

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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LG ELECTRONICS INC.  
Petitioner

v.

IMMERVISION, INC.  
Patent owner

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IPR2020-00179

IPR2020-00195

Patent No. 6,844,990

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REMOTE EXAMINATION of DAVID AIKENS

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TAKEN ON

THURSDAY, OCTOBER 1, 2020

CERTIFIED STENOGRAPHER:  
JESSIE WAACK, RDR, CRR, CCRR, CCR, NYACR, NYRCR  
REALTIME SYSTEMS ADMINISTRATOR  
JOB NO.: 49143

Henderson Legal Services, Inc.

202-220-4158

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LGE Exhibit 1018

LGE v. ImmerVision - IPR2020-00179

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REMOTE EXAMINATION of DAVID AIKENS,  
taken before JESSICA R. WAACK, Registered  
Professional Reporter, Registered Merit  
Reporter, Certified Realtime Reporter,  
Registered Diplomate Reporter, California  
Certified Realtime Reporter, Certified Court  
Reporter in New Jersey, New York Association  
Certified Reporter, New York Realtime Court  
Reporter and Notary Public of the State of New  
York, proceedings held via videoconference, on  
Thursday, October 1, 2020, commencing at  
11:04 a.m. EDT and concluding at 5:18 p.m.  
EDT.

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A P P E A R A N C E S

(all appearing remotely)

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21

22 --oOo--

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1 INDEX TO EXAMINATION

2 WITNESS: DAVID AIKENS

3 EXAMINATION PAGE

4 BY MR. BREGMAN 7

5

6 -o0o-

7 INFORMATION REQUESTED

8 None

9

10

11 WITNESS INSTRUCTED NOT TO ANSWER

12 None

13

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1 INDEX TO PREVIOUSLY MARKED EXHIBITS

2 WITNESS: DAVID AIKENS

3 Thursday, October 1, 2020

4 MARKED	DESCRIPTION	PAGE
5 Exhibit 1001 U.S. Patent 6,844,990		13
6 Exhibit 1005 U.S. Patent 5,686,957		262
7 Exhibit 2009 Mr. Aiken's declaration		14
8 Exhibit 2012 Pedrotti reference		253

9

10 \*\* No exhibits were included in the  
11 transcript \*\*

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PROCEEDINGS

October 1, 2020, 11:04 a.m.

New York, New York

\*\*\*\*\*

DAVID AIKENS

called as a witness herein, having  
been first duly sworn on oath, was  
examined and testified as follows:

EXAMINATION

BY MR. BREGMAN:

Q. Hi, Dr. Aikens. Dion Bregman here. 11:04:42  
We just met. So we are going to go through 11:04:45  
just a couple of introductory questions related 11:04:49  
to depositions. 11:04:51

So have you ever had your deposition 11:04:51  
taken before? 11:04:54

**A. Yes, I have.** 11:04:55

Q. How many times? 11:04:56

**A. I've testified once, and I think 11:04:57  
I've been deposed three times, so this will be 11:05:04  
my fourth. 11:05:06**

