyond** 146:19

**bills** 12:20

**bio** 77:11

**Bir** 9:3

**bit** 37:18 53:7,8

**blank** 28:10,13,15,17,25

**blanked** 113:12 114:13

**blue** 143:4,5,19,20 145:6,25

**board** 16:23

**body** 92:16

**both** 9:13 59:13 79:10 90:6,18,  
24 93:13

**bottom** 29:10 44:16 60:2 65:1  
70:16 73:5 81:13 132:1,11  
134:3 136:20

**bound** 110:24 111:1

**boundary** 40:22,24 41:2

**box** 136:15,21,25 137:10,19  
140:8 141:6

**break** 7:9 42:20 50:8 52:14,15  
77:11 79:25 81:7,8 103:2,3  
128:21,22 148:11,12 165:4,5

**breaking** 51:3 102:16

**briefly** 24:11,12

**bright** 42:17,24 106:23,25  
109:18,19,21 110:15,17,24  
111:3 123:4,5,11

**brighten** 128:17

**brighter** 103:19 106:16,19,23  
107:8,19 108:6,10,13,17,20,  
22,25 109:3,6,11,15,23,25  
110:3,5,6,9,14 111:6 115:18  
116:1 125:19

**brightness** 43:3 62:21,25  
83:17 84:6,8,25 85:6,8,12,15  
123:13

**brightnesses** 128:4

**bring** 85:16

**broad** 32:9 106:4

**broadly** 36:4 62:19

**Brooks** 9:7

**BS** 60:9

**build** 45:2,12 53:18 54:6

**building** 44:24 45:9

**builds** 156:22,24

**bulb** 125:19 127:19

**bulbs** 124:24 125:5,7,17,22  
126:8,25 127:7,19 128:4

**burn** 107:15

**busy** 13:24

---

## C

---

**C-U-R-I-A-M** 15:5

**California** 20:13

**call** 31:7 46:19 141:17

**Calls** 36:15 41:8,17 61:18  
66:3,10 79:3 81:22 82:20  
83:14 85:1 103:15 107:10  
108:1 116:9,23 120:3 122:8  
123:21 125:10 127:21 129:24  
131:12 134:10,18,24 135:16,  
25 137:1,21 143:10 146:14  
150:9 153:5,21 154:23 155:4,  
13,25 156:18 158:6,17 159:17  
160:5 162:8 163:12 164:19

**came** 56:21 152:19

**camera** 19:8 97:19 99:1  
159:23 160:1,3

**cameras** 19:10,19

**can** 5:12 7:5 10:19 11:8 15:17  
18:6 19:17,22 23:7,10 27:11  
30:2 41:2,19 42:13 56:11 60:7  
62:19 63:5,22 64:7 65:20  
66:16 70:22 73:8 75:1,5,24  
76:17 77:7 84:9,10,11,15,20  
86:12,16 89:22 90:6,12 91:9,  
18 92:18 93:21,25 94:5 95:9  
97:5 100:23 101:5 102:13,14  
104:22 105:22,24 106:4,5,9  
107:8 109:2 112:6 113:2,16,22  
114:5,8,9,24 115:11,12,19  
116:5 119:3,22 121:15 123:20  
127:17 129:7,10,13,19,22  
130:20 132:6,9,16,19,23  
133:6,19 134:2,5 136:24  
139:16 142:2,17 143:18 145:2  
149:25 150:1 152:16 156:15  
157:9 158:10 159:25 162:10,  
14,16,18,21,22,24 163:24  
164:22

**can't** 34:10 38:22 63:11 98:7  
103:18 105:13,17 110:17,21,

24 112:5 158:20

**cannot** 147:5

**capability** 112:21 162:4

**capable** 119:22

**Capital** 15:1,6,9

**car** 41:1 142:8 144:2 152:5,9  
153:9

**carries** 106:13

**carry** 148:5

**case** 7:23 8:6 10:2,8,9 11:20  
13:14,21,23,24 14:1 23:14  
24:4 25:3 26:9 29:1 30:19  
32:16 33:23 34:13 35:5 36:8,  
10,11,12 37:8 47:10 95:19  
117:23 127:18

**cases** 9:24 10:8 11:2,3 18:10  
98:17

**categories** 106:22

**cause** 12:16,17 83:4 86:12,17

**causes** 82:25

**caveats** 70:11 128:18

**center** 135:22 144:1,21

**centerline** 143:23,25 144:3

**certain** 86:3,6 113:16 127:20  
128:11 155:17

**certainly** 23:19 54:15 104:9  
138:12

**CFR** 48:18,24 49:4

**challenges** 50:13,14

**change** 28:22 39:9,14 41:15  
82:15,17,19,25 83:2,4,17 86:7,  
8,9,10 92:18 102:13 125:8  
157:16,25 158:16

**changed** 39:11 41:12 125:1  
126:14 127:2,10

**changing** 76:24 77:4,23  
78:15

**characterization** 145:15,20

**characterize** 122:22

**characterized** 89:7

**charging** 13:10

**check** 64:5,7 119:3

**Chicago** 16:19

**circumstances** 103:25

**citation** 48:17

**cite** 37:19,22 46:13 47:22  
57:25 59:7,10 80:12 132:1

**cited** 35:9

**citing** 37:21 47:16

**claim** 66:1 81:14,17,20 82:8,  
11,18 83:13,22 84:4,23 85:18,  
25 89:15,17,21,24 90:2,6,9,17,  
20,23 150:1,2,3,8,13,14,20  
154:6 156:10,13,16,22,23,24  
157:3,13,14,17,18,21,22  
158:1,2,11,15 159:1,2,3,4,10,  
11,14 160:16,18 161:6,10  
163:25

**claimed** 59:25

**claiming** 126:21

**claims** 50:21 51:11,16 58:13  
62:7,12 63:2,13,17,20,24 64:2,  
6,12,15,20 78:22 79:6 81:3,12  
89:13 156:6 158:5,20 160:13  
163:6 164:1,10,14

**clarification** 7:13,15

**clarify** 29:13 152:16

**clear** 29:8,18,20 90:23 94:16  
116:12 155:20

**close** 20:3

**co-author** 34:17,18

**code** 37:22 46:13 47:22 48:21

**collaborated** 138:12 139:24  
141:4 144:25

**colleagues** 144:25

**colloquially** 84:10

**color** 40:18 44:12 86:8,12

**column** 65:19 70:15,17,19  
72:6,8,10 73:5,6 75:16 76:2,17  
77:22 78:13,25 80:12 81:12,  
14,17 82:8 83:9,25 85:18  
89:14 93:7 95:25 99:16,17  
101:4 124:22 126:4 132:2  
159:11

**columns** 68:18

**combination** 45:19 50:19,25  
51:9 90:14

**combinations** 90:12,22  
124:13

**combine** 49:18,22 50:2

**combined** 45:24 46:7

**combining** 22:11,14 44:17,22  
45:8

**come** 25:8 56:25 140:6 145:1

**comfort** 130:13

**coming** 24:20 82:1 83:18  
108:13,23 133:14 145:5

**commands** 96:2

**comment** 158:21

**commented** 68:8

**commercial** 71:24

**commercially** 64:18 71:14,  
21,24

**common** 152:5

**commonly** 152:5

**communicated** 30:18

**company** 10:13,20 11:9,10,16  
12:21,22 13:4 20:12 54:25  
55:2,5

**compare** 39:20 159:4

**compared** 106:25 107:2  
109:3 131:20 157:7 158:9,19

**comparing** 28:2

**comparison** 157:8 159:2,8

**complete** 53:23

**compliance** 62:7 147:15

**complicated** 84:18

**complies** 144:7

**comply** 107:19 108:6

**components** 55:14

**composed** 129:12

**comprises** 65:22

**comprising** 101:9 102:1

**computer** 17:2,10,19,21  
18:12,19 19:1,4,5,11,14,18,22,



24 20:4,13 21:5,10,14,17,24  
22:6,15,18 56:15

**computer-based** 18:5

**concept** 62:24 123:16 131:8

**concepts** 131:19,20

**conceptual** 133:14

**concern** 12:16

**conclude** 137:16

**concluded** 165:11

**conclusion** 36:16 61:19 66:4,  
11 79:4 81:23 82:21 83:15  
85:2 150:10 156:19 158:7,18  
159:18 160:6 162:9 164:20

**cone** 142:13

**conference** 149:20,23

**configuration** 126:11

**confirm** 12:10 76:15

**conflict** 12:6,12

**conflicts** 15:10

**confused** 33:22

**connected** 138:1

**consider** 12:13 15:9 39:17,23  
83:21 88:11 109:19,22 123:25  
161:12,15

**consideration** 45:17

**considerations** 53:11,16

**considered** 32:22 33:5,7  
36:6,21 37:3 40:2 44:17 49:9  
85:21 107:4 109:21 110:6  
120:23 121:8,12

**considering** 35:20 113:14  
114:6,14

**context** 46:1 75:15 77:18  
79:7,13,17,19 81:25 82:22  
83:16 86:7 91:17 95:2,12  
100:4,17,18 102:24 103:13,18,  
23 106:5,7,20 109:20 111:4  
116:17,18 117:23 120:18  
121:23 122:3 123:20 152:24  
162:5 164:21,25 165:2

**contexts** 62:20 84:9 106:8

**contiguous** 23:6

**continue** 29:13 31:6

**continues** 37:19 46:11 70:16

**continuously** 76:13

**contrasted** 101:11

**control** 53:6 60:14 76:3,12,16  
91:13,20,25 163:8,11,18,21  
164:2,5,9,12,16,18,24

**controllable** 80:8 89:18

**controlled** 99:21 129:13,23  
130:10,20,21

**controller** 93:11,15,22 94:1  
96:2 97:20

**controls** 92:3,7

**conventional** 101:11

**convince** 45:18

**cornering** 43:18,25 44:6,13  
123:18

**correct** 5:21,22 6:20 9:11  
11:18 12:1,23 13:2 15:24 16:3,  
9,21 17:5,17,18 20:9,10,22  
21:3,25 22:1,4 23:17 30:21  
31:2,13,24 32:2,3 33:11,16  
34:2,5,16,17,19,20 35:8,14,22,  
23 36:8,9 38:4,5 40:19,20  
46:14,17,18 48:7,22,23 49:23  
51:17,21 52:11 55:10,18,25  
56:3,6,18 58:1,2,6 59:2,8,9,10,  
12,14,15,18,25 60:5,17 62:5,6  
65:24 66:2,9,20 68:2,11,14  
69:1,5 70:8 71:6,14 72:3,5,14  
73:20 74:17 75:23 77:5,24,25  
78:4,17 79:11,21 86:14,22  
87:1 88:8 89:6,19,22,25 90:4,  
8,19,25 91:6,18 92:19 93:22  
94:1,24 97:11 99:14,15 100:1,  
2,23 101:1 102:11,13 106:10  
108:3,18 109:7 110:18,25  
112:3 113:11 114:16 115:1,7  
118:4,10 119:10,11,12,14,15,  
24,25 120:2 121:6,24 122:4,14  
123:12 124:13,17 125:5,9,24  
126:5,9,16 127:4,7,12,16,20  
128:11 129:16,20,23 130:17,  
23 131:3,11,24 132:3,17,21,25  
133:11,20 134:3,6 135:5  
136:13,14,22 138:15,21,24  
139:2,3,7,10,11 140:3,4,12,19  
141:4,5,10,11,16,25 142:5,14,  
15 145:21 146:13,24 147:9,16

148:1,22 149:12,13,15 155:19,  
24 156:10 159:5 160:14  
161:17,21 164:6,15

**correctly** 12:24

**corresponded** 30:11

**could** 12:9,16 15:12 19:7 45:5  
46:4 47:7 49:20 50:2,15 51:9  
63:21 73:1 77:10 85:6,11,15  
90:3 106:17 107:4,13 108:17  
113:18,22 119:19 120:1,6  
122:20 123:11,19 124:23  
125:17 130:7 134:17,23 135:7,  
11,15,22 137:11,17,20 144:3,  
17 151:10 152:21 153:8,25  
154:25 159:23 160:3

**counsel** 141:3

**count** 23:8

**couple** 51:5 115:23

**court** 7:3 9:24 10:2

**create** 141:4 144:23

**created** 138:10,11 139:23  
144:24

**creation** 98:8 138:12

**cross** 143:20

**Curiam** 15:1,5,9

**current** 16:17

**curvature** 82:23 86:4 150:4,7,  
17 157:14 158:2,15

**curve** 83:7 119:20 141:17,21  
142:6

**curves** 72:19 124:16

**CV** 20:8,16 21:13 23:18,19  
35:14

---

**D**

---

**D'** 136:21

**dark** 42:17,24 63:11 105:3

**darkness** 43:3

**data** 75:22 97:19 99:22

**date** 61:13,16 62:3,4 70:18  
144:6

**David** 9:3

**day** 23:9 105:2 131:9

**days** 23:9 161:1

**deals** 39:6

**decided** 28:23 29:1

**declaration** 5:19,20 7:21,22,  
25 8:3 9:8,17 12:9 14:13,15  
23:25 24:4,19,23 25:1,20,23  
26:1,9,14,17,21,24 27:3,5,9,  
15,16,21,23 28:18 29:5,14  
30:3,15,16,21 31:25 32:5 33:7,  
10,18,20 34:8,12,14 37:11  
38:14,23 39:1,18 46:22 47:17  
49:1 58:13,24 59:16,21 61:1,  
10,11 64:16,25 65:10 67:6,11  
68:9,20,22 69:15 70:2 73:14  
74:11 75:11 77:8 78:3,7 79:16  
80:1 82:6 83:23 85:22 86:19  
87:17,20 88:13 97:2,8,10  
103:7 106:13 108:15 111:4  
115:16,21 118:17 121:16  
122:17,24 131:22,23 136:8,10  
138:6 144:17 145:21 148:21  
149:1,6,10 155:17 156:5 157:9  
158:10,25 159:20 160:10  
161:1,17,23 163:21,25 164:6

**declarations** 9:10,13 10:23

**declarative** 78:9

**decreased** 95:16,18,20,22

**define** 19:5 54:3 62:18 96:20

**defined** 56:22

**defines** 96:12

**definitely** 34:13

**definition** 46:6 75:25 123:14

**definitions** 164:7

**degree** 60:9

**department** 17:11,14

**depend** 13:23 41:19 42:6  
49:25 105:6,14,25 106:1  
125:12,15 128:4 148:6 162:20

**dependence** 132:13

**depending** 128:18 132:20,24

**depends** 13:21,24 41:10 42:2  
50:3,24 51:1 106:5 107:23  
110:1 128:19 152:15 153:17  
162:5

**deposed** 6:20 9:19 10:2,16,23

**deposition** 5:17,18 7:20 8:18,  
20,22 9:8,17 23:22 26:4 33:13  
61:4 64:13 87:9 124:6 126:1  
128:25 142:17,19 148:15  
165:11

**depositions** 9:25

**describe** 79:12,15,22 102:25  
108:24 109:1,11,14 116:18  
142:2 143:18 145:2 153:24  
157:7 162:3

**described** 35:22 40:8 74:5  
76:4 78:14 88:13 94:13 95:8  
99:25 101:21 128:15 130:19  
152:13

**describes** 37:1,8 41:3 67:16  
77:16,23 78:2 79:10,20 91:10  
93:20 97:15 100:14 110:15

**describing** 41:4 77:4 93:13  
94:6 100:18 101:15,18,23  
132:19,23 146:18,25

**description** 71:11 79:1

**design** 44:25 45:1,2,3,4,10,  
11,12,13,14,20,21 48:14 49:7,  
13,17,21 50:1,13 53:11,15  
125:13,15,17

**designed** 52:18,21,24 55:17,  
21 128:18

**designing** 44:24 45:9 53:20

**desired** 132:11,13,20,24

**detail** 37:8 38:8 44:2 54:15  
97:2,6 117:25 120:24 121:8,9,  
13 126:20 137:13,25

**details** 12:9 41:20 148:6,7  
154:18

**detected** 96:14 97:18 99:14

**detecting** 98:13

**determine** 61:25 62:2 86:7  
96:22,23 123:5 151:16 152:17  
154:12

**determined** 96:16

**determines** 91:11

**determining** 12:5,11 15:9  
49:18 100:8

**deviation** 131:15

**device** 73:15,18 75:12 88:1,2,  
4,7,11 95:23 116:5 159:25

**devices** 39:7 88:15 90:2

**diagram** 133:14 136:16 138:7,  
10,13,14,16,17 139:4,7,9,19,  
23,25 140:2,5,16,24 141:3,14,  
20,23 145:2

**dictate** 155:9

**dictating** 110:13

**did** 7:19 8:6,8,10,14,17 9:13,  
16 15:9 18:16,17,19 19:13  
24:8,9,10,19,24 25:13,19  
26:12,14 27:2,8,18 28:11  
31:21,23 32:4 33:13,15,18  
34:7,24,25 35:1,3 37:5 38:6,  
14,15,18 39:17,23 40:6 46:21,  
23,24 47:11 48:24 52:2 54:9,  
11,12 57:22 58:7,8 61:25 63:1  
64:11,14,15 75:5 76:9 78:7  
83:21 108:20 111:7 133:4  
144:23 151:24 152:22 158:10  
160:20,23 161:15,21 164:9

**didn't** 24:22 28:22,24 29:2,21  
35:6 38:8,17 39:20 58:3 62:2,4  
78:11 108:21 117:21 139:25  
154:10 159:4 161:9,10,12

**difference** 42:9,13 84:7,12  
122:6 145:24 156:16,22  
157:25

**differences** 145:5 156:21  
157:2,6,10,12 158:3

**different** 29:22 42:11 44:18  
62:20 65:22 84:9,15,20 89:4  
92:11 94:6 106:8,9 113:21,25  
122:18 127:15 130:18 145:16,  
23 159:3,6,7 163:1,14