1 Q. What was the most recent one? 11:05:07

2 A. **July -- I want to say 20th, on that** 11:05:09

3 **order.** 11:05:16

4 Q. Are these all patent cases? 11:05:17

5 A. **No. Some are patents, some are** 11:05:19

6 **contract law.** 11:05:21

7 Q. And the most recent one was a patent 11:05:23

8 case? 11:05:26

9 A. **The most recent one is a civil case.** 11:05:27

10 Q. And the one in July, that was also 11:05:29

11 via videoconference? 11:05:34

12 A. **That was videoconference, yes.** 11:05:37

13 Q. So we'll go through some sort of 11:05:39

14 basic ground rules which I'm sure you've heard 11:05:41

15 a million times before, and then we'll talk 11:05:44

16 about a remote deposition. That's a little bit 11:05:47

17 different. 11:05:49

18 All your answers need to be verbal 11:05:49

19 responses, of course. It's particularly 11:05:51

20 important now because we're not all sitting 11:05:54

21 together, and Jessica, our court reporter, 11:05:57

22 needs to hear your response, not a nod of the 11:05:59



1 head, for example. 11:06:01

2 Is that okay with you? 11:06:02

3 **A. Yes.** 11:06:05

4 Q. If you don't understand a question 11:06:06

5 and you need clarification, just feel free to 11:06:08

6 ask me to rephrase the question. 11:06:11

7 We're going to be taking a break 11:06:13

8 about every hour. Of course, if you need a 11:06:15

9 break at any other time, just let me know, and 11:06:17

10 we can take a break. I just ask that you 11:06:21

11 finish answering the line of questions that we 11:06:23

12 are busy dealing with at the time. 11:06:25

13 Do you understand that you are under 11:06:29

14 oath as if testifying in a court of law? 11:06:31

15 **A. Yes, I do.** 11:06:35

16 Q. Is there any reason why you can't 11:06:37

17 answer my questions fully and truthfully today? 11:06:39

18 **A. No, there is not.** 11:06:41

19 Q. Are you taking medication that would 11:06:43

20 affect your testimony? 11:06:45

21 **A. No, I'm not.** 11:06:47

22 Q. All right. Since we're not in 11:06:49

10

1 person, I'm going to ask a couple of additional 11:06:52  
2 questions. 11:06:54  
3 What materials do you have in front 11:06:55  
4 of you or available? 11:06:57  
5 **A. So on my left I have my laptop 11:06:59**  
6 **computer with the window open which includes 11:07:03**  
7 **all of the documents that you sent yesterday. 11:07:06**  
8 **Q. Okay. 11:07:09**  
9 **A. On my right, I have some paper 11:07:10**  
10 **copies of the same documents, specifically my 11:07:13**  
11 **declaration, Dr. Chipman's declaration, and the 11:07:17**  
12 **relevant patents in the case. 11:07:20**  
13 **Q. All right. And do you have any 11:07:22**  
14 **flags or markings on any of those documents? 11:07:24**  
15 **A. No, I do not. 11:07:28**  
16 **Q. Okay. I apologize if I keep 11:07:29**  
17 **clearing my throat, but it's super smoky here 11:07:33**  
18 **in California today. 11:07:36**  
19 **A. I'm sorry. 11:07:37**  
20 **Q. No problem. 11:07:37**  
21 **So I'm going to ask you to refrain 11:07:38**  
22 **from looking up anything or things on your 11:07:44**

11

1 computer other than the documents that we are 11:07:47

2 discussing; is that okay? 11:07:50

3 **A. I understand.** 11:07:51

4 Q. And you'll let me know if you're 11:07:52

5 looking at any of the other documents in front 11:07:54

6 of you other than the ones I've directed your 11:07:56

7 attention to, right? 11:08:00

8 **A. Yes.** 11:08:02

9 Q. I also ask that you refrain from 11:08:02

10 using chat or instant messaging features on 11:08:04

11 your computer or phone while I'm -- until I'm 11:08:07

12 finished asking my questions today; is that 11:08:12

13 okay? 11:08:14

14 **A. Yes.** 11:08:15

15 Q. Thanks. 11:08:15

16 Finally, just like a regular 11:08:19

17 deposition, you're forbidden from discussing 11:08:21

18 your testimony with your counsel until I'm done 11:08:23

19 asking you questions. 11:08:26

20 Do you understand that? 11:08:26

21 **A. Yes.** 11:08:28

22 Q. Okay. So do you understand that 11:08:29

1 you're testifying today with respect to two IPR 11:08:33  
2 proceedings, IPR 2020-00179 and IPR 2020-00195? 11:08:35

3 **A. I'm going to reach for my 11:08:45**  
4 **deposition. 11:08:50**

5 Q. Okay. 11:08:50

6 **A. Yes, that's correct. 11:08:51**

7 Q. When you say your deposition, you 11:08:53  
8 mean your declaration? 11:08:54

9 **A. Sorry. My declaration, yes. 11:08:55**

10 Q. And I'm just going to refer to them 11:08:57  
11 as the IPRs; is that okay? 11:08:59

12 **A. That's fine. 11:09:02**

13 Q. And is it correct that you provided 11:09:03  
14 a single declaration for both of these IPRs? 11:09:06

15 **A. That's correct. 11:09:09**

16 Q. Now, the questions asked today are 11:09:10  
17 going to be applicable for both proceedings. 11:09:14  
18 If you believe that your answer would vary 11:09:16  
19 between the proceedings, please note that or 11:09:18  
20 ask me to clarify my question. 11:09:22

21 Is that okay? 11:09:23

22 **A. I understand. 11:09:24**

13

1 Q. Why don't we look at Exhibit 1001. 11:09:26

2 And that's U.S. Patent 6,844,990. 11:09:38

3 **A. I have it.** 11:09:47

4 Q. And is this the patent that you've 11:09:47

5 provided your opinions on? 11:09:51

6 **A. Yes, it is.** 11:09:54

7 Q. And has the patent been -- 11:09:56

8 (Audio technical difficulties; 11:10:06

9 stenographer asks for 11:10:06

10 clarification.) 11:10:07

11 BY MR. BREGMAN: 11:10:07

12 Q. And it is the patent that is being 11:10:07

13 challenged in the IPRs, right? 11:10:09

14 **A. Yes.** 11:10:11

15 Q. And I'm going to refer to it as 11:10:15

16 either "the '990 patent" or "the patent." 11:10:16

17 Is that okay? 11:10:20

18 **A. Yes.** 11:10:21

19 Q. And you recognize this Exhibit 1001? 11:10:21

20 You've seen it before? 11:10:25

21 **A. I do.** 11:10:26

22 Q. Why don't you briefly tell me what 11:10:27

14

1 you believe the invention to be in the '990 11:10:31  
2 patent. 11:10:35

3 **A. Well, I'd like to refer to my 11:10:36**  
4 **declaration, because I spent quite a bit of 11:10:42**  
5 **time preparing it. 11:10:45**