**differently** 92:12 163:15

**digital** 88:7,11,15 90:2 92:17  
93:3

**dimension** 132:16,23 133:4,  
5,7 134:6

**dimensions** 132:12

**diodes** 89:22 90:7 91:6

**direct** 124:16

**directed** 95:22 99:19 100:15,  
17,23 121:19 122:13 150:6

<b>directing</b> 46:2	<b>distribution</b> 77:2 83:10,13,22 86:9,12 125:1 126:14 127:2, 10,14	103:17,22 104:1,6,9,13,24 106:2 107:22 108:8 111:24 112:8,14 115:3,10 116:25 117:25 120:13,17,22,24 121:2, 9,22 125:23 126:7,10,12,20 128:7 131:4,21 135:18,20 136:5 137:3,13,14,24 138:2,11 143:14 144:13,24 148:25 149:5,22 151:19 152:24 153:7 154:5,10,18 155:15,22 156:2 158:21 159:7,19 160:8 161:1 162:1 163:7,20,22 164:7
<b>direction</b> 20:5 46:4 76:25 80:6 85:19,25 86:3,6,13,17 91:23 92:18,21,23 100:19 102:15 123:1 128:11 132:13, 20,24 133:4 150:4,7,16 157:14,15 158:1 159:24 164:16	<b>District</b> 9:24 10:2	<b>done</b> 21:24 73:24 146:18 155:7
<b>directions</b> 101:2 127:20	<b>divert</b> 93:1	<b>dots</b> 138:18,20 140:6,7
<b>directly</b> 13:1 41:1 134:13 138:16 158:9 159:5	<b>diverting</b> 102:19	<b>dotted</b> 142:2,6,12,23 145:6,8, 24,25
<b>director</b> 17:16	<b>DLF</b> 80:7	<b>down</b> 31:7 37:18 42:21 60:2 67:23 70:15 115:22,23 139:19 160:25 161:3,11
<b>disagree</b> 58:14	<b>DMD</b> 88:8	<b>Dr</b> 5:8 24:1 26:6 33:11,18,20 34:8,13,14,16,17,18 52:18 57:18,20 58:1,9,17 59:13,17 81:11,15 87:12 103:5 124:8 129:2 143:2 144:5,8 148:18 155:19 163:9
<b>disbursed</b> 100:5,6	<b>Doctor</b> 61:8 149:17	<b>draft</b> 25:7,8 140:1 144:25
<b>disciplines</b> 18:2	<b>document</b> 24:1,3,10 26:6,8 29:16 33:24 38:16 47:8,11 61:7 87:14 89:14	<b>drafts</b> 27:17
<b>disclose</b> 67:3 149:14	<b>documents</b> 8:2 9:16 32:20, 22,25 33:2,11	<b>draw</b> 41:2 116:15 144:3
<b>disclosed</b> 52:10 71:4 91:21	<b>does</b> 5:23 6:1 12:21 13:23 15:7 16:11,13,14 17:7,23 20:1, 17 39:13 42:6 45:24 63:11 67:2 68:4,7 69:10,19 70:6 72:15 73:11 74:5 75:9 78:9,20 79:12,14,24 81:20 82:11,18 85:24 87:2,21,24 88:4 90:9,20, 21 91:3,7,20,25 95:12 96:6 100:3 101:13 102:4,19 103:13 105:5,10,13,25 109:1,5,15 110:9 120:8,12,16,20 123:2, 14,17 127:5 129:17 134:12,14 136:4 148:24 149:14,16,18 150:19 163:4 164:12	<b>drawing</b> 41:24 99:12 118:18 119:8,16 136:21 142:3,23 143:8 144:11,21,23
<b>discloses</b> 76:12 124:15 125:4 126:24 129:15,19,22 130:15, 18	<b>doesn't</b> 50:3 51:19 66:1,5,23 73:19 108:24 111:21,22 137:5 147:11	<b>drawings</b> 132:9
<b>disclosing</b> 125:21 126:8 132:15 133:17 139:13 146:11	<b>doing</b> 21:5 69:12 71:16 99:8 114:3,4,11	<b>drawn</b> 136:15
<b>disclosure</b> 71:13 129:18	<b>domains</b> 20:15	<b>drew</b> 42:6,16
<b>discuss</b> 49:6 78:20 90:22 112:10 148:22 149:11 156:9 164:5,7	<b>don't</b> 7:12,15 8:24 9:6,18,25 10:4 11:2,7,19 13:3 14:12,22 15:12 21:23 22:3 23:20 24:15 25:16,21 27:10,12 28:12,16 29:4 30:8,22 31:14,15,23 32:6 33:8,20 37:1,6,7 38:11,19,21, 24 39:4,12 44:1 46:8 47:5,7, 12,15,21,24 48:25 49:2 51:1, 23 54:3,14 55:24 56:1,16,24 57:24 58:14 63:15,20,24 64:9, 23 67:5,13,17 68:7,8,13,19,20, 21 69:3,12,14 70:1,12 71:16, 23 72:4,25 73:4,13 74:8,10,11, 14 75:3,10 76:9 80:19 81:2 83:8 87:4 95:11 98:16 102:23	<b>duly</b> 5:6
<b>discussed</b> 67:8 72:18 82:1 108:3 118:6 120:13 131:9		<b>dusk</b> 53:20
<b>discusses</b> 72:2,13 135:19		
<b>discussing</b> 8:23 25:2,7 56:9 67:19 70:13 74:10 77:6 78:22 81:2 131:24		
<b>discussion</b> 90:15		
<b>discussions</b> 8:25 25:4 32:16		
<b>disposing</b> 116:16		
<b>dispute</b> 15:22		
<b>dissertation</b> 21:1		
<b>distance</b> 41:13 42:3,7		
<b>distinction</b> 111:15 116:15 131:18		
<b>distinctions</b> 85:7,11		
<b>distinguish</b> 154:1		

---

**E**

---

**each** 80:7 93:9 95:3,4,7,19  
99:21 100:23 102:12

**earlier** 31:14 44:1 48:3 75:2  
82:2 131:9



**earliest** 61:13,16

**earth** 19:22

**ease** 25:25

**easiest** 97:3

**editing** 25:8 27:19

**education** 22:19

**effect** 86:9 91:23

**effort** 24:21

**eight** 163:1

**either** 71:5 93:23 95:9 100:20  
102:14 129:13

**electric** 149:3

**electrical** 60:10

**electronically** 80:10

**element** 163:9,11,18 164:12

**elements** 80:8,10,15,16 81:5  
150:13 163:21 164:2,5,10,16,  
18,24

**elevation** 162:23

**else** 8:17 9:5 17:23 19:5 25:15  
27:6 33:5 109:15

**emailed** 30:13

**embodiment** 76:22 78:14,20  
81:3 92:6 100:19 101:9,16  
130:5,8,19,25

**embodiments** 71:14 91:19  
92:2 129:17 137:12 149:16

**emits** 91:24

**emitted** 40:23 130:9 132:8  
133:10 146:8,12,23 150:5,20  
154:7 157:18,20,21

**emitting** 135:23

**employment** 16:17

**encompass** 110:9

**end** 65:23 75:7 77:14 80:24  
89:14 118:16 125:18 139:24

**ended** 128:16

**energy** 62:21,22 84:19 96:3  
104:16,19,21,23 150:25

**engaged** 72:22

**engagement** 31:1,12,16

**engagements** 12:13

**engineering** 57:7,13,15  
60:10,11

**Engineers** 57:10

**enough** 105:18,21,23

**entail** 117:5

**entire** 31:4 38:15 47:11  
114:15

**entirety** 58:7

**entities** 12:15

**entity** 12:6

**equal** 135:5,8

**equated** 95:4,6

**equates** 112:14

**equipment** 39:7

**equivalent** 60:12 112:12

**essentially** 17:15 26:25  
109:17 125:18,22 126:8

**estimate** 11:3,5 23:7 27:11,12  
141:11

**et al** 76:5

**Eureka** 149:17

**Evan** 16:2 30:4,6

**even** 19:19 114:24 126:21

**eventually** 25:6

**ever** 28:17 30:7,9,11,13 31:18  
39:9,11 47:2 52:18,21,24 53:4  
54:24 55:2,4

**every** 14:23 24:24 73:20

**everything** 41:12 69:14 78:11  
161:2

**everywhere** 106:16 108:17  
111:6 115:18 116:1,4,5,20

**exact** 12:3 111:2

**exactly** 10:4 11:19 19:21  
21:23 30:22 31:14,16 41:11  
102:24 115:10 131:15 143:14  
144:13 145:14 161:2

**EXAMINATION** 5:10

**examined** 5:6

**example** 6:13 18:6,8 19:18  
42:17 48:1,2,5,6 85:14 99:12,  
13 104:22 105:3 107:3 109:3  
122:21 129:11 133:10 135:9  
143:13 152:5,10

**examples** 48:11 56:21

**excuse** 19:13 38:15 40:17  
49:1 50:14 70:17 72:9 94:19  
96:22 115:19

**exhaustively** 78:11

**exhibit** 8:1,2 23:22,24 25:23  
26:2,4,18 27:21,24 28:3,4  
29:17,25 32:18,21 33:4,6,9,16,  
21,24 34:15 35:12,14 44:15  
46:16 58:25 59:8,10 61:4,6  
64:16,25 65:19 77:8 80:2  
86:20 87:7,9,12 97:10 103:7  
118:21,22 119:4 124:6,9,10  
128:25 129:2,5 131:22 132:2  
136:8 142:16,17,19,21,22  
143:2 144:17,20 146:1 148:15,  
17,21 156:6

**exhibits** 25:4 34:10,21 35:9  
38:3 48:21 118:25

**existed** 40:13

**existence** 40:3,6

**existing** 68:5,14 69:4

**exists** 40:13

**exiting** 80:7

**expect** 12:8 45:16 65:17 83:1  
118:5 120:14 160:7

**expectation** 140:20

**experience** 35:21 60:13

**experiment** 154:14

**experimentation** 45:18  
147:21,25

**expert** 11:4,6 12:13 22:15,18,  
22,25 55:9,12 56:15 57:1,7  
58:9,13,17 59:17

**expertise** 56:21,22,23,25

**experts** 59:1,4

**explain** 15:17 42:13 156:15

**explained** 108:19

**explanation** 124:20

**expressed** 25:10,22 161:22

**expressly** 125:4

**extremely** 122:20

**Eyes** 17:16

---

**F**

---

**Facebook** 11:9

**facial** 20:20 21:1,15,18,25  
22:7,22,25 23:1 56:16

**factor** 40:6

**factors** 14:2,4,8

**fair** 7:7,10,17 19:25 39:15 51:8  
89:5 104:8 139:13 141:21  
143:1 144:11

**fairly** 106:4

**falling** 96:3,7

**familiar** 14:10 15:1 16:12,15  
61:7 76:8 87:11 88:9,17,19,22,  
25 89:1 92:12 117:4 124:10  
129:5 148:18 149:17,19 163:8

**far** 41:6 76:19 115:22

**feasible** 70:25 71:2,5,6,21

**features** 44:17,22,25 45:3,4,8,  
10,13,14,20,21 72:20

**February** 24:5

**Federal** 37:25 38:10

**felt** 25:9

**few** 11:1,10 22:4 70:20 133:23

**field** 20:4 60:12 96:18,24 98:1,  
3,4,12 99:6 119:16,18,19,23  
120:2

**figure** 90:13 97:24 98:8,9,22  
118:19 119:9,17 131:24 133:9  
136:10,13 137:12 138:23  
139:2 140:4,6,12 141:10  
143:8,11,21

**figures** 68:18 97:25

**final** 138:12

**find** 35:3 37:11 58:4 75:6  
90:20 97:5 149:4 154:25 155:3  
157:12

**finder** 162:19

**finding** 152:4

**fine** 29:19 46:20 50:10

**finish** 50:6 73:22

**firm** 9:8 13:4

**first** 5:6 23:25 24:4 25:20,23  
26:16 27:1,5,15 37:21 47:2  
61:12 77:8 78:3,7 79:16 91:10  
127:8 129:8 130:7 140:1  
144:16,24 145:21

**FITZSIMMONS** 5:8,11 13:9,  
22 14:9 15:5,8,19 16:7 19:15,  
23 23:23 25:25 26:5 29:7,10,  
17,21,24 31:11 32:12 36:20  
39:22 40:5 41:14 42:1,8 43:5,  
10 44:10 48:12 50:4,9,11 51:5,  
7,15 52:1,8,13,17 53:3 55:8,  
16,23 57:3 58:16,23 60:23  
61:5,24 62:11,17 63:7,16,22  
64:1,6,10,24 66:7,14,18 67:1,9  
68:10,24 69:9 70:5,14 71:12,  
18 72:1,21 73:17,22 74:4,13,  
22 75:3,8 77:7,12 79:9 81:6,10  
82:3,16 83:3,20 84:22 85:10  
86:18 87:6,10 91:5 93:19  
94:13,15,17 95:5,17 96:13  
97:4,9,12,22 98:11,19 99:4  
100:13 101:3,24 102:17,18  
103:1,5,6,21 104:5,18 105:12,  
20 107:6,17 108:2 109:13  
110:3,8,16,23 111:14 112:24  
113:24 114:22 115:4,15  
116:14 117:3,13,19 118:1,15,  
23 119:2,7 120:7 121:1,6,11  
122:10,11 123:10 124:2,7,21  
125:14 126:23 128:1,5,21  
129:1 130:2 131:17 133:5,8,16  
134:1,16,22 135:3,21 136:7  
137:8 138:5 139:18 142:16,20  
143:17 146:21 147:23 148:10,  
16 149:24 150:18 151:3,22  
153:12 154:4,15 155:2,10,16  
156:4 157:1,11 158:14,24  
160:2,12 161:14,24 162:12  
163:3,17,23 164:23 165:3,7

**five** 8:16 50:9

**five-minute** 165:4

**fixture** 76:22 77:2 88:4

**Flaaten** 28:3 148:17,22,24  
149:1,11

**FMVSS** 38:1,6,15,23 39:3,6,  
11,17,21,23 40:3,15 43:6,11,  
14,17,20,23 44:1,4,11 46:7  
48:4,7 108:3,7

**focus** 20:1 54:4,6

**focused** 54:2

**focuses** 19:24 20:2

**fog** 43:15,24 44:5,12 120:20,  
23 121:3,8

**following** 60:4

**follows** 5:7

**forget** 128:16

**form** 20:6 157:8

**formed** 35:19

**former** 105:24

**forth** 27:18

**Forty-eight** 80:3

**Forty-one** 80:5

**Forty-two** 67:14

**forward** 52:24 55:9,13,17,21,  
24 56:2,5,9,18 58:10 59:1,4,17  
91:12 120:8,12,16,20 121:2,  
14,20,24 122:1,3,4,6,7,13,16,  
18,19,21,22,25 123:16,17,24,  
25 124:3 144:2 145:17

**found** 35:10 90:11

**Four** 17:16

**frame** 110:1

**France** 20:19

**Friday** 8:9,10

**from** 6:10,14,17 14:23 19:24  
21:13 33:11 34:2,4 41:6 42:3  
44:18,22,25 45:3,4,8,10,11,13,  
14,20,21 49:3 52:16 60:24  
67:2,19 71:11 76:5 79:16 80:7  
81:9 91:24 92:13,16 94:4,18,  
21 99:22 102:6 103:4 108:13,  
23 111:12 118:21 123:11,14,  
17 124:16 127:19 128:23  
132:10 133:10,14,19 134:3  
138:14,17,18,19 139:1 140:5,6  
141:24 143:15 144:2 148:13  
152:2 159:3 165:6

**front** 41:1 52:22 89:10 92:6

120:10 124:4 142:8 153:10

**frontal** 72:2,9,13,16,23 73:2

**full** 5:12 36:12 55:21 95:10  
 140:4 145:6,7

**functions** 44:18

**fundamentally** 57:6

**further** 37:18 41:15,21 67:23  
 164:1 165:7

**future** 71:3

## G

**gave** 69:25

**general** 18:5 31:17 36:17 46:1  
 55:4,14 66:13 72:5 74:1 81:3  
 84:14 98:9 100:11 101:20  
 102:23 103:17,22,25 104:13  
 106:20 107:22 111:24 116:17  
 117:22 120:19 121:25 123:13,  
 19 124:20 127:24 145:22  
 152:23 153:7 163:10

**generally** 37:21,23 38:7,9,24  
 39:14,16 40:8,22 49:13 62:20,  
 24 73:15 75:12 93:5 95:15  
 98:4,12,17 120:10,15 122:25  
 123:1,8 148:5 162:3 164:11,16

**geometrically** 116:12,15,21

**geometry** 96:10

**gets** 105:2

**getting** 67:13 148:9

**give** 18:6 58:19,21 69:13,24  
 70:19 97:1 104:22 146:4

**given** 70:12 134:14 136:2  
 140:20 147:4

**gives** 131:5

**go** 11:11 20:6 35:16 37:16  
 46:9 50:4,6 65:18 70:15 77:7,9  
 81:12,14 87:19 89:13 91:7  
 92:20,22,25 93:2 94:14 101:4  
 103:7 112:10 121:15 124:22  
 130:3 132:5 139:19 141:14  
 145:14 146:2 148:20 153:3  
 156:5,9 157:9 163:24

**goal** 53:18 99:7

**goes** 65:3 77:14 92:13 123:24

144:1

**going** 14:2 29:13 48:3 61:6  
 95:23 123:16 124:8 127:19  
 129:2

**good** 5:8,9 6:6 27:12 51:3  
 88:24 102:16

**got** 20:23 72:12

**Gotcha** 119:5

**Gotou** 124:8,12,15,22 125:4,  
 21,24 126:1,7,10,21,24 127:5,  
 6,9,14,17,23,25 128:3,6,7

**govern** 118:3,10

**government** 39:5 50:16,20  
 51:10,20 52:2 62:8 107:20

**GPS** 75:17,19,22 162:2,3

**grab** 87:6

**graphics** 20:4

**grid** 129:12

**ground** 142:7

**group** 156:6

**groups** 129:14,23

**guarantee** 148:8

**guess** 21:23 23:13 39:4 45:23  
 82:24 100:7 107:2 110:1  
 140:20 143:15 152:9 153:17

**guessing** 8:12 24:18

## H

**had** 8:25 12:5,13,14 15:10  
 27:4 31:18 60:9 72:22 82:1

**half** 8:12 23:12 136:16,20

**hallway** 78:23 79:13,18,19

**hand** 61:6 129:2 160:25

**hanging** 142:21

**happen** 147:1,3,12,22

**happens** 126:19

**happy** 68:23

**hard** 23:4 105:9 106:6 146:19

**hardware** 66:2,6

**has** 31:5 39:11 40:13 42:23  
 44:24 45:3,9,13 46:2 47:14  
 60:4 62:21 86:3 103:10 130:15  
 136:3 147:10 151:1 152:5  
 157:24

**have** 6:21 9:7 10:1,2,6,7,8  
 11:6,11 12:12,14 13:25 14:17  
 15:12 16:5 21:17,20 22:4  
 27:12,16 28:17,21 30:7,9,11,  
 13 36:10 38:19 40:25 44:17  
 46:25 47:2,7 48:17 49:5 52:18,  
 20,21,24 53:4 54:24 55:2,4,24  
 56:10,16,24,25 58:14 59:22  
 60:9 64:5,6,18 65:1,13 66:8,19  
 68:4,12,14 69:4,10,20 70:7  
 72:5 73:1 74:11,14 76:7 79:5  
 80:22 84:15,20 85:17 88:3  
 89:14 93:4 95:11 98:22 99:17  
 102:9 105:1 108:14 111:12  
 112:2,4 117:10,22 119:2  
 121:9,12 125:20,23 126:7,22  
 128:8,15 129:17 131:21  
 136:16,21,25 137:10,20 141:4  
 142:25 143:20 146:3 151:9  
 153:9 154:5,12 155:7 158:9,  
 19,21 159:7 160:23 163:22  
 165:7,9

**haven't** 9:9 11:23 52:6 56:2,5  
 83:6 120:14 131:20

**having** 5:6 25:4 39:12 44:18  
 59:23 131:10

**he's** 32:10 59:13

**head** 7:6 83:7 104:25 126:12  
 150:12 154:2 155:6 159:21

**heading** 49:7

**headlamp** 40:23 42:3 52:18,  
 21 54:24 82:1 83:19 86:6  
 91:24 96:8,15 101:14 107:18  
 108:5,9,10 119:18 125:7,13,16  
 128:8 130:15 133:11 137:11,  
 20 139:17 141:24 142:8,15,25  
 143:1,22 144:10,13

**headlamps** 40:10 51:17  
 52:11 58:18 64:19 65:16 68:2,  
 5 69:21 70:8 73:20 76:16  
 104:2,7,11 105:5 107:7 117:6,  
 19 124:16 129:15,20 148:24  
 149:15 152:6

**headlight** 124:25 127:1 143:6

**headlights** 67:3 76:13 86:25

97:15 101:11 108:14,23  
130:18

**heard** 31:18 72:23

**hearing** 32:14,15 72:25

**heat** 69:20 70:7

**here** 5:14 6:7 7:3 8:7 11:22  
12:18 18:8,9 34:10 35:9 37:3,  
15,16 40:12 43:2 51:5 59:16  
69:19 72:18 73:14 74:2,14,21  
75:11,15 76:11 78:12,20  
79:12,23,25 82:14,22 85:6,9,  
13 94:13 96:12 99:12 100:1,4  
104:9,24 105:13 108:15 109:5  
110:9,15 111:1,5,19,25 112:9  
119:8 120:13,23 121:25  
122:12,17,19,23 125:22  
126:13,24 130:19 132:15  
133:17,23 143:11 144:3,8  
145:2,20 148:8,9

**here's** 143:4

**herein** 99:20

**high** 43:7,21 44:5,12 65:2 74:6  
106:16,19,21,22 108:16 109:2,  
6 110:14 111:6 115:17,25  
120:16 122:19 123:1,2 151:14  
152:6,18 153:9

**high-beam** 107:9,19 108:6,  
10,13,22,25 109:11,15,21,23  
110:10 112:12,15 116:8,22  
117:1,5,15,16,22 118:3,10  
150:6,15,21 151:2,5,8,10,16,  
20,23,24 152:1,3,4,7,11,12,14,  
18,22 153:4 154:7,17,22  
155:23 157:22

**high-intensity** 121:20  
122:13,16,22

**higher** 13:14 103:19

**hit** 142:7

**hole** 135:22

**hoped** 148:9

**hour** 13:12 24:16,17

**hourly** 13:17,19

**hours** 8:13,16

**how** 6:22 7:19 8:10,14 10:14  
11:3 13:10,23,24,25 14:1,6  
18:4 19:5,20 20:2,5 21:20 22:2  
23:3,7 24:14 25:19 27:8 30:22

31:16 35:1,3 37:7 38:12 40:6  
41:6,15 42:24 53:22,24 54:3,  
16 61:25 62:18 73:15,18 75:12  
76:19 78:6 85:8 86:5 90:11  
91:25 92:9 95:6 96:6,15,20,22  
97:6 101:17,21,25 102:4  
104:10 108:9 115:22 122:22  
123:5 128:16,18 131:5,15  
138:1,3 139:16 140:22 146:18  
147:1,3,11,25 148:5 151:13  
152:13,17,19 153:3,7 158:23  
160:10 162:5,20

**however** 135:10

**human** 22:12 62:23 84:17,19  
85:16 123:8

**human-computer** 17:25  
18:3,6,24

**humans** 18:11

**hypothetical** 128:13 143:7,10  
152:9 153:18,19

---

## I

---

**I'** 136:17

**I'D** 105:10

**I'LL** 6:24 7:3,16 26:20 29:17  
37:24 57:19 65:18 69:17,24  
70:3,19 72:6 79:25 87:19  
144:5 146:2,3 162:25

**I'M** 8:12 10:1,12,24 12:3,24  
16:18 19:20 26:17,21 27:7  
29:7,8,12,18 30:10,12,14,19  
31:7 35:4 36:23 39:10 42:5  
43:2,9,13,16,19,22 44:2,9,14  
47:4 52:7 55:12 56:7 57:1,7,  
11,14 59:3 61:6,20 68:23,25  
69:8,18 76:8 79:6 80:24 88:9,  
17,24 91:7 92:12 94:3 97:6  
100:11 107:15 111:1,2 112:15  
116:12 117:11 118:7,13 119:5  
124:8 129:2 131:15 135:1  
137:5,6 142:21 149:3,4 151:10  
152:17,19 153:1,2,18,19 154:2  
155:9 160:10

**I'VE** 8:23 11:1 12:13 18:23  
23:1 36:11 38:7,10,12 47:9  
55:20 58:12 61:21 64:22 70:12  
80:24 108:12,21 118:6 120:17,  
23 121:7,22 153:23 157:7

**I-N-D-E-C-T** 10:15

**idea** 108:14

**ideally** 73:16,18 75:6,13

**identification** 23:21 26:3  
61:3 87:8 124:5 128:24 142:18  
148:14

**identifying** 19:2 99:9

**illuminate** 20:7

**illuminated** 41:3

**illuminating** 57:15 120:10  
122:1,4 142:11 145:16

**illumination** 43:4 53:21 54:2,  
4,7,9,13,16 76:25 77:5,24  
78:16 120:8,12,16,20 121:2,  
14,20,24 122:3,6,7,13,16,18,  
20,21,23,25 123:16,17 124:1  
125:2,19 126:15 127:3,11,15,  
16 128:17

**illuminations** 40:10

**illustrates** 141:15,18,20

**images** 19:2,7 20:7

**imaginary** 144:1

**imagine** 107:12 125:17

**imaging** 17:3,24 18:24 20:13  
21:12 55:12,14 99:22

**impact** 53:22

**implications** 84:16,20

**important** 49:14 54:8,15 65:6,  
15 160:24 161:3,6,10,12,16,  
21,25

**improved** 68:4,14 69:4,10,20  
70:7

**incandescent** 139:17

**include** 17:23 18:7 34:15 56:9  
74:6 87:24 90:6 109:16  
120:12,16,20 121:3 123:17  
135:14 136:9 163:16

**included** 21:10 38:3 53:10,15

**includes** 17:21 87:23 89:17  
90:18,24 97:24 150:5,14  
160:16

**including** 18:23 36:7,22  
40:10 57:1

<b>incoming</b> 99:22	12 84:1,3,7,24 85:4,8,12,15	67:21 68:17 69:13,25 71:16
<b>Incomplete</b> 143:9	86:8,12 91:13 98:23 103:11,	72:10 74:2,20 75:24,25 76:15
<b>incorrect</b> 78:5	13,20,23 104:2,7,10,17 105:4,	78:21 79:13 84:16,23 85:5,8,
<b>increase</b> 85:19,24 86:2,5,13,	6,14,25 106:2,9 112:13,17,23	13 94:2,6 95:8 98:13 99:8,10,
17 127:20 128:11,17 150:3,5,	113:6,8,10,12,15,17,18,21	13 100:18 105:18 106:6 109:2,
14,16 157:13,15,17	114:2,7,8,10,12,15,20,24	14 114:12,15,23 121:25 122:1,
<b>increased</b> 13:17	115:1,6,13 122:19,21 123:1,2	2 124:9 129:3 133:13 139:15,
<b>increases</b> 157:19	130:9,11,16,22 131:1 150:24	23 140:20,21 141:11 143:12,
<b>increasing</b> 130:13	<b>intentionally</b> 28:10,15,17,25	21 144:14 145:14 146:11,19
<b>Indect</b> 10:13	<b>inter</b> 5:20 9:20,23 10:17 30:5	152:9 153:17,19 154:13 161:9
<b>independent</b> 127:24 128:3	<b>interact</b> 18:4,9	<b>itself</b> 53:19 65:18 88:4 90:21
156:23,24	<b>interacting</b> 18:11	112:14 115:11 140:3
<b>independently</b> 89:18 93:10,	<b>interaction</b> 17:25 18:3,7,24	<hr/>
14,21,25	<b>interest</b> 96:11	<b>J</b>
<b>indicate</b> 103:9	<b>interesting</b> 14:7	<hr/>
<b>indicated</b> 31:15 98:21	<b>interior</b> 55:5	<b>J-I-A-N</b> 57:19
<b>indicative</b> 25:9	<b>International</b> 10:21 36:18	<b>J-I-A-O</b> 57:20
<b>individual</b> 89:18 101:10 102:1	37:8 57:12 129:3	<b>Jeff</b> 9:3
<b>individually</b> 80:8 99:19	<b>interpret</b> 138:3 160:11 163:15	<b>Jian</b> 57:18
100:15 129:14,23	<b>introduce</b> 23:24 26:1	<b>Jiao</b> 33:11,20 34:13,14,16,17,
<b>individuals</b> 12:15	<b>intuitively</b> 84:5	18 57:18,20 58:1,9,17 59:13,
<b>industry</b> 50:16,20 51:11,21	<b>invent</b> 66:23	17
52:3 53:4 60:13	<b>invented</b> 66:8,19	<b>Jiao's</b> 33:18 34:8
<b>influence</b> 12:17	<b>inventing</b> 66:2	<b>joint</b> 24:21
<b>information</b> 22:12,13 91:13	<b>invention</b> 52:4 59:25 60:9	<b>Joseph</b> 32:13
124:15	65:12,21,22 70:23,24 91:11	<b>judgment</b> 123:9
<b>Initially</b> 25:2	130:8	<b>just</b> 7:3,9 21:21 23:10 24:17
<b>input</b> 19:22	<b>inventions</b> 71:20	26:1,21 28:22 29:9,13,19 31:4
<b>inputs</b> 19:24 20:1	<b>inventor</b> 16:2,8 32:11,17	42:22 45:23 46:19 50:3,7 64:7
<b>inside</b> 93:2	<b>invoices</b> 12:25 13:5	66:14,24 67:19 73:14 75:11,16
<b>installed</b> 124:25 127:1,7	<b>involved</b> 11:1 27:16 51:1 53:5	77:22 79:6,15 92:7 95:8,24
<b>institute</b> 16:19,24,25	<b>involvement</b> 22:20	97:9 101:18 104:25 106:6
<b>intelligence</b> 18:1,25 20:14	<b>involvements</b> 12:14	109:11,14 114:5 117:11 118:6
<b>intended</b> 85:17 109:10,14	<b>involves</b> 16:6	120:24 121:22,25 126:4,19
110:15 135:14 143:12 145:12,	<b>IPR</b> 10:19 24:4 31:6 34:2	136:2 143:13,21 146:3 155:20
17	<b>IPR2022-01586</b> 5:23 34:4,9	158:8,12 162:25 163:22
<b>intends</b> 147:7	<b>isn't</b> 66:8,19 71:13 78:3	<hr/>
<b>intense</b> 122:7	<b>issuing</b> 114:20	<b>K</b>
<b>intensity</b> 40:18 43:21,24 44:5	<b>it's</b> 10:12,21 13:15 15:12 18:4	<hr/>
62:13,16,18,19 63:1,3,6,8,10,	19:6 23:4,5,20 26:9 30:20	<b>Karlsson</b> 28:2 129:3,7,15,19,
	37:11 41:4 51:1 66:23,24	22 130:3,15,18,25 131:5
		132:2,5,15 133:9,15,24 134:9,
		12,14 135:19 136:2,4,24
		137:3,5,7,25 138:2,4,14,17,19,
		23 139:7,9,16 140:2,5,6,21,23
		145:11 146:1,2,7,11,16,17,22
		147:7,14 149:11,14
		<b>Karlsson's</b> 131:24 132:19,23



133:10,17 137:12,16 139:1,12  
140:11,17,18 141:9 143:6

**keep** 93:1

**key** 25:7

**kind** 54:16 76:15 84:18 88:23  
104:15,20,22 106:3 147:21,25  
148:5

**kinds** 19:8,11 78:23 89:4

**knew** 38:24

**know** 5:14 9:2 10:25 14:22  
21:23 22:2 28:14 29:21 30:22  
31:15 32:6,7,10,13 37:1,6  
39:4,6,9,11 43:6,11,14,17,20,  
23 44:1,4,11 46:6,8 47:15,16,  
19,21 49:4,15 54:3,22 57:18,  
20,21,22 58:15 63:15 64:23  
71:16 73:2,4 83:8 87:4 98:16  
103:17,22 104:1,6,13 106:2,3  
107:22 108:8,12 116:25 117:2,  
23,25 120:25 121:2 126:12,20  
135:20 136:6 137:15 138:3  
143:14 144:13 151:13 152:13,  
24 153:7,24 154:21 155:15,19,  
21,22 156:2

**knowledge** 14:19,20 32:4  
35:21 39:12 62:10

**known** 36:8 38:10,12 55:4  
65:13 73:3 76:12 88:8,15,18

**KSR** 36:8,18,23,25 37:1,7

**Kushman** 9:7

---

## L

---

**l/w** 70:25

**lab** 17:16,19 20:23

**label** 98:22 136:17

**labeled** 136:21 137:11,20  
138:7,21 139:4,20 140:25

**lamp** 44:24 45:3,9,13 65:24  
66:9,20,23 67:3,12,14

**lamps** 39:7 43:15,18,24,25  
44:5,6,12,13,18,23 45:8  
120:20,23,24 121:3,8 123:18

**language** 156:13 158:20  
159:1,3,7

**laptops** 18:8

**large** 19:20

**larger** 41:21,23

**last** 8:9 24:6,10 26:10,14  
69:25 73:6 137:24 157:24

**law** 9:8 13:4

**learned** 38:12

**learning** 18:1,25

**least** 23:12 34:18 41:20 60:12  
79:19 107:14 150:5 157:17,19

**lectures** 21:24 22:2

**LED** 52:19 55:2 58:17 69:11  
76:22,25 91:18 139:16 145:5,  
6,7

**LEDs** 50:15 51:16 52:10 63:18  
68:1,5,14 69:5 90:18,24 91:4  
92:7 101:14 129:13,15,19,22  
135:23 136:17,22,25 137:10,  
19 148:24 149:3,14

**left** 28:10,13,15,17,25 132:10  
133:19 140:15,18 141:13,24  
142:4,13,25

**legal** 11:19 36:6,15,21 37:12  
61:18 66:4,11 79:4 81:22  
82:20 83:14 85:1 150:9 156:18  
158:6,17 159:17 160:5 162:8  
164:19

**legally** 31:17

**lens** 92:14,16

**lenses** 163:18 164:18

**less** 24:17 145:7

**lesser** 107:3

**let** 15:20 37:11 42:20 73:22  
76:14 94:19 122:10 149:5

**let's** 23:11,24 27:23 29:5  
32:18 35:16 37:16 46:9 50:4  
52:13 59:20 61:10 65:19 70:15  
73:5 76:17 81:6,11 86:19 87:6  
89:13 90:23 99:16 101:4  
103:1,7 106:12 111:18 112:10  
117:15 124:22 128:21 130:3  
132:5 138:6 146:1,2 148:10  
165:3

**level** 59:23 60:4,7,16,19,24,25  
110:13 111:2 150:6,15,20  
151:20 152:22 154:7 157:22

**levels** 83:17 154:1

**LIFIA-IMAG** 20:16

**light** 40:23,24 41:1,5 42:18,24  
46:3 52:19 62:22 63:11 65:4,  
14 73:19 76:22 77:1,2,19 80:6  
81:18,20,25 82:9,11,15,17,18,  
23 83:2,18 85:19,24 86:3,5,13,  
17 87:25 88:3,18,23,24 89:1,4,  
17,24 90:3,8,18,25 91:11 92:3,  
4,5,8,10,14,15,19,25 93:1 94:5  
95:21 100:21,22 101:10,16,22  
102:3,4,6,8 104:16,19,20,23  
105:4 106:16,17,19,24,25  
107:3,4,5,8,9,13,18 108:5,9,  
10,12,13,17,20,22,23,24,25  
109:6,11,14,18,19,21,22,23  
110:5,9,10,13,14,15,17,25  
111:2,3,6,8,20,22 112:1,6,11,  
12,15 115:18 116:1,3,6,7,16,  
20,21 119:19 120:120 121:123,17,  
24 124:16,25 126:13 127:1,9,  
14,20 128:10,11 129:11,12  
130:9,11,12,17,23 131:1,2  
132:8 133:10,14 135:24 136:4,  
24 142:7 146:7,13,23 147:7  
150:4,5,6,14,15,21,24,25  
151:2,5,8,10,14,16,23,24  
152:1,3,4,11,12,14,18,22  
153:4,9,11 154:1,7,17,22  
155:24 157:13,15,18,19,22  
164:17

**light-emitting** 89:22 90:7  
91:6

**lightbulbs** 128:8

**lighting** 36:4 52:22,24 53:5,6,  
11,16 55:5,9,13,18,21,25 56:3,  
6,9,18,25 57:1,2,5,6 58:10  
59:2,5,17 60:14 65:24 72:2,9,  
14,16,23 73:2,8 78:23 79:13,  
18,19 103:14,24 106:21  
119:23 130:10 137:14 149:20

**lights** 40:19 99:9 105:1,2  
107:19 108:6 109:12,15,20  
112:9 152:7

**like** 12:10 14:4,6 20:15 62:22  
67:6 69:16 88:7 98:17 104:25  
107:14,23 109:17 110:2  
135:11 141:11 142:25 143:4,5  
144:4,16 146:17 151:1 157:10  
160:8