6 **Is that all right? 11:10:46**

7 Q. Yeah, that's okay. 11:10:49

8 **A. So as I say in paragraph 25 of my 11:10:52**  
9 **declaration, "The '990 patent relates to 11:11:10**  
10 **panoramic imaging and display." 11:11:16**

11 Q. Before we get there, why don't we 11:11:17  
12 just introduce your declaration. 11:11:19

13 So you're talking about 11:11:21  
14 Exhibit 2009? 11:11:23

15 **A. That's correct. 11:11:24**

16 Q. And that's -- if you go to the very 11:11:24  
17 last page, that's your signature? 11:11:27

18 **A. Yes, it is. 11:11:29**

19 Q. Okay. And this is the declaration 11:11:30  
20 that we discussed earlier that discusses both 11:11:32  
21 of the patents in the IPR? Sorry. Both of 11:11:35  
22 the -- discusses the '990 patent from both of 11:11:39

15

1 the IPRs? 11:11:42

2 **A. That's correct.** 11:11:45

3 Q. Okay. Sorry. I cut you off. Why 11:11:46

4 don't you continue telling me about the 11:11:50

5 inventions. 11:11:52

6 **A. Well, as you can see from my 11:11:55**

7 **Section 6, I go through the patent and the 11:11:59**

8 **claim summary. I'm not exactly sure what you 11:12:02**

9 **specifically want to know.** 11:12:05

10 Q. I just want to know sort of in a 11:12:06

11 nutshell what you believe the invention of the 11:12:08

12 patent, the '990 patent is all about. 11:12:12

13 **A. Well, it is about panoramic imaging 11:12:17**

14 **and display.** 11:12:22

15 Q. Panoramic imaging and display, of 11:12:23

16 course, is -- 11:12:26

17 **A. I'm sorry. Could you repeat that? 11:12:27**

18 **You're breaking up a little.** 11:12:28

19 Q. Panoramic imaging and display, in 11:12:29

20 and of itself is not new, right? 11:12:34

21 **A. Panoramic imaging dates back to 11:12:36**

22 **roughly to the 1840s.** 11:12:41

1 Q. Okay. And display of panoramic 11:12:43  
2 images is also very old, right? 11:12:46

3 A. Same time frame. Thomas Sutton's 11:12:48  
4 panoramic camera. 11:12:52

5 Q. Okay. So what is the invention, in 11:12:53  
6 a nutshell, of the '990 patent? 11:12:55

7 A. Well, as the patent explains in 11:12:57  
8 prior art, a panoramic imaging lens would have 11:13:01  
9 a linear relationship -- might have a linear 11:13:05  
10 relationship between the angles of field in 11:13:08  
11 object space and the height of the image in 11:13:12  
12 image space. The '990 patent -- I'm sorry. 11:13:16  
13 No, please. 11:13:21

14 Q. No, go ahead. 11:13:22

15 A. No, I was finished. That's fine. 11:13:25

16 Q. Okay. So I think what you're 11:13:27  
17 talking about is if we go back to the patents, 11:13:29  
18 Exhibit 1001, we're looking at Figure 4A and 11:13:32  
19 4B; is that correct? 11:13:39

20 A. That's correct. 11:13:39

21 Q. So maybe you can start with that and 11:13:39  
22 explain to me what's shown in Figure 4A and 4B 11:13:41



17

1 and tell me what -- what the invention is. 11:13:44

2 A. Well, actually, first we should look 11:13:47

3 at Figure 5. 11:13:50

4 Q. Okay. 11:13:51

5 A. Figure 5 puts the context -- puts 11:13:52

6 the invention in a little better context. This 11:13:55

7 is the prior art. 11:13:58

8 Q. Uh-huh. 11:14:01

9 A. So this figure describes a series of 11:14:03

10 angles in object space and a series of heights 11:14:05

11 in image space. And it shows a linear 11:14:09

12 relationship between the angle and the height 11:14:12

13 on the detector. 11:14:15

14 In the patent, it specifically 11:14:16

15 describes the Angle A2 as being half of A1. In 11:14:19

16 this particular figure, A1 is drawn 11:14:25

17 incorrectly. It should extend from line A all 11:14:28

18 the way to the optical axis. 11:14:30

19 So A2 is half of A1. And similarly, 11:14:33

20 the image of those -- the image point related 11:14:36

21 to those object points are A prime and B prime 11:14:38

22 at the image plane, and they would have heights 11:14:41

18

1 of D1 and D2 respectively, and D2 is one-half 11:14:44  
2 of D1. This is called a linear field 11:14:49  
3 relationship, or  $H$  equals  $F$  theta, commonly 11:14:52  
4 referred to as an F-theta lens. 11:14:57