**likely** 123:3 155:21

**limiting** 71:13  
**line** 31:4,7 70:17,19 73:6,7  
 75:16 76:2,17 80:12 81:17  
 83:9,25 93:8 130:4 142:3,24  
 144:1 145:7,8,24,25 146:10  
 159:11 162:9  
**lines** 65:20 70:20 72:6,7,8,11  
 77:22 78:13,18 85:18 96:1  
 99:17 101:4 124:22 126:4  
 129:8 132:3,5,6,7 133:18,23  
 143:20 146:3,6  
**link** 47:10  
**list** 8:2 11:11 25:4 32:21 33:4,  
 6,9,25 34:10,15 35:9 38:3  
 46:17 48:22 78:11  
**listed** 8:1,2 9:16 23:18,19  
 32:20 33:6 40:12 46:16 48:21  
 82:6 86:11  
**lit** 128:9 137:11,20 142:13  
**little** 10:12 140:21 143:23  
**LLC** 12:1 15:1  
**locate** 34:24,25 35:1  
**located** 35:2  
**locating** 99:2  
**location** 91:11 96:15,17,19,23  
 99:5 151:11,13 153:10  
**long** 8:10,14 23:2,3 24:14  
 38:12 53:24 54:14 68:17 69:13  
 70:1  
**look** 12:10 49:5 56:10 61:10  
 63:21,22,23 64:8 68:23 69:17  
 70:4 75:16 76:14 97:3 98:9  
 99:16 106:14 149:6 155:8,12,  
 23 159:10  
**looked** 24:13 38:7,19,25  
**looking** 15:13 33:9 34:10  
 67:21 93:7 95:24 99:9  
**looks** 143:3  
**lost** 80:24  
**lot** 10:9 14:22 27:18 107:23  
 137:4 148:6  
**lots** 22:20  
**low** 43:12,24 44:5,12 106:22  
 109:4 110:3,6 120:12 122:20

**low-beam** 107:4 109:23  
 110:5,10 111:8,20,22 112:1,6,  
 9  
**lower** 112:17 113:5,7,10,12  
 114:10 151:1,4,7  
**lumen** 65:3,14  
**lumens** 71:1  
**luminance** 65:4,14  
**lunch** 103:1

## M

**machine** 18:1,25  
**made** 45:19 160:9  
**Magna** 10:20,21  
**main** 54:4,6 106:22 156:22  
**maintain** 162:25  
**majority** 23:11  
**make** 29:8,18,20 41:21,23  
 57:2,4 85:7,12 92:25 94:16  
 98:10 103:18 140:23 147:3,22  
 154:12  
**makes** 22:18,25 76:8 145:18  
 147:10  
**making** 30:3,15 66:23 145:22  
**manage** 16:23  
**management** 69:21 70:8  
**many** 6:22 11:3 21:20 22:2  
 23:7 25:4 40:9,11,13 55:13  
 101:9 148:7  
**map** 75:22 97:20  
**mapped** 124:15  
**Marietta** 21:4 53:14  
**mark** 142:17  
**marked** 23:21 26:3 61:3 87:8  
 124:5 128:24 136:17,22,25  
 142:18,21 148:14  
**marker** 143:5,19  
**Martin** 21:4 53:14  
**material** 14:7  
**materials** 7:21,24 8:1

**matter** 11:13,17 12:6,12,20  
 13:5,11,12,16 14:11,14 15:11  
 30:4 41:6 57:23 160:25 161:11  
**matters** 9:21,24 10:18,22,25  
 15:14,21 16:1 18:13  
**Matthew** 5:5,13  
**maximum** 44:4 73:19 103:11,  
 13,23 104:2,6,10 105:6,14,25  
 106:2,8 112:13,17,22 113:5,8,  
 10,12,14,17,18,21 114:2,6,8,  
 10,12,14,20,24 115:1,5,13  
**maximums** 40:16  
**may** 10:1 38:19 41:22 56:7  
 65:9 72:4 79:22 86:8 87:5  
 92:11 114:19 132:11 133:3  
**maybe** 23:13 50:1,3,9 64:11  
 72:10 75:24 80:10 113:22  
 114:4 116:12 165:3  
**mean** 7:25 8:22 11:25 14:21  
 15:18 18:3 21:21 22:9 23:8  
 24:12 30:17,18 35:24 36:1  
 38:9 40:21,22,24 41:10,23  
 42:11,15,20,21 44:22,24 45:8,  
 9,20,23,24 46:4 47:18 49:12  
 53:8,17 57:5 62:15,19 63:6  
 73:11,19 75:10 81:20 82:11  
 85:4,25 88:2 90:13,15 91:20  
 92:22 95:12 96:17 100:3,6,7  
 101:13 102:19,24 103:13  
 104:19 106:9,19,23 108:20  
 110:24 113:25 116:3,5,11  
 120:8 122:5 123:2 124:3  
 125:15 130:21 135:2 143:25  
 151:4,24 152:4 153:1,25  
 164:12  
**meaning** 83:21  
**means** 74:15,21,23 75:4 76:23  
 77:4 78:15 82:14 83:17 84:5,  
 24 86:2 91:23 95:15 100:4  
 103:18,23 108:19 120:10  
 122:4 123:3 130:10 150:20  
 152:1 154:6 160:7,21  
**meant** 79:17,22 144:14 161:3  
**measure** 151:10,13 152:2,14,  
 18,21,22 153:11 155:23  
**measured** 104:10,15 159:25  
**measurement** 104:15,16,19  
 151:2,5,6,17,21,23,25 152:12,  
 14,15,25 153:2,13,15 154:13

**measuring** 150:24 153:3  
154:17,22

**mechanical** 60:10 76:23  
77:4,23 78:8,15,20 79:10,17,  
20,24

**mechanisms** 77:19

**media** 17:12 20:23

**medical** 19:18

**medication** 6:13

**meet** 8:6,8,10,15,17 50:16,20  
51:10,20 52:2 64:19

**meeting** 152:10

**member** 23:15 57:9,12

**mention** 63:24 79:24

**mentioned** 9:19 18:23 19:10  
27:5 78:8 133:25 150:14

**mentioning** 63:21

**mentions** 78:12

**met** 7:22 8:5,23 9:7 30:7 32:1

**Meta** 11:10

**meter** 153:9,11

**method** 124:24 126:19,20,25  
127:6,9,17 156:23

**methodology** 154:16,21

**Michigan** 5:2 37:22 46:13  
47:22

**microbeam** 89:19,21 91:18,  
21 93:21,25 95:3,4,7,22 96:6  
102:19,20

**microbeams** 91:15 92:1  
93:10 95:19,20 96:3 99:21,25  
100:14,20,23 101:10 102:2,5  
103:10

**Microsoft** 18:14,19

**mid** 46:25

**might** 33:22 67:7 71:25 82:24  
85:17 104:25 107:24 125:20  
163:16

**mind** 46:19 111:15

**minimum** 43:21,24

**minimum/maximum** 40:17

**minute** 79:25

**minutes** 50:9 51:5

**mirror** 88:7,11,15 92:13,24  
94:4 96:11 100:20,21

**mirrored** 90:2

**mirrors** 88:4,6,21 89:8 92:5,8,  
9,17,18 93:4 102:6,10,13

**Mischaracterizes** 42:25 48:8  
70:9 94:12 95:1 109:8 110:19  
115:8 117:7 147:17 148:2  
154:8 160:4 161:7,18

**missed** 91:7

**misspoke** 72:10

**MIT** 20:20,23

**modifications** 120:6

**modify** 120:1

**modifying** 81:25 122:19

**modulator** 87:25 88:23,24  
89:2,24 90:3,8,19,25 92:4,5,9,  
10 100:19 101:16 102:3,4,9

**modulators** 88:3,18 89:5  
101:22

**module** 77:1

**moment** 34:11 76:10 118:8,14  
146:4 149:18,23 150:12  
158:22 160:10

**months** 161:2

**more** 24:16 46:3 84:10 88:19,  
22 91:14 105:11 126:10  
143:23 164:2

**morning** 5:8,9

**most** 65:23 82:25 88:25 89:1  
92:12

**motivation** 49:18,22 50:2  
51:24

**motor** 37:25 38:10 39:9 48:14,  
15

**movable** 80:15,17,20,22 88:3,  
6,21 89:8

**move** 88:5

**moving** 77:18 94:4 98:4,13,20

**Mr** 5:8,11 13:9,22 14:9 15:5,8,  
19 16:2,7,8 19:15,23 23:23

25:18,25 26:5 29:7,10,17,21,  
24 30:7,9,11,13,16,20 31:11,  
18,21,25 32:4,7,12 36:20  
39:22 40:5 41:14 42:1,8 43:5,  
10 44:10 48:12 50:4,9,11 51:5,  
7,15 52:1,8,13,17 53:3 55:8,  
16,23 57:3 58:16,23 60:23  
61:5,24 62:11,17 63:7,16,22  
64:1,6,10,24 66:7,14,18 67:1,9  
68:10,24 69:9 70:5,14 71:12,  
18 72:1,21 73:17,22 74:4,13,  
22 75:3,8 77:7,12 79:9 81:6,10  
82:3,16 83:3,20 84:22 85:10  
86:18 87:6,10 91:5 93:19  
94:13,15,17 95:5,17 96:13  
97:4,9,12,22 98:11,19 99:4  
100:13 101:3,24 102:17,18  
103:1,5,6,21 104:5,18 105:12,  
20 107:6,17 108:2 109:13  
110:3,8,16,23 111:14 112:24  
113:24 114:22 115:4,15  
116:14 117:3,13,19 118:1,15,  
23 119:2,7 120:7 121:1,6,11  
122:10,11 123:10 124:2,7,21  
125:14 126:23 128:1,5,21  
129:1 130:2 131:17 133:5,8,16  
134:1,16,22 135:3,21 136:7  
137:8 138:5 139:18 142:16,20  
143:17 146:21 147:23 148:10,  
16 149:24 150:18 151:3,22  
153:12 154:4,15 155:2,10,16  
156:4 157:1,11 158:14,24  
160:2,12 161:14,24 162:12  
163:3,17,23 164:23 165:3,7

**Ms** 13:6,20 14:5 15:2,16 16:4  
19:12 25:14 29:6,9,12,19,23  
31:3 32:8 36:15 39:19,25 41:8,  
17 42:4,25 43:8 44:7 48:8  
49:24 50:6,10,23 51:3,6,13,22  
52:5 53:2 55:7,11,19 56:19  
58:11,20 60:21 61:18 62:9,14  
63:4,14,19 64:4,21 66:3,10,21  
67:4 68:6,15 69:6,23 70:9  
71:7,15,22 72:17 73:12,21,24  
74:7,18,24 79:3 81:22 82:13,  
20 83:14 84:13 85:1 86:15  
91:1 93:16 94:11,14,25 95:13  
96:9,25 98:6,15,25 100:10,25  
101:19 102:16,21 103:15  
104:3,12 105:8,16 107:1,10,  
21,25 109:8,24 110:11,19  
111:9 112:18 113:19 114:17  
115:2,8 116:9,23 117:7,18,20  
118:11 120:3,21 121:4 122:8  
123:6,21 124:18 125:10



126:17 127:21 128:12 129:24  
131:12 133:1,12,21 134:10,18,  
24 135:16,25 137:1,21 139:14  
143:9 146:14 147:17 148:2  
149:21 150:9,22 151:18 153:5,  
21 154:8,23 155:4,13,25  
156:18 157:4 158:6,17 159:17  
160:4 161:7,18 162:8,25  
163:12,19 164:19 165:1,9

**much** 13:10,25 14:1,6 25:19  
27:8 38:8 54:15,16 97:6  
120:14,17,24 121:9,12,23  
146:19

**multiple** 27:16 28:21 47:19

**multiplicity** 99:19 103:10

**MVCA** 46:19,21 47:3,5,8,14,  
20 48:6,17 49:3

**my** 5:13,17,18 7:16,21 8:1  
9:25 11:11 12:8,17 13:12,14,  
25 14:19 22:19 23:19 24:4  
25:4,9,10 26:20 31:24 34:7,10  
35:20,21 37:10 39:4,21 40:3,  
14 45:7,11 49:11 56:21,22,25  
59:22 62:10 65:10 67:6,22  
68:8,19,21 69:15 70:2 73:14,  
22 74:10 75:11,14 78:7 79:16  
82:6 83:7 88:13 94:16 97:2,7  
101:20 104:24,25 105:13  
109:7 113:4 117:14 118:25  
126:12 133:13 134:13 139:15  
140:13,20,22 141:11 143:16  
144:25 145:22 148:25 149:1,6  
150:11,12,23 152:15 153:8  
154:2 155:6 157:8 158:10,13  
159:20,21 160:9,25 161:11,22  
162:25 163:21

**myself** 45:18 62:2 118:22  
126:22

---

## N

---

**name** 5:12,13 12:3 32:14  
57:25 76:8

**narrow** 99:20,25 100:3,7,9  
101:10 102:2,5

**narrow-angle** 91:14

**necessarily** 23:5 45:17 49:22  
50:3 99:7,10 134:15 149:2

**necessary** 54:17 65:5,15

**need** 7:4,9 28:24 29:2 105:11  
118:21 147:21

**needed** 54:17,19,21 106:17  
108:18

**never** 32:1 55:17 64:22 78:8  
93:2 108:12,21 112:16 113:5  
145:12 153:23

**new** 13:14,19 65:24 66:2,9,20,  
23,25 67:3,11,14 77:1

**next** 59:11 140:24

**night** 53:20

**no** 6:1,12,16,19 7:6 8:19 9:9  
15:25 22:3 23:22,24 26:4  
28:16 29:9,12,23 30:5 38:17  
39:8 52:23 53:1 55:1,3,6,22  
56:1,4,24 57:11,14,17 58:14  
61:4 74:20 76:4,7 77:18 78:5  
79:5 82:25 83:4 87:7,9,12  
90:10,13,15 92:20 93:17  
101:15 103:8,25 108:14  
110:22 111:2 112:2 118:14  
119:21 124:6,10 128:25 129:4  
139:9 142:19 146:17 148:8,15  
149:9,23 156:3 165:7,9

**nodding** 7:6

**non-camera** 159:12,15,22  
160:20 161:5,15 162:2,7,11,  
13,15,17,19,21,23 163:5

**non-mechanical** 77:16,17  
78:2,10 79:11,12,15,18,23

**non-movable** 77:16,17 78:2,  
10 80:23 81:4,5 86:21 87:2,21,  
22,24 88:12

**non-regular** 134:23 135:2

**non-square** 135:9,10,12

**non-vehicle** 79:14

**note** 80:15

**noted** 141:6 159:6

**nothing** 31:5

**notice** 37:21

**number** 21:14,17 23:4,15 46:4  
99:17 140:9

**numbering** 28:23 33:23

**numeric** 151:6,7,9,12

---

## O

---

**oath** 6:7

**object** 21:1 31:4 96:4,7,11,14,  
23

**objection** 13:6,20 14:5 15:2,  
16 16:4 19:12 29:6 31:3,8 32:8  
36:15 39:19,25 41:8,17 42:4,  
25 43:8 44:7 48:8 49:24 50:23  
51:13,22 52:5 53:2 55:7,11,19  
56:19 58:11,20 60:21 61:18  
62:9,14 63:4,14,19 64:4,21  
66:3,10 67:4 68:6,15 69:6,23  
70:9 71:7,15,22 72:17 73:12,  
21,25 74:7,18,24 79:3 81:22  
82:13,20 83:14 84:13 85:1  
86:15 91:1 93:16 94:11,25  
95:13 96:9,25 98:6,15,25  
100:10,25 101:19 102:21  
103:15 104:3,12 105:8,16  
107:1,10,21,25 109:8,24  
110:11,19 111:9 112:18  
113:19 114:17 115:2,8 116:9,  
23 117:7,18,20 118:11 120:3,  
21 121:4 122:8 123:6,21  
124:18 125:10 126:17 127:21  
128:12 129:24 131:12 133:1,  
12,21 134:10,18,24 135:16,25  
137:1,21 139:14 143:9 146:14  
147:17 148:2 149:21 150:9,22  
151:18 153:5,21,22 154:8,23  
155:4,13,25 156:18 157:4  
158:6,17 159:17 160:4 161:7,  
18 162:8 163:1,12,19 164:19  
165:1

**objections** 66:21

**objects** 19:2 96:4,7 99:14

**observers** 62:23

**obtained** 77:3 129:10

**obviate** 49:22 50:2

**obvious** 49:15 50:22 51:12

**obviousness** 36:7,14,22,24  
37:2,9,10,14 39:17,23 40:7  
49:10,11,19 158:5 160:22

**October** 5:1

**off** 83:6 104:25 126:11 128:9  
150:11 154:1 155:6 156:22,24  
159:20

**offhand** 9:1,25 11:1,12 27:10  
39:8 49:5 61:21 63:15 64:23  
70:11 73:4 81:2 87:4 110:21  
112:8 117:25 126:21 131:21  
163:7

**often** 62:23

**Oh** 59:6

**okay** 6:4,24 7:12,15 18:14  
24:3 37:24 38:3 51:6 52:13  
67:18 81:6 88:11 89:7 97:23  
101:4 115:24 118:2 119:5  
129:7 133:6 135:6 139:9 144:5  
146:5,22 149:9

**old** 65:25 66:24

**omitted** 34:11

**oncoming** 97:16

**one** 9:3 10:19 13:8,24 14:7,23  
16:5,11 23:9 27:1 29:14,15  
37:21,24 40:25 41:4 44:25  
45:3,10,13,20 46:3 47:9,25  
55:13 65:25 66:24,25 86:11  
88:23 89:7 91:14,19 92:2,13,  
20,22,24 94:4 101:1 102:15  
104:14 106:5 114:4 124:12,25  
125:5,7 127:1,19 128:9,10  
135:13,18 136:3 139:24 141:1  
142:25 144:24 149:16 151:10  
152:21 164:2

**one-bulb** 125:2 126:15 127:3,  
11,15

**ones** 9:23 11:8 118:14

**online** 35:2,7

**only** 10:19 17:21 23:9 25:17  
63:12 92:20,22,24 93:4 101:12  
133:24 136:25 137:10,19

**onto** 143:7

**open** 81:11

**operate** 103:11 112:13

**operates** 112:16,22 113:5,9

**operating** 73:9,11,16,18 74:5,  
9,16 75:9,13 113:7 131:10

**opine** 104:9,24 117:21 155:17  
163:20 164:8

**opined** 69:15 118:7

**opining** 67:5 73:13 75:10

**opinion** 12:17 45:2,12 49:17  
50:19 59:22 61:16 70:2 74:12  
79:5 83:5 84:24 102:19 112:2,  
11 113:9 119:22 121:9 125:21,  
23 126:7 131:18,21 137:18  
142:12 145:9 157:3 158:13,16,  
21 160:9 161:5 163:22

**opinions** 5:17 25:9,10,22  
27:20 35:20 68:20 74:11 83:23  
85:22 87:16 111:25 157:8  
159:20 161:11,13,16,22

**opposed** 47:23,25

**optical** 57:13 60:11 65:5,15  
80:8,10 87:3,22,23 97:18  
163:8,11,18,20 164:2,5,9,12,  
18,24

**optically** 45:24 46:6

**optics** 57:7 92:6 128:18  
145:13 164:17

**optimal** 73:8,11 74:5,9,16  
75:9 131:10,14

**optimally** 130:11,16,22 131:1

**options** 137:14

**order** 49:15 51:20 147:22  
151:15

**ordinary** 49:14 59:23 60:5,7,  
17,20 137:9,15,18 138:2 147:2  
154:20 155:18

**organizations** 23:15

**oriented** 143:23

**original** 138:11

**originally** 85:17 109:17

**other** 6:17 8:23 11:6 12:13  
14:2,4 15:14,21 16:1,6,8 18:1,  
21,22 19:8,10 20:5 21:7,8 25:3  
29:15 44:25 45:4,10,14 46:1  
47:23 54:23 68:18 72:19 79:14  
84:17 92:6 94:5 113:17 114:9  
128:19 135:15 139:24 157:2  
159:22,25

**others** 11:10 35:12 47:25

**otherwise** 112:22 131:16

**outline** 42:6,16,19

**outlined** 140:8 143:19

**output** 92:18,20,22 95:9,10,21

107:8 125:19 157:19

**outputs** 107:18 108:5

**outside** 9:7 105:3 116:7,11,21  
117:23 119:19,23 120:1 153:8  
163:5

**over** 24:13 39:14 69:17 70:4  
75:16 119:3 143:22

**overall** 101:8

**overcome** 50:15

**overdriven** 107:13

**overly** 32:9

**own** 99:3

**owner** 11:14,22 60:16

---

## P

---

**p.m.** 81:9 103:4 128:23 148:13  
165:6,11

**packaging** 63:18,21,24 69:11

**page** 24:6 26:10 27:23 28:6  
29:5,8,10,22,25 36:5 37:13,17,  
18,19,23 44:15 46:9,10,11,12  
48:16 50:12 58:25 59:11 60:2  
64:25 65:1 77:13,14 91:10  
106:13,14 115:23 118:17  
129:7 130:3,4 132:1,5,7  
133:18 136:10 138:7 139:19  
140:24 144:19,21 146:2,6

**pages** 33:9

**paid** 13:1,3

**PAL** 149:20

**papers** 21:17,20 56:5,7,14,17  
58:4,7

**paragraph** 28:17 29:25 32:18,  
19 35:16,25 36:5 37:16,17,22,  
25 40:8,15 42:10 44:15 46:9,  
10 48:3,16 50:5,12 58:24 59:1,  
4,7,20,21 60:3,15,25 61:10,11  
67:10,15,17 77:9,13,15 80:1,4,  
25 86:20 87:19 97:7,12,23  
99:13 103:8 106:12 108:15  
115:16,20 118:16,17 119:8  
121:15 122:17 129:8 130:5  
131:23 138:6 139:20 140:25  
141:22 145:3 148:20 156:5,9,  
12 158:25 163:24

**paragraphs** 28:1,7,11,14,23  
29:3 37:15 49:6 136:9 144:18  
148:21 149:10

**parking** 10:9

**part** 14:24 19:3 20:18 31:21  
38:22 39:6 40:14 49:9 51:24  
53:19,23 54:8 114:11 115:13

**partes** 5:20 9:20,23 10:17  
30:5

**particular** 47:24 63:17 64:2  
81:3 88:17 96:4,7,14 105:2  
116:17 122:2 151:11 152:24  
153:10 161:13,16

**particularly** 93:5 107:3 147:4

**parties** 10:17 11:6

**parts** 38:18,19,20 42:17 77:19  
114:7,9 161:4

**party** 10:11

**passage** 67:10 78:25 79:24  
91:21 93:13,20 94:18,21 95:24  
100:14 101:13,15,18 126:9,18  
147:14

**patent** 6:1,5 8:25 11:14,22  
15:15,21 16:3,11,14 25:2,17,  
18 30:5,6 32:11,16 33:19,21,  
22 36:1,2,3 50:21 51:11,16,19  
52:2,9 59:24 60:16 61:7,14,17  
62:5,7 63:2,13,17 64:2,15,20  
65:12,18 66:1,8,13,19 67:2,16,  
19 68:1,4,11,13,17,25 69:4,10,  
13,18,20 70:1,6,15 71:4,13,20,  
24 72:2,13 73:3,8 74:6,15  
75:17 76:2,4,7,11,12 77:15  
78:1,12,22 79:2,8,10,20 80:12,  
21 81:4,11,15,21 82:12 83:13,  
22 84:4,23 85:25 87:11 88:16  
89:15 90:9,11,15,21 124:9  
131:10 149:25 154:6 156:17  
159:10,14 160:13 161:6 163:4

**patents** 8:24 16:6,8,9 22:4,6  
32:22,25 33:2 55:24 56:14,17  
62:12 78:13

**pattern** 40:18 42:9,14,15,18,  
21,23 43:3 64:3,9 77:2 96:8,15  
101:8 102:1 108:11 113:16  
114:8,9,16,19,24,25 115:7  
116:8,22 117:1,5,15,17 125:8  
132:13,20,24 141:24 142:24  
144:10

**patterns** 117:22,24 118:3,10  
145:10

**pays** 12:20

**PDF** 29:22

**pen** 144:3,5

**people** 14:22 18:4,9 19:2 27:4  
84:14 85:7,11 106:21 155:7  
163:14

**per** 62:22 71:1

**perceived** 123:3,5,11

**percent** 12:3 31:16 118:7  
137:6

**perception** 84:17,19 85:16

**perfect** 29:23

**performance** 65:2

**perhaps** 10:21 45:18 83:8  
143:22 152:2 153:25 154:2,12  
155:7 159:23

**period** 107:15

**person** 8:9,14 49:14 59:23  
65:12 123:12,14 137:9,15,18  
138:2 147:2,13,19,24 154:20  
155:11,18,22

**personally** 17:2 34:24 35:10  
54:9 55:20 58:3,15

**perspective** 143:16

**pertain** 87:3,22

**pertains** 105:5 159:14

**petition** 25:2 124:13

**petitioner** 60:4

**petitioner's** 60:16,19

**Phd** 5:5 20:23

**photoelectric** 149:2

**phrase** 19:20 45:24 72:4 74:1,  
9 88:18,19 106:24 109:17  
110:12,14 121:25 122:2  
123:19 149:4 153:25 154:11  
157:21,23,24 163:15

**physical** 84:18

**physically** 116:12,16

**physics** 57:6 60:11 84:16,17

**picked** 7:7

**place** 24:8 26:12

**plane** 132:9 133:19 134:2

**please** 5:12 7:4,9 15:4 26:21  
30:2 31:10 60:7 73:22 77:9  
101:5 105:22 113:3 121:16  
129:9 130:7 132:6 142:17  
143:8 144:6,18 149:25 150:1,2  
159:10 163:24

**plus** 68:18

**point** 15:13 51:4 66:24 67:7  
68:22 69:16 70:3 72:6 73:20  
77:11 102:14,16 145:19,22  
159:8 162:1

**pointed** 79:15,23 88:14

**pointing** 59:3 140:9

**points** 25:5,7 83:18

**polygon** 135:15

**portion** 54:1,3,9 67:21 138:17  
139:9 140:5 142:9,10,12

**portions** 138:18 145:16

**POSA** 44:17 59:24 60:8  
154:25 155:3

**position** 77:19 91:14,20,25  
92:13,15 93:9,14,20 94:4,8,9,  
19,22 95:3,6 96:6,12 97:20  
102:13 112:16 113:4 114:23

**positioned** 100:21,22

**positions** 92:7 93:4,23 95:9

**possible** 15:12 51:14 76:3  
83:17 126:11 137:14

**possibly** 82:15,17

**post-doc** 20:20

**potential** 15:10 142:24 145:10

**potentially** 46:4

**preceding** 97:17

**precise** 75:25 144:15 145:13

**preferably** 129:13

**preferred** 76:21,22 78:14  
130:4,8,19,25

**preparation** 9:14 31:22 64:12

**prepare** 7:19 8:17 27:2,15

30:21  
**preparing** 8:19,21 9:17 24:25  
 25:19 26:23 27:8 38:14,23  
 46:21 49:1 64:16  
**prescribed** 48:18  
**present** 70:25  
**president** 16:18  
**presume** 39:13 44:3  
**pretty** 10:24  
**prevent** 6:10,14,17  
**previous** 42:17 45:21  
**previously** 10:3 17:4 18:14  
 72:24 87:14 125:24  
**primarily** 25:14,15  
**primary** 124:12  
**principles** 18:12  
**prior** 38:25 43:1 50:19 51:9  
 52:10 73:3 82:7 88:15 95:1  
**priority** 61:13,16 62:3,4  
**probably** 8:16 12:2,8 14:2  
 24:17 25:16,18 46:2 50:2 76:9  
 104:4 128:16,20 147:19  
 161:12  
**problem** 51:20  
**problems** 19:6 20:15  
**proceeding** 5:21 9:11 23:25  
 31:6,19,22 33:14,19 34:2,4,8  
 69:19 72:22  
**process** 12:11,18 24:25 25:11  
 26:23,25 27:14 30:22 94:7  
 97:15 102:25  
**processes** 94:6  
**processor** 99:21  
**produce** 101:12 107:14  
**produced** 76:25 101:8  
**produces** 99:19  
**producing** 125:18  
**professional** 12:14 22:20  
**professor** 17:4,10  
**program** 17:13

**progress** 70:18 149:19  
**project** 21:9 53:9,13,18,23,24  
 54:1,5,10 56:8 143:7 149:17  
**proposed** 60:4,16,19  
**proposes** 68:1  
**proposing** 154:3,14  
**provide** 5:17 23:7 27:11 59:22  
 65:23 95:9,10 111:7,25 112:6  
 118:18 130:10 139:25 149:6  
 164:7  
**provided** 9:10 10:22 31:24  
 35:7,10,12 36:7,23,25 47:8,10  
 58:5,6 70:2 76:23 119:12  
**provides** 49:11 86:21  
**providing** 14:13 83:23 85:21  
 87:16,20 112:11 160:21  
**PTAB** 31:7  
**Publication** 129:4  
**publishes** 39:3  
**purely** 84:16  
**purport** 51:19 68:4 69:10,20  
 70:7  
**purported** 65:12  
**purporting** 66:8,19 68:13  
 69:4  
**purpose** 28:20 152:15  
**purposes** 28:21 76:4,14,15  
**put** 97:6 110:24  
**puts** 116:20  
**putting** 106:16 108:16 111:1,5  
 115:17,25 140:22  
**puzzling** 90:21

## Q

**quadrilateral** 134:23 135:2,4  
**qualified** 56:15  
**quantify** 110:17,22  
**question** 7:12,16 23:10 29:15  
 31:10 42:22 45:6,7,11 48:3  
 50:7 54:16 64:23 66:17 69:17,  
 25 73:23 75:14,18 80:16 94:16

96:21 105:9,11,13,22,24  
 110:2,7 111:20 113:2,4,23  
 114:1,3,5 116:13 117:11,14  
 119:6 136:5 137:24

**questioning** 31:4 162:9

**questions** 5:18 6:25 7:1  
 152:20 163:2 165:8

**quick** 63:23 64:8 77:11

**quickly** 92:13 107:15

**quite** 11:1,10

**quote** 49:2 65:1 67:10,18,24  
 80:15,16,19,24 81:2 88:13

**quoted** 49:2 65:10

## R

**radar** 162:15

**rain** 162:13

**range** 17:24 19:6,17 20:14  
 162:19,21

**rate** 13:12,13,14,17,19 150:25

**rather** 95:23

**rationale** 158:11

**rays** 20:6

**re-aiming** 77:1

**re-read** 114:5

**reacts** 104:20,23

**read** 30:2 36:10,11 38:14,15,  
 18 58:7,12 60:7,24 65:20  
 66:15,16 70:20,22 75:1 76:17  
 77:22 78:13 79:24 101:5,18  
 124:23 129:8 130:7 132:6  
 136:3 150:1

**reading** 147:14 151:1,4  
 153:11

**real** 22:11 112:2

**reality** 22:8,9,11,14

**really** 19:16 27:12 52:7 73:5  
 74:11 92:20 107:16 108:12,14,  
 21 120:23 121:7,9 131:21  
 137:6 158:21

**reason** 6:10,17 47:24

**reasonable** 85:5 124:19  
143:15 144:12

**reasons** 58:14

**recall** 11:19 13:3 15:12 23:20  
24:15 28:12,21 29:1,4 31:20  
32:14,15 38:12,19,21,22,24  
39:12 47:5,7,12,13,24 51:23  
56:11,12 58:3 63:20 67:5 68:7,  
13,21 69:3,12 70:12 71:23  
72:25 73:13 74:10 75:3,10  
76:9 81:2 112:8,14 126:10  
148:25 149:5,22 154:18  
158:10 159:19 162:1 163:7,21

**received** 21:13 56:2

**recite** 51:16 90:20

**recited** 33:6 64:19

**recites** 89:17,21,24 90:2,6,17,  
23

**reciting** 160:18

**recognition** 20:21 21:2,15,  
18,25 22:7,23,25 23:1 56:16

**recognize** 24:1 26:6

**recollection** 12:25 27:6 69:22  
70:6 71:19 149:1 163:4

**reconcile** 78:6

**record** 5:12,23 7:6,7 29:20  
31:5,8 94:16

**recorded** 7:5

**records** 124:9

**rectangle** 134:17,21 135:8,9,  
10,12 138:19,21

**rectangular** 135:7 145:7

**red** 136:15 142:2,6,12,23  
145:8,24

**redirect** 165:9

**Reduced** 98:22

**reduction** 96:2

**redundant** 125:18,22 126:9

**refer** 6:4 26:16 46:11 81:4  
109:6 122:23 146:3 151:17

**reference** 28:2,3 37:25 48:21  
89:10 91:17 93:7 100:1 103:9  
110:1 112:1,3,5 118:24 119:3,  
14 124:12 129:3 140:2 146:2

148:17,18,22 149:11,12,14

**referenced** 33:3

**references** 46:17 49:19,23  
51:10 52:10

**referred** 35:4 75:24 99:20  
149:20 151:19

**referring** 12:2,22 26:17,21  
29:22 32:21 33:1,24 66:12  
75:15 87:5 92:8 103:8 109:18  
111:2 117:1 121:24 152:25

**refers** 74:3 75:17,19 77:18  
100:20 112:8 158:25

**reflection** 102:14

**reflective** 39:7 80:9

**reflectors** 163:11,16 164:24

**reflects** 92:14,15

**refractors** 80:9

**refresh** 126:22

**regard** 39:1

**regarding** 9:8 25:17 84:16  
104:16

**regards** 54:12 132:12,16

**regime** 73:9,11 74:5,10,16  
75:9 131:10

**regional** 113:15

**regions** 113:8,11,16,17

**regular** 13:13,14 135:4

**regulate** 40:11

**regulation** 38:11 40:13 48:5,7  
**regulations** 40:3,6,9 44:2  
48:4,11,13,14 50:16,20,25  
51:10,21 52:3 62:8 107:20,24  
108:3,7 117:24 118:3,5,9  
146:8,12,24 147:5,8,16

**regulatory** 39:14

**relate** 22:6,8 96:6

**related** 8:23 10:9 17:2,24  
18:2,13 19:7 25:3 33:19,21  
43:3 48:14,15 79:14 115:12

**relates** 6:1 70:23,24 88:20

**relating** 15:14

**relationship** 20:4

**relationships** 12:16

**relative** 62:23 117:14

**Relevance** 13:6,20 14:5 15:2  
19:12 31:3 32:8 53:2 55:19  
58:11,20 64:21 66:3 69:23  
71:22 73:12,25 120:21 149:21  
153:22

**relevant** 36:6,21 37:12 49:17  
69:16

**remember** 8:24 9:25 10:4,12,  
19 11:2,7,8,11 25:16,21 27:10  
28:12 31:14,15 34:11 37:7  
54:14 61:20 68:19 69:14 70:1  
72:4 115:10 144:24 152:19  
161:1

**remembering** 12:24 97:6

**remind** 118:21

**remotely** 8:9,11

**remove** 28:11

**removes** 139:1

**render** 50:21 51:11

**repeat** 31:9 45:5 105:22,24  
113:2

**rephrase** 15:20 122:10

**replace** 65:25 85:14

**replaced** 28:24

**replacing** 66:24

**report** 16:23 33:3 104:24

**reporter** 7:3

**representation** 41:24 143:1  
144:9 145:10

**representative** 164:1

**represented** 132:8 134:9

**represents** 137:13

**reproduction** 142:22

**request** 30:4,16,17 31:25

**requested** 30:20,23

**requesting** 30:24

**require** 62:7,12 63:2,8,11,17  
64:2,9 82:18 105:18



**requirement** 43:6,11,14,17,  
 20,23 44:4,11 63:12

**requirements** 39:14 40:16

**requires** 150:8,12 164:2

**research** 16:24 17:1,2,19  
 18:19 20:20 21:5 22:19 31:21

**reshape** 82:9,11

**reshaping** 82:23

**respect** 10:16 40:16,17 56:17  
 114:15,18 115:6 128:6 131:9  
 146:12 158:4

**respective** 146:8,24 147:8,16

**respectively** 26:18 125:3  
 127:4

**respond** 7:4 137:23

**responding** 99:11 105:4

**response** 45:22 75:14 111:23  
 113:3

**responsibilities** 16:22

**responsive** 99:22

**restate** 113:23

**restrict** 111:22

**result** 139:25 148:9 151:11

**retained** 15:14,20 16:1 57:22

**retaining** 11:13,17

**retention** 15:23 16:5

**return** 151:6

**review** 5:20 9:13,16,20,23  
 24:10 26:14 30:5 32:4 33:13,  
 18 34:7 38:6,8 46:21,24 47:11  
 48:24 64:11,15 67:2 76:9  
 146:4