5 Q. Just looking at the arrow for D1 and 11:14:59  
6 D2, should there be arrow points on that center 11:15:02  
7 line, or does D1 extend all the way from one 11:15:05  
8 side to the other side? 11:15:10

9 A. No, you're correct. Those are -- D1 11:15:11  
10 extends below the center line, and negative D1 11:15:14  
11 extends above the center line. So D2 goes 11:15:19  
12 below the center line and negative D2 goes 11:15:22  
13 above the center line. 11:15:27

14 Q. Okay. So I think I got that. 11:15:28  
15 So if we go back to Figure 4A and 11:15:29  
16 4B, how does that apply to what we just 11:15:32  
17 discussed with respect to Figure 5? 11:15:34

18 A. Okay. So that is a linear 11:15:36  
19 relationship between field angle and image 11:15:37  
20 height. If you look at Figure 4A, it shows a 11:15:39  
21 series of concentric circles, each of which is 11:15:42  
22 from a different field height, specifically 10 11:15:47

1       degrees, 20 degrees, 30 degrees and so on.       11:15:51

2               In this particular case, the lens in       11:15:54

3       question is imaging over plus or minus 90       11:15:58

4       degrees diameter. So there is the -- the       11:16:00

5       circles relating to the field angles are C10,       11:16:05

6       C20 and so on up to C90.       11:16:09

7               Q.     Uh-huh. And lenses are always round       11:16:12

8       or circular, as you said?       11:16:16

9               A.     I'm just describing this figure.       11:16:17

10              Q.     Okay. And my question just       11:16:20

11       generally, are lenses always circular?       11:16:22

12              A.     That's -- that's a very broad       11:16:24

13       question. In what context? In this patent?       11:16:27

14              Q.     In this patent.       11:16:31

15              A.     In this patent.       11:16:32

16              Q.     Are lenses circular?       11:16:33

17              A.     No, I believe not. We'll have to       11:16:36

18       look at a different figure. Should we leave       11:16:39

19       this line for the moment?       11:16:42

20              Q.     Why don't we look at that figure.       11:16:42

21       We'll come back in a second.       11:16:44

22              A.     In this patent, there is Figure 18,       11:16:45

20

1 for example. And these are not necessarily 11:16:51  
2 round or square or -- although we're not -- 11:16:55  
3 they could have any shape depending on the type 11:17:01  
4 of lens. 11:17:03

5 Q. I see. 11:17:03

6 A. Although -- although there are no 11:17:04  
7 figures to this effect, you could also have 11:17:06  
8 anamorphic lenses where you have different 11:17:08  
9 shapes in the two directions, for example. 11:17:11  
10 Lenses can be elliptically shaped, they could 11:17:12  
11 be round, they could be square. 11:17:16

12 Q. I'm looking at Figure 18. How can 11:17:18  
13 you tell from Figure 18 that the lenses are not 11:17:20  
14 circular? 11:17:22