**reviewed** 7:21,24 33:20 34:13  
 47:2 64:7 68:11 69:1 76:7  
 87:14,16 112:3 125:24 126:1,4  
 160:13

**reviewing** 38:22 47:5

**reviews** 10:17

**revise** 65:9

**revisions** 27:17

**right** 5:24,25 6:2 7:2,19 8:4  
 13:17,18 16:20 17:6,8,9,20

18:15,20,21 20:21,24,25 21:2,  
 6,15,16,18 22:5,7 23:16 28:4  
 31:17 33:17 34:3,6,22,23  
 35:15 37:4,20 38:1,2 46:15  
 49:7 51:18 56:12 58:4,10  
 64:18 76:13 80:13,18 86:25  
 87:17 88:9 89:2,11 93:15,23  
 97:3,23 98:24 100:15,24  
 102:14 108:15,24 109:7 112:8  
 124:14 126:6,13,24 132:10  
 133:20 139:8,20 140:13,25  
 141:17,21 142:10,24 143:3,6,  
 22 144:10,13 145:3 149:4  
 159:21 161:1

**right-hand** 140:8 141:6,15,19

**ring** 15:7 149:18

**road** 72:20 82:23 83:7 86:4  
 98:14,20 124:17 130:12,13,16,  
 22 131:2 142:7 143:7 150:4,7,  
 17 157:14 158:1,15

**robotics** 20:14 21:11

**role** 16:17

**room** 25:14 104:25

**rough** 11:5

**roughly** 23:13

**rules** 62:8

**run** 16:24

## S

**safety** 38:1,11 40:10 48:14  
 130:14

**said** 7:24 8:5,21 20:8 25:12,15  
 27:14 28:14,15 29:8 31:1,12,  
 14 36:21 41:22 44:1,20 45:7,9  
 53:15 54:6 56:15,24 58:3  
 68:25 75:2,9,10,19 79:18 82:4,  
 17 88:20 89:17 97:13 103:22  
 108:21 109:2,17 110:13 115:3,  
 11 117:9 126:19 151:23  
 153:23 154:11 160:8 161:10

**same** 26:25 27:4,14 36:5  
 41:11 44:3 58:19,21 62:14  
 66:21 69:13,24 82:13 83:25  
 84:24 94:2,3,7,10,23 102:20,  
 24,25 115:20 116:19 125:18  
 137:24 149:3 150:22 157:4,23  
 163:19 165:1

**Samsung** 11:9

**Santa** 17:4

**satellites** 162:4

**saw** 89:10

**say** 12:22 14:20 19:1,13 22:9,  
 15,22 23:4,11 28:9,10 32:19  
 36:2,5 40:15 44:16 45:23 46:1  
 48:10 51:8 54:1,19 55:14 57:4  
 58:25 59:4 66:5 77:15 78:7,9  
 79:17,22 80:6 85:3 88:6 90:9,  
 10 91:3 108:16 111:21 115:17  
 116:20 120:22 124:23 133:4  
 134:14 136:4 137:7 141:22  
 146:19 147:11 149:5 154:10  
 155:20 156:12,22 158:8 159:4  
 161:9

**saying** 37:3 42:2,5,23 48:6  
 66:22 69:8 75:4 78:25 79:6  
 93:24 108:21 109:5 111:11  
 151:8,10 152:21 153:24 154:2

**says** 20:16 30:3,15 35:20  
 36:18 48:18 60:8 61:12 65:2,3  
 72:8 73:7 74:16 76:3,14 81:18  
 82:8 86:2 89:23 91:6 93:8,17  
 96:1 99:18 112:13 126:13,18  
 127:8,13,17 128:7 130:4,19  
 131:4,7 132:22 133:3,6 134:4,  
 5,7 135:19 136:17 140:21  
 146:7,25 147:7 154:6 163:25

**scenario** 42:6 78:22 82:24  
 83:1,4 107:14 140:14,18  
 141:12 144:10

**scene** 19:9

**schedule** 14:1

**school** 17:14

**science** 17:10

**scratch** 141:19

**search** 35:6

**second** 26:1,9,14,16,24 27:2,  
 9,15,20,23 30:3,15 33:10  
 58:24 59:20 61:11 70:20,22  
 80:1 83:23 85:22 86:19 87:17  
 97:10,14 103:7 106:12 121:15,  
 18 128:10 131:22 142:23  
 148:20

**section** 37:12,20 46:14 48:19,  
 24 49:4 125:4

**see** 12:15 21:13 28:1,6 29:25  
32:19,23 35:6,16 44:16,20  
48:17 50:13,18 58:25 59:6  
60:6 61:11 63:24 65:6 67:12,  
13,15,17,18,23,25 70:21 72:8,  
12 73:7,10 75:17,19 76:2,6  
77:20 80:6,11 81:14,18 82:8  
83:9,25 85:18 87:5 91:15 93:8  
96:4 97:25 99:18 103:9 106:17  
116:1 118:18 119:4 121:18  
130:5 136:10,18 138:7 139:5,  
20 140:9,25 141:7 144:18,22  
146:6,10 155:8 156:6,12  
159:11 163:25 164:3

**seeing** 72:19

**seem** 90:20 105:10

**seems** 72:5 73:15 75:11,15  
98:9,17

**seen** 64:18 89:14

**selectively** 96:2

**send** 13:5,7 100:21,22

**sense** 19:7 21:20 27:12 45:19  
54:21 98:10 117:22 122:5  
140:23 145:18 164:8

**sensing** 21:11 162:4

**sensor** 97:18 99:1,23 104:20,  
22 105:1 153:17 159:12,15,22  
160:3,21 161:5,16 162:2,7,10,  
11,13,15,17,19,21,23 163:5

**sensors** 19:8,11,17,19,21,25  
20:1,2 99:5 149:2,4

**sentence** 40:21,22 42:10,12,  
15 61:12 66:5,13,14,22 67:15  
70:22 71:10,11 74:2 95:3  
97:14 109:5 115:20 116:3  
121:18 126:13 127:5,8,13  
130:1,7 135:13,19 136:3

**sentences** 76:20 115:23

**separate** 15:23 17:14 111:11  
129:12

**separately** 125:1 126:14  
127:2,10 156:10 158:11

**set** 84:18 92:13,15 93:10,15,  
21,23,25

**setting** 92:25 94:4

**settings** 92:24

**seven** 163:1

**several** 23:6,19 33:10 34:15  
40:11 57:25 106:4 157:5

**shade** 143:4,5

**shaded** 98:21,23 99:2 143:19

**shading** 143:21

**Shah** 13:6,20 14:5 15:2,16  
16:4 19:12 25:14 29:6,9,12,19,  
23 31:3 32:8 36:15 39:19,25  
41:8,17 42:4,25 43:8 44:7 48:8  
49:24 50:6,10,23 51:3,6,13,22  
52:5 53:2 55:7,11,19 56:19  
58:11,20 60:21 61:18 62:9,14  
63:4,14,19 64:4,21 66:3,10,21  
67:4 68:6,15 69:6,23 70:9  
71:7,15,22 72:17 73:12,21,24  
74:7,18,24 79:3 81:22 82:13,  
20 83:14 84:13 85:1 86:15  
91:1 93:16 94:11,14,25 95:13  
96:9,25 98:6,15,25 100:10,25  
101:19 102:16,21 103:15  
104:3,12 105:8,16 107:1,10,  
21,25 109:8,24 110:11,19  
111:9 112:18 113:19 114:17  
115:2,8 116:9,23 117:7,18,20  
118:11 120:3,21 121:4 122:8  
123:6,21 124:18 125:10  
126:17 127:21 128:12 129:24  
131:12 133:1,12,21 134:10,18,  
24 135:16,25 137:1,21 139:14  
143:9 146:14 147:17 148:2  
149:21 150:9,22 151:18 153:5,  
21 154:8,23 155:4,13,25  
156:18 157:4 158:6,17 159:17  
160:4 161:7,18 162:8,25  
163:12,19 164:19 165:1,9

**shaking** 7:6

**shape** 40:18,21 41:4,11,15,21,  
23,25 42:2,10,14,19 43:4,6,11,  
14,17 76:24 77:5,24 78:16  
81:25 82:15,17,18 83:1,18  
125:8 132:12,16,19 134:6  
135:15 157:16,25 158:15

**shaping** 81:18,20

**shift** 132:9 133:19 134:2

**shifted** 143:22

**shine** 41:2 116:5,7,21

**shining** 102:7

**short** 148:10

**should** 73:16,18 75:12

**show** 145:4

**showing** 90:13 99:13 140:13

**shown** 140:12,18 141:10,12  
142:9 145:2,23

**shows** 90:11 141:23 143:2

**side** 128:8,9,14 140:8 141:6  
142:4

**sides** 135:5,8

**sign** 144:6

**signal** 95:11

**signature** 24:6,8 26:10,12

**significant** 45:17

**similar** 56:17 62:24 78:23  
109:20 131:8,16 138:23  
139:16,24 143:21

**similarly** 143:14

**simple** 18:8

**since** 13:16 16:20 47:14 90:21  
108:16 115:17,25 158:8  
161:10

**single** 101:12 125:19

**sitting** 74:14 105:13

**situation** 128:14 133:15  
153:18,19

**situations** 107:13

**six** 23:13

**size** 41:12 63:18,21,25

**skill** 49:14 59:23 60:5,7,17,20,  
24,25 137:9,15,18 138:3 147:2  
154:20 155:18

**skilled** 65:13 147:13,24  
155:11,22

**SLM** 92:16,17 101:15

**SLM203** 87:25

**SLS** 80:7

**small** 20:12 102:6,9,13

**smaller** 152:23

**so** 6:23,24 7:3,4,15 8:2 9:6,18

10:4 11:17,23 12:5,8,25 13:16  
14:12 16:10 18:12 19:18,24  
22:12,14 23:8,10,11 24:21,22  
25:15 27:14,16 28:19,23 29:9,  
15 30:8,20 31:7,24 33:8 34:7,  
10,18 35:6,19 36:23 37:14,23,  
24 38:8,14,22 40:12,15 42:2,  
20,23 44:2,3 45:2,12 48:6 49:2  
50:3,12 51:8 52:6 53:20 54:22  
55:14 56:13,14,23 57:24 58:24  
59:16 60:24 61:25 62:4,23  
63:1 65:17 66:1 67:10 68:19  
69:3 70:2,6,16 71:4,13 72:13  
74:11,14 75:9,13 76:14 77:8  
78:1,13,25 79:19 80:2 81:12,  
17 82:18 84:11,20 87:19 88:6,  
11 90:6 91:19 92:17 93:3,13,  
20 94:2,8,18,21 95:12 96:1,14,  
21 97:2 99:2,9,25 100:19  
101:17 102:8 104:1 105:13  
106:6,8,23 108:14,20 109:5  
110:4,17,24 111:2,5,6,22  
112:1,15,16 113:9,13,14,22  
114:4,6,14,23 115:25 116:20  
117:4,15 118:2,7,9 119:1,5,8,  
22 120:24 121:2,9 122:3,20  
123:11,13 125:4 126:11 127:6,  
14 128:19 129:15,19 130:15,  
25 131:20 132:15,19 133:9  
134:8,21 135:4,7,20 136:5,8  
137:5,14 138:2 140:2,16  
141:18,20 142:12 143:13  
144:8 145:20 146:1,11,18  
147:13 151:7,8 152:12 153:2,  
18,19 154:1,5 158:20 160:3,  
10,19 161:3,5,15 163:15,22  
164:5,18

**societies** 22:20 23:16

**Society** 57:9,12,16

**software** 18:12

**solution** 65:24

**solve** 51:19

**some** 9:22 12:9 18:1,10,21,23  
19:7 23:4 37:20 44:24 45:3,10,  
13 47:23 53:10,15 56:7 76:15  
77:11 82:24 85:6,11 88:3 97:1  
104:16,20 114:3,4,20 117:10  
118:5 120:5 123:23 128:17  
133:14,15 135:15 147:4  
150:15,24 152:2 153:9,15  
155:8 159:22,24 163:15,16

**someone** 162:5

**someplace** 112:9

**something** 19:9,19 25:8  
28:23 29:2 46:2 49:15 62:21,  
22 78:9 86:3 100:9 112:17  
113:5 114:1 123:3 144:4 151:1  
160:8

**sometime** 46:25

**Sometimes** 28:22

**somewhat** 41:19 42:11 92:11  
123:15 128:19 145:23

**somewhere** 61:22 62:1 67:7  
68:22 69:16 70:3 109:22

**sorry** 5:18 29:7,12 45:5 59:3  
66:16 67:15,22,23 75:18,21  
80:24 81:13 91:7 94:3 99:16  
107:25 119:6 133:4 149:3

**sort** 104:16 136:15 143:13  
145:15 152:23 162:5

**sound** 5:24 6:2 16:11,14 17:8

**sounds** 5:25 6:6 31:17 88:9

**source** 41:20 77:1 89:17 92:4  
96:11 102:6 129:11

**sources** 46:3 52:19 65:4,14  
89:19,21 91:12 107:13 129:12

**Southfield** 5:2

**space** 23:12

**spatial** 83:10,12,21 86:9,12  
87:25 88:3,18,23 89:1,4,24  
90:3,7,18,25 92:4,5,8,9  
101:16,21 102:3,4,8

**speak** 14:22 98:7

**speaking** 18:10

**specific** 39:12,21 40:19 50:1,  
25 56:20 62:12,16 63:2,6 64:9  
104:14 105:11,18,21,23 106:5  
110:13 111:23 118:14 151:20  
154:3,5,13 155:9 159:7 160:8

**specifically** 8:19,21 14:15  
23:5 24:15 25:10,13,16 28:13  
36:18 37:1 38:22,24,25 41:23  
54:12 56:4 72:25 75:4 87:5  
91:4 108:8 110:22 111:1  
137:4,5 138:1 148:25 155:15  
156:3 161:20

**specification** 90:16

**specifics** 37:7

**specified** 31:16

**specify** 40:16

**speculation** 41:9,18 103:16  
107:11 108:1 116:10,24 120:4  
122:9 123:22 125:11 127:22  
129:25 131:13 134:11,19,25  
135:17 136:1 137:2,22 139:12,  
15 140:17 143:10 146:15  
153:6,22 154:24 155:5,14  
156:1 163:13

**speed** 162:7,10

**spell** 10:14 15:3 57:19

**spend** 25:19 27:8

**Spero** 16:2,8 30:4,6,7,9,11,13,  
16,20 31:18,21,25 32:4,7

**spoken** 14:17 30:9 32:1

**spotlight** 129:10

**spread** 19:21 105:7,15 106:1

**square** 134:8,15,20 135:4

**Stam** 32:13 76:5,8,12

**stand** 20:17 25:22 27:20  
145:20,22

**standard** 36:7,13,22,24 37:2,  
4,6,21 39:1 154:16,21 155:22

**standards** 36:6,22 37:12,20  
38:1,11 39:2,9 48:18 50:17,21  
51:11,21 52:3 104:1,6 152:10  
155:8,11

**stands** 86:24

**start** 27:24 48:4 65:20 81:13  
111:18 117:15 118:25 147:20

**started** 17:7 114:1

**starting** 25:6 65:21 70:18,22  
76:20 81:12 101:6 130:3

**starts** 37:12,18 46:10 77:13  
106:13

**state** 5:12 31:5 47:23 59:19,21  
60:3,15 70:25 86:20 106:15  
121:19 122:12 127:5 137:5  
158:10

**stated** 51:24 115:5

**statement** 65:8,10 78:1 79:7  
87:2,19,21,24 111:5,11,12,18,



21,23 131:4,7 146:19,22  
147:10

**statements** 78:6

**states** 71:20 80:19 127:6,9  
133:22 134:2 137:4

**stating** 31:7 35:19 71:4  
111:11 146:16 148:25 159:19

**steering** 159:24 162:17

**stick** 158:12

**still** 25:22 27:20 44:15 50:12  
59:20 65:8 67:13 69:12 83:9  
85:18 95:25 115:16 145:9

**strength** 95:10

**strike** 56:13 94:20

**string** 152:20

**structural** 76:24 77:5,24  
78:16

**studied** 23:1 157:8

**study** 18:4 35:22

**subject** 15:21 69:19 136:5

**subjective** 123:13

**submitted** 24:5

**subtle** 83:7

**subtly** 84:15

**such** 40:3,12 48:4,5,7 76:3,14  
80:9 82:7 100:12 117:24  
129:12,18 130:10

**sufficient** 65:3,4,13,14

**suggested** 35:12

**suggestion** 154:14

**summaries** 36:11

**summary** 71:10

**suppose** 120:5 123:23 153:8

**sure** 8:12 10:1,5,19,24 12:3  
19:20 27:7 29:8,20 39:4,10  
43:9,13,16,19,22 44:2,9,14  
45:7 47:4,21 52:7 56:7 73:24  
94:16 97:4 107:16 112:15  
114:6 118:7,9,13 131:15  
135:1,10 137:6,16 153:18  
155:9 160:10

**surfaces** 80:9

**switch** 29:15

**switching** 29:18

**sworn** 5:6

**system** 49:13 52:2,25 53:23  
55:18,21 70:8 75:17,19,22  
76:3,12,23 77:16,17,18,23  
78:3,8,11 79:12,20 86:21 87:3,  
21,22,23 90:6,17,24 96:23  
97:18 98:12 99:1 117:2 121:19  
137:16 147:4 148:7 150:3  
156:25

**systems** 10:10 18:12 52:22  
53:6 60:14 65:5,15 69:21 72:3,  
9,14,16,19,24 73:2 79:11  
147:5

**Szuma** 9:3

---

## T

---

**T-E-L-E-O-S** 20:8

**tablets** 18:9

**taillights** 97:16

**take** 14:2 37:24 50:7 52:13  
81:6 103:1 124:8 128:21  
144:16 146:1 148:10 149:7,25  
152:1,13 165:3

**taken** 19:7 52:15 81:8 103:3  
128:22 148:12 165:5

**taking** 6:14 141:15,18,21  
146:11

**talk** 50:13 114:3 115:12 155:7

**talking** 69:18 78:21 79:8  
107:24 111:3 133:18 138:20  
149:5

**talks** 126:10 157:13,15,17,18

**tapping** 18:10

**teach** 78:10 90:10 134:12

**teaches** 127:24

**teaching** 90:10 131:5 146:18

**technical** 51:20 84:10 154:13

**technically** 143:12 144:15  
145:12

**technique** 104:14

**Technological** 16:18

**technologies** 11:25 12:7 13:1  
14:10,18,25 31:2,13 70:24  
71:5

**technology** 17:12 18:4,5  
22:14 36:4 65:24 67:11,14

**Teleos** 20:8,11,12

**tell** 11:8 63:5 112:5 115:19

**telling** 69:3 112:7

**ten** 6:23 9:20

**tend** 106:21

**term** 72:15,23,25 83:10,12,21,  
25 84:3 85:8,12,19,21,24  
88:10,21 89:1 94:9,22,23  
103:25 110:9 113:14,15 114:6,  
14,18 115:5,11 120:8,18  
121:8,12,23 122:12 135:11  
153:2 159:12 160:20 161:5,15  
162:3 163:5,8 164:9,12

**terms** 30:22 41:13 82:6 84:15,  
20 103:19 106:4 145:13  
152:25 157:6 160:23

**testified** 5:7 10:6

**testifying** 6:11,14,18 10:11,  
18

**testimony** 48:9 70:10 95:1  
109:9 110:20 115:9 117:8  
147:18 148:3 154:9 160:5  
161:8,19

**than** 13:14 24:16,17 46:3  
95:23 107:8,19 108:6,10,13,  
22,25 109:6,11,15,25 110:3,5,  
6 112:17 113:5,7,10,12 114:10  
122:18 145:7 151:1,4 157:2

**Thank** 45:15 115:24

**Thanks** 29:23 101:7

**that** 5:16,20,23,24,25 6:1,2,4,  
6,7,10,13,14,17,24 7:4,6,7,10,  
13,16,21,22,23,24,25 8:7,22  
9:11,16,19,23 10:8,14 11:8,15,  
18,21 12:1,6,8,9,16,18,23  
13:2,13,15,17,19 14:16,21  
15:3,20 16:5,11,14,20 17:5,7,  
14,17,20 18:11,15,20 19:1,7,  
17,19,25 20:9,15,16,17,18,21,  
23 21:2,6,10,13,15,18 22:4,7,  
10,15 23:9,12,16 24:4,6,22,25

25:3,6,9,10,19,23 26:10,20  
27:4,7,16 28:4,12,20 29:1,2,22  
30:2,10,12,14,15,18,20,21,23  
31:2,12,13,17,20 32:1,10,14,  
21,23 33:2,3,7,11 34:4,7,11,  
16,17,22 35:10,19,24 36:2,5,  
10 37:3,6,20 38:1,5,10 39:1,  
10,15 40:8,12,15,19,21,23  
41:2,6,19,22,24 42:2,5,16,19,  
22,23 44:24 45:3,6,9,13,16,18  
46:16,19,24 47:2,25 48:7,21,  
23 49:2,7,21 50:18 51:2,8,10,  
23 52:6,9,10 53:13,17,19,22,  
23,24 54:1,5,10,19,22 56:4,7,  
11,12,13,14,21,23,24 57:2,4,5,  
19,25 58:9,13,15,17,22 59:7,  
16,19 60:3,6,7,15 62:5,19,22  
63:10,12 64:7,19,23 65:2,6,8,  
9,11,13 66:5,23,24 67:6,7,12,  
18,24,25 68:8,21 69:12,13,15  
70:4,12,13,17,21 71:4,10,17,  
20 72:4,5,12,15,19,25 73:10,  
14 74:1,3,10,12,16,21 75:4,6,  
11,18,24 76:6,11,18 77:6,14,  
15,20 78:1,7,11,22,25 80:11,  
15,19,25 82:4,25 83:1 84:12,  
24 85:5,7,11,15,16,21 86:3,7,  
10,13,20,21,25 87:5,17,21,24  
88:6,8,9,13,17,19,21 89:2,5,8,  
21,23 90:2,3,6,9,10,11,13,15,  
17,20,23,24 91:7,10,12,15,23  
92:7,11,13,19 93:3,13,20,22,  
24 94:1,8,19,20,22,23 95:9,11,  
24 96:4 97:2,3,19,24 98:1,3,7,  
9,22,23,24 99:8,10 100:14  
101:13 102:4 103:9,10,22  
104:1,7,14,20,22,24 105:1,3,9,  
17 106:4,9,15,17,24 107:4,7,8,  
14,18 108:5,9,13,16,19,22,24  
109:6,11,14,17,20,22 110:2,4,  
5,10,17,25 111:7,11,13,18,22,  
25 112:6,11,15,16,21,25  
113:2,4,9,11,13,15 114:8,9,11,  
20,23,25 115:1,3,5,20 116:1,3,  
5,7,20,21 117:10,15 118:2,4,5,  
7,10,22,23 119:16,19,22,23,24  
120:1,6,13 121:6,8,24 122:4,  
10,25 123:1,3,12 125:12,22,23  
126:8,9,20,22,24 127:5,6,8,9,  
17,19,24 128:7,10,13,16  
129:19,22 130:5,7,15,20,21  
131:4,5,6,8,15 132:15,23  
133:9,18,19,23,24 134:2,5,8,  
14 135:1,2,11,14,20,22,23  
136:2,4,11,16,17,18,24,25  
137:4,7,10,12,17,19,25 138:3,

8,10 139:1,4,5,7,9,13,21,23  
140:9,19,20,23 141:1,3,4,7,16,  
19,21,24 142:3,10,12,13,14,  
15,25 143:1,15,18 144:1,4,5,6,  
11,12,17,22 145:4,9,15,18,21  
146:4,7,10,11,17,19,22 147:1,  
3,7,10,12,13,15,20,22,25  
148:5,9,25 149:2,8,22 150:12,  
15,16,23 151:1,8,11 152:1,2,5,  
9,10,12,14,16,19,21,22 153:1,  
10,13,14 154:11,12,14,16  
155:1,3,18 156:2,22 157:2,6,  
12,19,22 158:8,9,12,13 159:1,  
6,21,23,25 160:7,9,16,24  
161:22,25 163:15,21 164:3,8,  
16

**that's** 7:2 8:4 11:20 12:2 13:18  
16:21 17:6,9,18,19 18:21 19:3  
20:10,22,25 21:3,16 22:1,5  
23:14,17 26:2 29:19 32:3 33:5,  
9,16,17 34:2,3,6,20,23 35:8,  
15,23 36:9 38:2,3 39:16 40:20  
44:20 46:15,18,20 51:14,18  
58:2,6 59:9,12,15 62:6 69:8  
71:9,10 75:13,14 77:4 79:22  
83:18 87:1 88:24 89:6,9 93:23  
96:20 97:11 99:15 100:2,24  
101:1,22 102:11,14 108:24  
111:23 113:7 117:9 119:4,8,9,  
11,15,25 122:5 123:8 124:14,  
19 126:6,21 127:8,13 131:4,6,  
8 132:7,22 133:22 134:4,7  
136:13,21 138:10,14,21,23  
139:3,8,11,12 140:4,8,11,13  
141:5,9,11,22 142:15,21  
143:14 146:22,25 149:9,13  
152:23 154:2 159:23 160:3  
161:20

**their** 44:2 58:7 91:19

**them** 9:22 11:2,7,11 13:7  
14:23 15:13 18:9 23:20 34:25  
35:2 56:10 64:7 102:7 104:9  
117:25 157:7 158:20 159:9  
164:7

**then** 20:3 28:6 29:14 45:11  
50:21 60:2 65:3 70:16,19 82:8  
86:9 97:19 106:8 108:19  
113:7,9 114:2 118:10 123:24  
128:9 147:20 161:6,15

**there** 6:10,13 10:22 12:15  
16:20,22 17:7 18:17 19:16  
23:19 24:6,8,24 25:15 26:12  
27:24 28:1,7,21,24 29:1,2,11,

25 32:19 33:5 34:12 35:17  
36:5 38:10 40:9 42:9,10 43:11  
46:22 47:19,24 48:16 49:7  
51:9 52:9 58:25 59:21 61:12,  
23 62:1 64:7 65:2,20 67:13,15,  
18 69:14 70:3,20 71:19,25  
72:9 73:6 75:20 76:20 77:15  
81:14 82:24 83:9 84:7,9,11  
85:6 88:19,21 89:4,10 91:7,10  
92:11,24 95:8 97:7,15 100:8  
101:13 104:1,4 106:4 107:12  
111:15 112:20,25 114:7,24  
116:18 117:23 118:2,9,18  
119:3 120:5 121:16,18 122:6,  
20 124:23,24 126:24 127:7,17  
131:18 132:1,22 134:4,9  
135:22 136:17 140:4 143:19,  
20 144:20 145:4,15 146:6,20  
147:10 148:8 152:7 153:13  
154:16,18 156:20 157:2,5  
158:12 161:3

**there's** 6:19 7:3 11:10 20:3  
23:13 33:10 43:6,14,17,20,23  
44:4,11 46:6 49:18 67:23  
78:15 90:10,13,15 97:23,25  
104:14 106:3 112:9 126:18,20  
127:6 135:23 137:4,13,25  
138:7 139:4,19 140:24 146:17  
148:7

**thereby** 130:13

**these** 12:9 18:11 26:16 35:2  
50:15 84:9,19 92:17 93:9 94:5  
133:23 158:9 160:24

**they** 7:4 20:3 22:8 28:10,14  
35:4,7,10 39:10 40:11 49:20  
56:22 58:4,6 62:7 63:8 64:9  
80:19,22 81:13 84:15,19,20  
85:3,4 98:13,16,17 102:14,24  
107:15 119:15 128:15 148:4  
155:8 159:6 164:22

**they're** 13:3 14:23,24 72:18  
104:14 128:14 138:1 158:23  
159:6

**thing** 25:6 84:24 94:2,3,10,23  
100:12 102:20,24 114:4  
116:19 144:12 148:6 149:3  
159:25

**things** 18:21,22 20:7 21:7,8  
22:13,21 25:3 39:21 40:11  
42:11 46:5 54:23 56:13,14,20,  
21,23,24 57:8 62:20 68:19  
78:24 79:14 82:6 86:11 106:9

107:23 113:21,22,25 114:3,4  
128:19 137:4 155:17 160:24

**think** 6:23 9:6 10:4,20 11:23  
13:12 14:1,7,12 31:23 39:16  
40:25 49:20,25 50:24 51:1,14  
53:25 64:9 68:8,21 69:14 71:9  
74:21,23 75:6 76:9 79:13,17  
80:19 82:14,25 83:16 84:5  
85:5 88:20 93:5 99:7,16  
103:18 104:4 106:21 110:4  
113:20 115:3 116:18 120:13,  
17,18 121:22 123:19 124:19  
125:12,21 128:7 135:13,18  
137:13 138:2,11 144:12  
146:16 147:10,20 148:4  
151:19 154:18,20,25 161:21  
163:14 164:21

**thinking** 53:21

**Thirty** 11:5

**this** 7:23 8:5,25 9:10 11:13,17,  
23 12:6,20 13:5,10,12,16  
14:11,14 15:10,13 23:24,25  
24:1,3,4,5,10,19 25:3,5,14,17,  
18 26:6,8,9 29:1,15,16,23  
30:3,19,21,25 31:4,5,6,19,22  
32:11,16,17 33:3,14,18,21  
34:4,8,13 35:5,22,24 38:8,14,  
25 40:8,22,25 46:25 47:6,10  
48:5 51:3 56:8 57:22 61:6,7,21  
64:11 65:21,22 67:10 70:23,24  
72:22 77:8,13,18 78:21,22,23  
79:7 80:2,16,19 81:2,25 83:1,  
6,16 84:18 85:16 86:7 87:14  
91:21 93:5,13,20,24 94:18,21  
95:2,12,19 97:9,15 100:4,14,  
17,18 101:9,13,15,18,22  
102:16,24 103:18 104:25  
108:24 109:1,20 110:12 111:4,  
10 117:23 118:8,21 120:18,24  
121:23 122:3 124:10 125:4  
126:1,10,13,18 129:3 134:13  
135:13,18 137:12 138:13  
139:25 140:2,5,16 141:3,14,18  
142:16,22 143:2,11 144:10,19,  
20,23 145:9,22 147:14 148:17,  
18 149:6 153:24 157:24  
159:20 160:9,11 161:11 162:1,  
9 164:21,24 165:2

**thoroughly** 74:9

**those** 6:25 8:24 9:2,13,20,24  
10:18,25 16:8,9,11 18:13,22  
19:24 21:21 22:2,6 23:18 28:1,  
2,9,11,13,14 34:21,24 35:1,3,6

37:24 39:1 42:11 45:23 48:10  
49:9 56:20,24 57:8 58:4,7  
59:13 70:20 71:2 76:15 78:6  
84:15 86:11,16 89:7,21 90:11,  
22 92:3,9 93:3,23 98:3,20,23  
99:6 101:2,5 102:12 104:6  
111:15 113:20,25 118:6,19  
119:12,14 124:23 129:22  
131:16,19,20 132:6 158:3,20,  
22 161:12 163:1 164:14

**though** 47:6 56:11 58:4 78:16  
103:22 138:14 158:25

**thought** 11:23 12:7 25:5  
64:22 83:6 108:12,22 109:3  
117:10 120:14,17 121:22  
160:24

**three** 53:9,25 86:11,16

**threshold** 100:8

**through** 11:11 12:18 27:14  
29:14 35:2 37:17 49:6 63:23  
64:8 65:20 70:19 73:7 97:17  
101:5 124:23 129:8 132:3,7  
133:18 144:1 146:3,6 157:9  
164:17

**Thus** 101:6,8

**time** 13:25 14:1 23:2 25:19  
27:8,13 37:24 39:15 47:2 52:3  
54:14 59:24 60:8 65:11 82:25  
105:2 107:15 133:24 144:20  
146:24 147:6 149:7

**timeframe** 93:6

**times** 6:22,23 9:20 10:16  
54:11 84:21 103:11 112:14,23  
146:9 147:9,16

**tiny** 88:3,6,20 89:8 92:5,8,9,17

**today** 5:14 6:5,8,11,15,18,25  
8:7,18 9:14 74:14 82:2 126:2

**today's** 7:19 64:12

**together** 140:22 156:7

**told** 61:21 62:2 74:20 121:22

**top** 73:6 81:17 83:7 104:25  
126:11 129:7 132:10 134:3  
150:12 154:1 155:6 159:21

**topics** 19:6

**Torchlight** 11:16,17,21,25  
12:2,7,23 13:1 14:10,17,24  
31:1,12

**touch** 118:6

**touching** 18:10

**toward** 89:13

**towards** 44:16 60:2 65:1  
70:16 132:1 136:20 143:23

**Toyota** 16:18

**track** 98:23

**tracking** 99:3,5

**tradeoff** 50:1

**tradeoffs** 49:7,17,21

**transcript** 33:13

**transmitted** 97:17

**trial** 10:6

**true** 39:16

**trustees** 16:23

**truthfully** 6:11,15,18

**try** 19:9 29:17 42:20 99:8

**trying** 10:12 61:20 117:11  
149:4 152:17,19 153:1,2,19

**TTIC** 16:19 17:1

**Tuesday** 5:1

**Turk** 5:5,8,13 24:1 26:6 52:18  
57:18 81:11,15 87:12 103:5  
124:8 129:2 143:2 144:5,8  
148:18 155:19 163:9

**turn** 27:23 28:6 29:5,8 32:18  
59:20 65:19 73:5 76:17 86:19  
91:9 106:12 138:6 141:15  
144:18 150:1 153:9

**Turner** 25:18

**turns** 105:1

**two** 8:7,12 9:10 42:11 48:10  
60:12 76:20 78:6 84:15 92:2,  
24 93:4,23 94:6 95:8 101:2  
106:22,23 111:16 113:20,25  
116:18 118:25 124:24 125:5,7,  
17,22 126:8,25 127:7,19 128:8  
131:16,19,20 156:21 158:22

**two-bulb** 125:2 126:11,15  
127:3,11,16

**type** 17:1 75:22 90:3

**types** 40:19 89:7

**typical** 116:7,22 117:1,4,14,  
16,21 151:2,4,16,20,23,24  
152:1,3,4,8,12

**typically** 18:5 19:6 92:14,16  
151:6

**typing** 18:10

---

## U

---

**UC** 17:4

**unclear** 26:20 74:2

**under** 6:7

**underline** 67:11

**underlined** 67:13,21,22

**underlining** 67:23

**understand** 6:7,24 7:8,12  
19:9 23:10 26:17 29:12 54:21  
60:3,15 81:24 82:4 110:6  
117:12 137:10,19 147:3,14,20,  
24 148:5 152:17 153:1,3,20  
154:11 160:18,20 164:9

**understandable** 76:1

**understanding** 11:21 20:2  
30:20 31:24 34:7 36:13,24  
37:9,10,14 40:12 49:13 63:1  
74:15 75:13 80:21,22 82:5  
83:12 84:3 93:3 94:8,18,21  
101:17,21,25 102:8,12 107:7  
109:7 111:7,12 117:10,16  
118:2 128:2 134:13 136:24  
140:13,22 150:8,11,19,23  
154:5 159:16 160:23

**understood** 7:16 111:3

**undertake** 147:25

**undue** 12:17

**unit** 153:13

**units** 153:15,16

**university** 20:18

**until** 107:15

**up** 7:7 24:20 25:8 57:2,4 73:6  
79:25 81:11 125:18 141:14  
145:1 152:19

**updating** 27:18

**upon** 35:21 68:4,14 69:4,10,

20 70:7

**upper** 136:16

**URLS** 35:2

**US** 6:1 30:5 38:11 39:4 40:16  
76:4,7 124:9

**use** 47:25 50:14 52:10 62:3  
68:5 72:15 77:10 84:14,19  
122:16 125:7 129:19 144:5  
148:24 153:13 159:6 163:4

**used** 7:22,24 19:11,14,17,22  
73:15 74:2 75:6,12 77:17  
84:23 85:3,9,13 90:4 97:19  
102:25 114:21 121:25 122:2,  
12,19 124:12 152:5 153:2  
162:3

**user** 65:23

**uses** 131:14 149:1 152:6  
157:21,22 159:11 162:6

**using** 43:2 51:16 68:1 72:4  
91:12 92:17 104:20 124:15  
125:1,5 126:14 127:2,10,15,16  
129:11,15 149:14 152:8

**usually** 19:3,8

---

## V

---

**vague** 15:16 16:4 29:6 39:19  
41:9,18 42:4 43:1,8 49:24  
50:23 51:13,22 52:5 55:7,11  
56:19 60:21 62:9 63:4,14,19  
64:4,21 66:10 67:4 68:6 69:6,  
23 71:7,15,22 72:17 73:25  
74:7 79:3 84:13 86:15 93:16  
94:25 96:9,25 98:6,15,25  
100:10,25 101:19 103:15  
104:3,12 105:8,10,16 107:1,  
10,25 109:9,24 110:11,20  
111:9 113:19 114:17 115:2  
116:9,23 117:18,20 120:3  
122:8 124:18 125:10 126:17  
127:21 128:12 129:24 131:13  
133:12,21 134:11,24 136:1  
137:22 146:14 147:18 148:3  
151:18 158:7 163:12