15 A. Well, Figure 18 uses a pair of 11:17:23  
16 mirrors. 11:17:25

17 Q. Uh-huh. 11:17:25

18 A. You see the second mirror has a disc 11:17:26  
19 shape to it. 11:17:30

20 Q. Yep. 11:17:30

21 A. An optical imaging system which is 11:17:33  
22 used at an off-axis angle is very rarely round. 11:17:35

21

1 Q. I see. What shape would that 11:17:40

2 normally have? 11:17:42

3 A. Like I said, it could be elliptical, 11:17:43

4 it could be square, it could be rectangular. 11:17:47

5 Q. Sticking with Figure 18, what is 11:17:50

6 No. 43? 11:17:52

7 A. I'm not sure. I'll have to take a 11:17:53

8 look at the specification, if that's all right. 11:17:57

9 Q. Sure. 11:17:59

10 A. The beam is deflected by the mirror, 11:18:00

11 M2 is sent onto an Image Sensor 43. So Item 43 11:18:17

12 in Figure 18 is the image sensor. 11:18:22

13 Q. Are imaging sensors -- what shape 11:18:24

14 are image sensors normally? 11:18:26

15 A. In this particular case, I don't 11:18:28

16 believe the specification says what the shape 11:18:31

17 of the image sensor is. The sensors, again, 11:18:33

18 come in lots of different shapes and sizes. 11:18:36

19 Q. You can get a circular image 11:18:38

20 sensors? 11:18:39

21 MR. MURRAY: Objection to form. 11:18:43

22 THE WITNESS: Speaking in the 11:18:49

1 context of, like -- like a camera or in the 11:18:51

2 context of a satellite? What... 11:18:55

3 BY MR. BREGMAN: 11:19:00

4 Q. I'm not sure what's the difference 11:19:00

5 between a satellite and a camera. 11:19:01

6 A. Well, I guess the simplest answer is 11:19:05

7 sensors come in lots of different shapes. 11:19:07

8 Q. Do they come in shapes that are 11:19:09

9 circular? 11:19:11

10 A. Well, so first of all, there's -- 11:19:12

11 there is a difference between an image sensor 11:19:23

12 and a camera. 11:19:25

13 So, I mean, that's why the question 11:19:25

14 is so vague, it's very difficult for me to 11:19:27

15 approach it. But if you consider Item 43, 11:19:30

16 which is an image sensor, you can certainly get 11:19:32

17 round image sensors. They do exist. 11:19:35

18 Q. You say there's a difference between 11:19:39

19 a camera and an image sensor. What's the 11:19:41

20 difference? 11:19:43

21 A. An image sensor is -- it can mean a 11:19:43

22 lot of different things, including a camera. 11:19:47

1 Q. Okay. But you said a camera and an 11:19:49  
2 image sensor are two different things. Why are 11:19:53  
3 they different? You just said they could be 11:19:55  
4 the same. 11:19:57

5 A. Well, they're different words. They 11:19:58  
6 mean different things. That's what I mean. An 11:20:00  
7 image sensor is a more general, broad term for 11:20:02  
8 any sensor that's collecting an image. 11:20:04

9 It could be a camera or it could be 11:20:07  
10 a -- it could be a CCD, a CMOS sensor. It 11:20:11  
11 could be an array of microbolometers. It can 11:20:16  
12 have a lot of different structure to it, some 11:20:21  
13 of which we would not colloquially refer to as 11:20:24  
14 a camera. 11:20:26

15 Q. And when you're talking about the 11:20:27  
16 camera, you still have an image sensor inside 11:20:29  
17 the camera? 11:20:32

18 A. So "camera" is really an ambiguous 11:20:32  
19 term. A lot of people would call a camera, 11:20:34  
20 like, the -- the device that's inside their 11:20:37  
21 phone, for example, which includes an image 11:20:40  
22 sensor but has a lot of other stuff too. 11:20:43

1                   So camera, some people would call a   11:20:45  
2                   camera just an image sensor. Other people       11:20:49  
3                   would call a camera the image sensor and its       11:20:51  
4                   processing electronics. Others would call it       11:20:55  
5                   the entire encapsulated system like in my phone   11:20:58  
6                   where it has a lens and an image sensor and       11:21:01  
7                   electronics that's behind it. Some might even     11:21:04  
8                   include the software in the definition of the     11:21:06  
9                   camera.   11:21:07  
10                  Q.       And you might even have cameras that   11:21:08  
11                  don't have an image sensor -- right? -- just     11:21:10  
12                  analog camera?                                     11:21:12  
13                  A.       I think -- I'm not sure that that's     11:21:13  
14                  possible. I'd have to think about it. I'm     11:21:22  
15                  not -- so you can have an image sensor that is   11:21:26  
16                  not a camera. I'm not sure you can have a     11:21:29  
17                  camera that doesn't have an image sensor     11:21:31  
18                  involved somewhere.                     11:21:33  
19                  Q.       I mean, once upon a time we had     11:21:34  
20                  analog cameras. People called them cameras,   11:21:37  
21                  and they didn't have an image sensor, right?   11:21:40  
22                  A.       Oh, sure. Yes. For example, Thomas   11:21:43



1       Sutton, when he invented the panoramic camera,       11:21:44  
2       he included a -- I think it was a silver       11:21:47  
3       nitrate plate that was on a curved plane, and       11:21:49  
4       that was his image sensor.       11:21:52  
5             Q.       Uh-huh.       11:21:53  
6             A.       In the sense -- in a very broad       11:21:53  
7       sense of image sensor. It's not an electronic       11:21:55  
8       sensor. It's a -- it's a chemical plate that       11:21:57  
9       can record images.       11:22:02  
10            Q.       So it's your belief that a chemical       11:22:04  
11       plate or a chemical phone, a photographic       11:22:07  
12       phone, is a form of an image sensor?       11:22:11  
13                    MR. MURRAY: Objection to form.       11:22:14  
14                    THE WITNESS: I was just describing       11:22:15  
15       the case where Thomas Sutton invented the       11:22:20  
16       panoramic camera, and that's pretty       11:22:23  
17       indisputable that it is a camera and that       11:22:25  
18       it had a way of recording the image. And       11:22:28  
19       that recording device was what we would now       11:22:31  
20       call film, but it was a glass plate.       11:22:34  
21       BY MR. BREGMAN:       11:22:37  
22             Q.       So you're saying that glass plates       11:22:38

1 form photographic film, that could be an image 11:22:41  
2 sensor? People in the art refer to that as an 11:22:47  
3 image sensor? 11:22:50

4 **A. I think that's a stretch. Again, it 11:22:50**  
5 **depends on the use of the word. In this 11:22:55**  
6 **particular patent -- patents are complicated 11:22:58**  
7 **devices, right? 11:23:01**