**value** 151:7,9,12

**variable** 76:13 80:10

**various** 19:18 21:11 22:13  
25:5 83:18 113:22 140:22  
156:20

**vary** 123:11,14 132:12,16,19,  
24 133:3,6 134:5

**vehicle** 21:9 37:22 38:1,10  
39:9 40:9,19 41:4,7 46:13  
47:22 48:14 51:16 52:11,24  
53:12,16,19,22 54:2,4,7,22,24  
55:9,13,17,21,24 56:2,5,8,18  
57:1,2,4,6 58:10 59:1,4,17  
65:16 67:3 69:21 70:8 73:20  
78:21 79:1,8 86:6 97:16,17  
99:10 117:5,19 120:11 123:24  
124:3,4 141:15,18,20 143:7

**vehicles** 21:10 48:15 53:10  
97:20,25 98:3,13,20,24 99:2,6,  
9,14

**verbally** 7:4

**versa** 132:11

**version** 47:16,18 67:22 119:9  
136:13 138:13

**versions** 47:19 92:11

**versus** 127:15

**very** 11:5 20:3 23:13 75:25  
83:7 84:10,18 92:13 105:10  
140:21

**viable** 71:14

**vice** 132:11

**video** 19:2

**view** 96:18,24 98:1,3,5,12 99:6  
119:17,18,19,23 120:2 133:13

**vision** 17:3,19,21,22 18:20  
19:1,4,5,11,14,18,22,24 20:13  
21:5,10,14,18,24 22:6,16,18  
56:16

---

## W

---

**walk** 153:8,10

**wall** 40:25 41:2,3,6,12,15,24  
42:16,19

**walls** 41:21

**want** 28:22 29:7,13 31:5 50:7  
68:22 70:3 94:15 96:21 149:7

**wanted** 29:19

**wants** 147:11,15

**was** 5:6 10:8,9,19 14:16 20:12,  
20 21:1,9 24:5,21,25 25:9,10,  
14,15 26:23,25 27:4 28:20,24  
29:2,20,21,22 30:18 33:21  
34:12 40:14 41:15 45:7,11  
47:2,24,25 50:7 51:23 52:15  
53:18,20,25 54:1,4,6,7,14,16,  
17,19 56:8 61:22 62:2 67:21  
81:8 103:3 111:20 113:2,4  
117:11,14 119:6 128:22  
144:17 145:4,12,17 148:12  
152:8,10,21 154:11,14 161:21  
165:5

**wasn't** 161:25

**watts** 71:1

**way** 18:9 22:11 29:14 40:25  
41:4 43:2 77:10 81:24 82:4  
88:24 130:20,21 137:24  
150:24 152:8 153:25 154:2

**ways** 13:24 18:11 116:18  
155:9

**we'll** 25:25 77:9 106:14

**we're** 37:16 66:13 93:7 95:25  
133:17

**we've** 101:21 118:5 136:3

**weeks** 161:2

**Welcome** 103:5

**well** 14:3 18:14,20 25:18 26:2  
49:20 60:12 71:1 72:5 79:15  
82:22 83:6 85:14 91:3 92:2  
104:24 106:20 134:20 145:12

**went** 12:18 27:14 30:22 98:8  
114:3

**were** 7:22,24 9:2,20,22,23,24  
10:11,17,23,25 12:5 14:10  
17:4,10,16 20:8,16 21:4,5  
30:24 35:4,7,9,10,12 52:9  
53:4,13,24 56:20,22 57:22  
58:4,6 67:19 73:3 80:7,25  
85:14 88:15,18 95:24 97:21  
98:20 113:14 160:21,24

**what** 7:25 8:22 9:25 10:8,11,  
17,25 11:6,19 12:2,3 14:4,20,  
23 15:17 16:22 17:1,23 18:6,  
22 19:10 20:17 21:8 22:9,18,  
25 24:3,12,25 25:5 26:8,23  
28:9,14,20 30:16,23 31:14  
32:25 35:24 36:2,13,18,23  
37:1,6,15 38:9,24,25 40:21,24

41:3,10 42:5,13,17,18,20,21  
44:20,22 45:7,20,23,24 47:18  
48:2,13 49:4,9,12 53:8,17  
54:1,12,16,17,19 56:22 57:5  
61:16,21 62:2,15 63:5 66:13  
69:8 72:16 73:11 74:15,21,23  
75:1,4,9,14 76:15 77:22 78:9  
79:22 81:20 82:11 83:4 84:5,  
12 85:11,24 86:2 87:4 88:2,24  
91:20 92:12,22 95:8,12,20  
96:17,21 97:21 98:1,8 100:3,6,  
17 101:17,18,22 103:13,23  
104:6,19 106:2,3,5,19,25  
108:19,20 109:1,15,19,25  
110:24 111:18 112:6 113:1,21,  
22,25 115:11 116:3,25 117:4,9  
118:22 119:6 120:8 122:5  
123:2,5,20 124:3 125:15  
126:19,21 127:8,13,23 128:6  
131:4,6 132:22 133:17,22  
134:4,7,14 135:1,2 137:6,14  
138:17 139:12 140:5 141:22,  
23 142:2,9 143:1,25 144:8,9,  
13 145:6,8,17 146:25 147:21  
150:8,19 151:4,13,15,16,24  
152:3,4,15,16,24 153:1,16,17,  
20,24 154:5,11,21 155:3,22  
156:15 157:12 159:14 160:18,  
20 161:2 164:12

**what's** 5:16 12:11 13:19 16:17  
18:3 20:11 36:8 37:9,14 49:6  
55:4 63:10 64:19 82:4 83:12  
84:3 94:3 95:18 105:21,23  
117:16 123:11 128:1 145:2  
150:8,19

**whatever** 20:7

**wheel** 159:24

**when** 8:8 12:5,22 14:20 15:9  
18:17 19:1 21:4 22:9 24:10  
26:14 41:22 46:24 57:4 74:15  
75:2 84:14,19 85:21 88:6 98:9,  
13 105:2 113:14 114:6,14  
115:17 116:20 127:15,19  
154:6 160:21

**where** 10:22,23 13:5 14:22  
15:21 16:1 32:15 34:18 44:16  
48:4,16,17 50:13 53:4,13  
54:22 59:3,13 61:12 67:7,24  
73:7 75:19 76:3 78:14,21 80:6,  
25 81:18 82:8 92:3,4,14,15  
93:8 96:18 99:18 103:9 107:13  
112:9 113:16 115:19 121:18  
125:17 127:7 130:4 135:19,23

138:20 140:11,14,17 141:9,12  
142:6,7 143:5,14 145:13  
152:13,18 156:12 163:25

**whereas** 157:14

**wherein** 150:3

**whereupon** 52:15 81:8 103:3  
128:22 148:12 165:5

**whether** 12:5,11 15:10 49:18  
74:2 80:22 84:16 100:8 112:5  
121:2 125:7 126:7 158:22

**which** 16:24 20:5 23:14 26:21  
32:20 33:24 37:18 38:20 39:6  
40:11 41:3 47:16,18 53:10  
65:23 68:25 69:18,25 70:24  
71:1,2 72:7 76:8,24 78:10,18  
79:7 82:24 87:12 90:20 91:9  
97:21 98:21 99:20 101:11  
106:3 107:23 109:2 118:3,9  
121:12 124:24 126:19,25  
127:17 128:15 129:11,13  
130:11,16 132:2,9,11 133:23  
136:3 145:6,8,22 147:10  
155:11 156:23,24

**while** 10:12 37:16

**who** 8:6 9:2 11:15 12:20 14:13  
25:12,16 27:2 30:23 32:13  
39:3 47:8 57:18,21 144:24  
155:7

**Who's** 11:13

**whole** 80:7 114:19,23 115:6  
138:16 162:9

**why** 5:14 28:13 47:22 161:25

**wide** 19:6,16

**widely** 100:4,6

**window** 132:9,15 133:9,18,24  
134:5,8,13 135:11,13,15,19,23  
139:1 140:11,14,17,21 141:9,  
12 142:10

**within** 42:16,18 43:4 96:14,24  
98:4 99:6 114:25

**without** 45:17 46:1 135:8  
146:25

**witness** 5:9 13:7,21 14:6 15:3,  
7,17 16:5 19:13,16 31:9 32:10  
36:17 39:20 40:2 41:10,19  
42:5 43:2,9 44:9 48:10 49:25  
50:24 51:14,23 52:6 55:12,20



56:20 58:12,21 60:22 61:20  
62:10,15 63:5,15,20,23 64:5,8,  
22 66:5,12,16,22 67:5 68:7,17  
69:8,24 70:11 71:9,16,23  
72:18 73:13 74:1,8,20 75:1,5  
77:10 79:5 81:24 82:14,22  
83:16 84:14 85:3 86:16 87:4  
91:3 93:17 95:2,15 96:10 97:1,  
5,11,14 98:7,16 99:1 100:11  
101:1,20 102:23 103:17 104:4,  
13 105:9,17 107:2,12,22  
109:10,25 110:4,12,21 111:10  
112:20 113:20 114:18 115:3,  
10 116:11,25 117:9,21 118:13,  
25 119:5 120:5,22 121:7  
123:8,23 124:19 125:12  
126:18 127:23 128:3,13 130:1  
131:14 133:3,6,13,22 134:12,  
20 135:1,18 136:2 137:3,23  
139:15 143:11 144:7 146:16  
147:19 148:4 149:22 150:11,  
23 151:19 153:7,23 154:10,25  
155:6,15 156:2,20 157:5  
158:8,19 159:19 160:7 161:9,  
20 162:10 163:14,20 164:21  
165:2

**witness'** 43:1 70:10 95:1  
109:9 110:20 115:9 117:8  
147:18 148:3 154:9 160:5  
161:8,19

**WO** 129:4

**won't** 7:6

**wondering** 50:7

**word** 24:24 62:19 68:19 70:1  
71:23 75:6 85:4,14,15 131:14,  
15 152:8 159:8

**wording** 157:9 158:3

**wordings** 156:21

**words** 24:22 45:23 67:18 84:9  
94:6 102:23 143:18 157:6  
158:12

**work** 13:10 18:17 20:3 21:10,  
11,14 25:3,13 27:2 35:21  
45:16 53:10,15 54:9,12 90:12  
92:10,11 101:22

**worked** 18:14 23:1,8,9,11  
24:20 25:12,17 30:24 53:4,9  
54:24 55:2,4

**working** 7:23 13:16 14:11,16  
20:13 21:4,9 30:19 31:18 35:5

47:9 53:13,24

**works** 162:20

**world** 20:6 22:12,13 54:21

**would** 6:10,14,17 11:3,5,10  
14:7 18:7,8 19:1,5 21:23  
22:15,22 23:8,13 27:16 36:2  
39:4 41:6,15,20,22 44:17 45:5  
46:1,25 48:10 49:5,21,25  
50:19 53:19,22 54:1,19,22  
55:14 56:10 58:9,17,19,21  
60:9 62:18 64:5,19 65:11,13  
67:6 69:12 82:24 83:1,4 84:12  
85:3,7 88:6 90:10 96:15,20,22  
97:2 98:3,13,16,18,23 99:2,5  
101:17,25 102:9 104:7,10,15  
105:3 107:18 108:5,9 109:21  
110:5 111:18 113:13 116:7,21  
117:5 118:21 120:14 121:3  
123:24 125:8,12,15 126:22  
127:19 128:4,10,16 131:6  
135:4,10 137:7,9,15,18,23  
138:3 140:14,18,23 141:12,17  
142:7,11,13 143:4,5,6,15  
144:12,14,16 145:14,15,23  
146:17 147:1,2,12,14,19,20,  
21,24 148:4,6,8 151:6,8,11,13  
152:10,13,16,17,23 153:3,8,  
13,15,16,20,23 154:21 155:3,  
11,18,20,23 156:21 158:8,12  
159:22 162:20 163:15

**wouldn't** 41:11 45:2,12,16  
50:21 99:3 128:15 134:14

**wrap** 79:25

**write** 24:19,22,24 161:10,21,  
25

**writing** 68:21

**written** 37:10,11,15 56:5  
157:6

**wrong** 99:17

**wrote** 12:8 26:9 160:25 161:3

---

## Y

---

**yeah** 47:12 50:10 71:9 79:5  
87:6 102:17 108:19 113:12,13  
116:25 121:25 131:7 137:23  
143:13 146:25 153:15

**year** 17:7 23:8,9,12 24:5 47:1,  
6 61:22,25

**years** 23:4,6,7,13 40:13 53:9,  
25 60:12 61:12

**Yechezkal** 16:2 30:4,6

**yellow** 142:9,13

**yes** 5:15 6:3,9,21 7:8,11,14,18  
8:4 9:12,15 10:7,24 12:19,24  
13:18 16:10,13,16 17:12,15  
18:16 19:15 21:7,19,22 22:8,  
17,24 23:20 24:2,7,9 25:24  
26:7,11,13,19 27:18,22,25  
28:5,8,19 30:1 32:24 33:12  
35:18 37:23 38:5 42:11 44:19,  
21 46:23 48:20 49:8 50:18  
52:12 55:15 58:8 59:6,15,19  
60:1,6,18,22 61:2,9,15 63:9  
64:14,17 65:7,9,17 67:21,25  
68:3,12 69:2 72:15 75:25  
76:16 77:6 80:14 81:1,19  
82:10 83:11,24 84:2,11 85:20,  
23 86:17,23 87:13,15,18 88:1,  
14 89:3,12,16,20,23 90:1,5  
91:8,16 93:5,12 94:2 96:5  
97:14 98:18 99:24 100:16  
101:7 103:12 106:11,18 108:4  
110:4 111:17 112:4 114:11  
116:2 119:13,18 120:15,19  
121:17,21 122:5,15,20 124:11  
125:6,25 126:3 127:5,8,13  
129:6,18,21 130:1,6,24 131:4,  
25 132:4,18,22 133:7,22  
134:4,7,21 135:14 136:12,19,  
23 138:9,22,25 139:6,22  
140:10 141:2,8,22 142:1 143:3  
144:15 145:4 146:10 148:19,  
23 149:16 152:8 155:20 156:8,  
11,14 159:3,13 160:15,17,19  
163:10 164:4,7,11 165:2

**yesterday** 8:9,14 24:11,13,17  
26:15

**yet** 51:11

**you'd** 12:10 69:15 157:10

**you'll** 7:13 26:17 119:4

**you're** 5:14 6:7,13 12:22  
22:15,22 23:15 26:20 29:13  
30:15 35:19 37:3 47:16 48:6  
55:9 61:7 69:3 88:19 89:1  
103:8 108:20 109:5 112:6  
114:6,14 117:1,4 118:9 131:23  
138:20 152:24 153:24 154:16

**you've** 6:20 9:10,19 10:16,22  
11:3 13:17 16:20 21:13,24

32:1 38:9 55:17 56:23 112:3  
125:24 136:15 144:8

**your** 5:12 7:5 8:2 9:8,17 11:21  
12:11,20,25 13:5,10,13,17  
14:20 16:17,22 20:8,16,20,23  
21:1,13,14 23:10,18,24 24:6,8,  
25 26:1,10,12,14,16,23 27:2,6,  
8,15,20,23 29:5 30:15,20 31:1,  
12,22,25 32:4,21 33:6,9,10  
34:15 35:9,14,19 36:13,23  
37:9,14 38:3,23 39:17,18,23  
40:7 42:10 45:2,12,21 46:16,  
21 47:16 48:3,21 49:1,9,17  
50:6,19 58:24 59:16,20 60:25  
61:1,10,16 63:1 64:16,25 67:2,  
10 69:21 70:6 71:19 75:13,14  
77:8 78:1,3 80:1,16,21 83:4,  
12,23 84:3,24 85:22 86:19  
87:2,16,17,19,20 93:3 94:8,18,  
21 97:10 101:17,25 102:8,12,  
19 103:7 106:12 107:7 108:15  
109:5 110:7,9 111:5,7,15,20  
112:11,16 113:2,4,9 114:1,2,  
23 115:16,20 116:13 117:11,  
16 118:2,17,19 119:22 121:15  
122:17,23 125:21 128:1  
131:18,22 136:5,8,10,24  
137:18,24 138:6 139:12  
140:16 141:20,23 142:12,23  
143:8 144:16 145:9,20 148:20  
149:10 150:8,19 153:19  
155:17 156:5 157:3 158:4,16,  
25 159:15 160:21 161:5,17  
163:4,24 164:5

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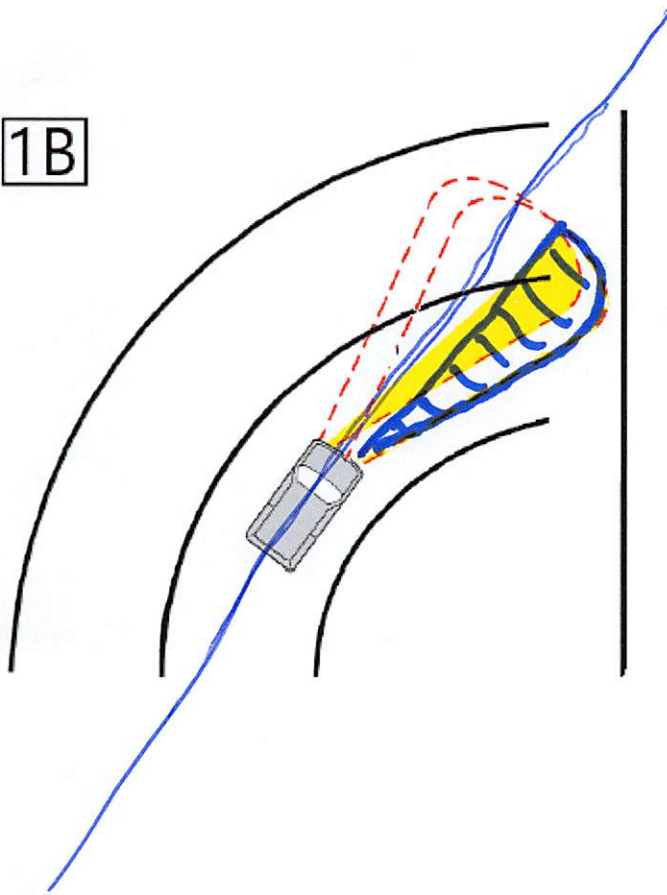
## Z

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**Z-H-O-N-G** 57:19

**Zhong** 57:18

1B



Matthew T. Neal  
10/17/23