8 **So the language can be extremely 11:23:02**  
9 **complex and very specific. So I'm a little 11:23:04**  
10 **concerned that you're maybe misconstruing my 11:23:06**  
11 **general discussion about cameras to some 11:23:09**  
12 **specific term in the patent. 11:23:11**

13 **Q. So when you refer to this patent, 11:23:12**  
14 **the '990 patent, you just told me that the 11:23:15**  
15 **components -- components 43 in Figure 18 is an 11:23:19**  
16 **image sensor. Would you -- 11:23:25**

17 **A. That's -- 11:23:28**

18 **Q. Is it your understanding that that 11:23:28**  
19 **component could be film or plate? 11:23:30**

20 **A. I would have to read the 11:23:33**  
21 **specification. We can take a look, if we like. 11:23:35**

22 **Q. Sure. 11:23:37**

1           **A.     We do have to be careful about**           11:23:41  
2           **differentiating between broad generalizations**       11:23:44  
3           **and the specific language of the patent, if**       11:23:46  
4           **that's all right.**                                       11:23:48

5           Q.     You're the expert.  You read the           11:23:49  
6           patent.  You let me know what it means by image   11:23:51  
7           sensor.   11:23:56

8           **A.     I'm just reading the description of**       11:23:57  
9           **the second embodiment at this point.**               11:24:10

10                   (Pause in testimony.)                       11:24:36

11                   **This section doesn't describe the**           11:24:37  
12           **image sensor in any further detail.  It simply**       11:24:39  
13           **calls it an image sensor.**                               11:24:41

14           Q.     Do you believe yourself to be a           11:24:42  
15           person of ordinary skill in the art?               11:24:44

16           **A.     I meet the minimum criteria of a**           11:24:46  
17           **person of ordinary skill in the art.**               11:24:54

18           Q.     Okay.  So as a person of ordinary       11:24:56  
19           skill in the art, when you read this patent,       11:24:58  
20           what would you understand the image sensor to   11:25:00  
21           be referring to?                                   11:25:02

22           **A.     In that figure, I would presume that**       11:25:03

1           **the image sensor is some kind of image**           11:25:07  
2           **recording device.**           11:25:09

3           Q.       And that could include phone,           11:25:10  
4           photographic phone?           11:25:15

5           **A.       Yes, I think it would.**           11:25:19

6           Q.       I'm sorry. That was a yes?           11:25:24

7           **A.       Yes, I think it could.**           11:25:26

8           Q.       Okay. Let's go back to Figures 4A           11:25:29  
9           and 4B.           11:25:31

10                        You had previously testified that           11:25:33  
11           lenses need not be circular, and you pointed me           11:25:35  
12           to Figure 18, and you're showing me a           11:25:40  
13           reflective mirror.           11:25:43

14                        Are there any cases of lenses that           11:25:46  
15           don't -- that are not a reflective mirror that           11:25:50  
16           are noncircular that come to mind?           11:25:55

17           **A.       Well, out of context of the '990**           11:25:59  
18           **patent, yes, of course. I design optical**           11:26:07  
19           **systems routinely with noncircular lenses.**           11:26:08

20           Q.       Okay. Let's go back to Figure 4A           11:26:12  
21           and 4B, and you were explaining how that           11:26:14  
22           related to the prior art Figure 5.           11:26:17

1 By the way, is Figure 4A and 4B also 11:26:21

2 the prior art? 11:26:24

3 **A. Yes, that's prior art.** 11:26:25

4 **Q.** Okay. So can you tell me what the 11:26:26

5 relationship is between Figure 5 prior art and 11:26:29

6 Figures 4A and 4B prior art. 11:26:33

7 **A. Well, I believe I explained** 11:26:35

8 **Figure 4A. Would you like me to go through it** 11:26:38

9 **again or should we move on to 4B?** 11:26:40

10 **Q.** No, I understand Figure 4A, thanks. 11:26:42

11 **A. Uh-huh.** 11:26:44

12 **So Figure 4B is a different way of** 11:26:45

13 **representing the information associated with** 11:26:48

14 **the spacing between each of those circles in** 11:26:50

15 **Figure 4A. In this figure, the X axis is the** 11:26:54

16 **angle in degrees, and the Y axis is the** 11:26:58

17 **relative height at the image plane.** 11:27:03

18 **And there is a line, a linear** 11:27:07

19 **relationship which is indicated as FDC, which** 11:27:09

20 **shows the height of the image for a given field** 11:27:13

21 **angle. And as you can see, it's a straight** 11:27:20

22 **line, and it is a linear relationship so that** 11:27:22

1	<b>it goes to 1 at 90 degrees.</b>	11:27:29
2	Q. So that basically just means that	11:27:31
3	the rings or circles, concentric circles in	11:27:34
4	Figure 4A are evenly spaced?	11:27:38
5	<b>A. That's correct.</b>	11:27:40
6	Q. And the lens in Figure 4A, for a	11:27:40
7	person to understand that by looking at	11:27:48
8	Figure 4A, they don't really need Figure 4B?	11:27:53
9	<b>A. To understand Figure 4A, you do not</b>	11:27:56
10	<b>need Figure 4B; that's correct.</b>	11:27:59
11	Q. And the lens in Figure 4A will have	11:28:01
12	a linear relationship between the angle and the	11:28:05
13	distance irrespective of where that was plotted	11:28:13
14	on the chart in Figure 4B, right?	11:28:18
15	<b>A. Well, to be clear, Figure 4A is not</b>	11:28:19
16	<b>a lens. Figure 4A is just a schematic</b>	11:28:21
17	<b>relationship between the image heights, right?</b>	11:28:24
18	<b>But I presume what you meant is the lens</b>	11:28:27
19	<b>that -- that is being referred to in Figure 4A,</b>	11:28:30
20	<b>which is also shown schematically in Figure 5.</b>	11:28:32
21	Q. Okay.	11:28:36
22	<b>A. Now, could you repeat your question</b>	11:28:36

31

1     **just so I --** 11:28:38

2           Q.     So the lens that's represented 11:28:39

3     schematically in Figure 4A will have the 11:28:41

4     characteristics of whatever is shown in 11:28:43

5     Figure 4B irrespective of where the chart in 11:28:46

6     Figure 4B was plotted or not, right? 11:28:50

7           MR. MURRAY:  Objection to form. 11:28:53

8           THE WITNESS:  Once again, Figure 4A 11:28:54

9     is not a lens.  Figure 4A is a distribution 11:28:57

10    of concentric rings which is shown 11:29:01

11    schematically in a 2D pattern, and then it 11:29:03

12    is shown in a 1D pattern in the 11:29:07

13    relationship in Figure 4B.  So these are 11:29:10

14    two figures representing the same 11:29:12

15    information. 11:29:14

16    BY MR. BREGMAN: 11:29:14

17           Q.     Why don't we just skip Figure 4A 11:29:15

18    altogether. 11:29:17

19           A.     All right. 11:29:20

20           Q.     5A is a schematic of a lens, right? 11:29:21

21           A.     It is a -- yeah, called a cartoon, 11:29:25

22    but, yeah.  It is a -- it is a representation 11:29:28

1 of a lens in the prior art. 11:29:30

2 Q. Okay. And why -- sorry. Why do you 11:29:32

3 call it a cartoon? 11:29:34

4 A. Well, it's -- it's not -- it's not, 11:29:35

5 for example, what we see in Figure 15 or 11:29:41

6 Figure 16, which would be more of a schematic 11:29:46

7 of a lens, which actually shows surfaces and 11:29:50

8 information about the lens. 11:29:56

9 Here the lens is just represented 11:29:57

10 kind of generically with Item 15. It's -- and 11:30:02

11 the figure is intended to show the relationship 11:30:05

12 between the field angles and the image heights. 11:30:07

13 Q. Uh-huh. 11:30:10

14 A. So calling it a schematic is being 11:30:10

15 far too generous. I'd call it a cartoon that 11:30:13

16 shows the relationship between object space and 11:30:16

17 image space. 11:30:20

18 Q. What does a schematic mean? 11:30:21

19 A. Well, when I say the term "a lens 11:30:23

20 schematic," I'm meaning something that's more 11:30:28

21 like Figure 15, Figure 16, Figure 18, something 11:30:31

22 which shows the relative positions of 11:30:36



1 individual elements. 11:30:38

2 May also include showing rays and 11:30:40

3 stops and other mechanical features that may be 11:30:44

4 important to the image. That's what I would 11:30:47

5 refer to as a schematic. 11:30:50

6 Q. I just looked up the word schematic 11:30:51

7 as we were talking, and I want to know if you 11:30:53

8 agree with this definition. 11:30:56

9 So "A schematic is a symbolic and 11:30:57  
10 simplified diagram or other representation"? 11:31:00

11 MR. MURRAY: Objection to form. 11:31:04

12 THE WITNESS: Well, I don't see what 11:31:07

13 you're looking at exactly, but could you 11:31:08

14 repeat that again? How would you like to 11:31:10

15 define schematic for the purposes of this 11:31:12

16 discussion? 11:31:14

17 BY MR. BREGMAN: 11:31:14

18 Q. I want to know if you agree with 11:31:16

19 this. Is a schematic "a symbolic and 11:31:18

20 simplified diagnose or other representation"? 11:31:20

21 MR. MURRAY: Same objection. 11:31:24

22 THE WITNESS: I think it might be, 11:31:25

1 but I can imagine other definitions of 11:31:41  
2 schematics. 11:31:44  
3 BY MR. BREGMAN: 11:31:45  
4 Q. As you've read the '990 patent, what 11:31:45  
5 would you understand a schematic to mean? 11:31:48  
6 **A. Well, we could look and see if 11:31:50**  
7 **there's any reference to the term and if it's 11:31:53**  
8 **defined in the patent. 11:31:55**  
9 Q. Okay. 11:31:56  
10 **A. Do you have a particular -- 11:32:05**  
11 Q. I'm looking to see -- 11:32:06  
12 **A. -- spot -- 11:32:07**  
13 Q. So Figure 2. 11:32:09  
14 **A. Uh-huh. 11:32:12**  
15 Q. Go back to Figure 2. 11:32:12  
16 **A. Yep. 11:32:13**  
17 Q. Figure 2 I see on Column 1, line 29 11:32:14  
18 it says, "Figure 2 schematically represents." 11:32:20  
19 Likewise for Figure 3 on line 46, it says, 11:32:31  
20 "Figure 3 schematically shows." 11:32:38  
21 **A. Okay. So it seems in this case, 11:32:41**  
22 **these -- these diagrams are being referred to 11:32:42**

1 as schematics, and they do represent some 11:32:46  
2 simplification of an object system image, 11:32:53  
3 right? It would be interesting to see what the 11:33:01  
4 reference to Figure 5 is, and are those 11:33:04  
5 referred to as schematics as well. 11:33:08

6 Q. I'm looking at the bottom few lines 11:33:19  
7 of Column 6. Bottom two lines, 66, it says, 11:33:23  
8 "Figure 5 schematically represents a classical 11:33:28  
9 system for taking panoramic shots." 11:33:31

10 A. Indeed. 11:33:35

11 Q. Okay. 11:33:37

12 A. It does appear that in the '990 11:33:38  
13 patent, all of these figures are being referred 11:33:40  
14 to as schematics, or at least a schematic 11:33:46  
15 representation. 11:33:51

16 Q. I see. 11:33:51

17 And in your parlance that you used 11:33:52  
18 earlier then saying that Figure 5 is a cartoon, 11:33:55  
19 is it fair to say that a schematic is a 11:33:59  
20 cartoon? 11:34:02

21 A. In this case, I would refer to 11:34:02

22 Figure 5 and Figure 6 as cartoons, because 11:34:06

1       **although they show the relationship between**       11:34:11  
2       **object space and image space, they don't show**       11:34:13  
3       **any information about the lens itself. So I**       11:34:16  
4       **think it was in the context of a lens**       11:34:19  
5       **schematic, and they're not lens schematics.**       11:34:21  
6           Q.       I'm sorry. I'm not understanding       11:34:23  
7       the difference.       11:34:24  
8                    What's a lens schematic? Isn't       11:34:26  
9       Figure 5 a lens schematic?       11:34:27  
10           A.       **No, it is not.**       11:34:29  
11           Q.       What is it?       11:34:30  
12           A.       **Figure 15 and 16, those are lens**       11:34:31  
13       **schematics. Figure 5 is, in understanding of**       11:34:36  
14       **the parlance of the '990 patent, is a schematic**       11:34:39  
15       **representation of the relative -- the**       11:34:42  
16       **relationship between object angles and image**       11:34:47  
17       **heights.**       11:34:50  
18           Q.       Okay.       11:34:51  
19           A.       **Which is different from a lens**       11:34:53  
20       **schematic. A lens schematic involves lenses.**       11:34:55  
21           Q.       A lens schematic will show you what?       11:34:57  
22       What about the lenses? They're layouts and       11:34:59

1 location relative to one another? 11:35:03

2 A. For example, sure. 11:35:04

3 Q. What else does it show? 11:35:08

4 A. It depends on what's being 11:35:10

5 represented schematically, right? In the case 11:35:13

6 of 5A and 5B, what the author was trying to 11:35:17

7 schematically represent was a relationship 11:35:22

8 between angles and space. 11:35:24

9 In the case of Figure 16, the author 11:35:25

10 is schematically representing the individual 11:35:30

11 elements that, when combined, form an imager. 11:35:34

12 So this is a lens schematic in that it has 11:35:37

13 lenses labeled L1, L2, L3, L4, L5, L6, and L7. 11:35:41

14 Q. Okay. 11:35:47

15 A. It has an apodizer labeled D1, and 11:35:47

16 it shows their relative spacing as well. 11:35:50

17 Q. And this was drawn to scale? 11:35:53

18 MR. MURRAY: Objection to form. 11:36:06

19 THE WITNESS: Well, I can't say I 11:36:09

20 took a ruler to it. It certainly looks 11:36:11

21 reasonable. So is it drawn to scale? 11:36:14

22 Well, it is not drawn to -- to specifically 11:36:17

1           emphasize some feature or other which would 11:36:21

2           mean it would not be drawn to scale. 11:36:24

3                    So I think the answer is I don't 11:36:26

4           know. 11:36:29

5   BY MR. BREGMAN: 11:36:29

6           Q.     And what would -- what would allow 11:36:30

7           you to know whether it's drawn to scale? 11:36:32

8           **A.     Well, if I had an optical model of 11:36:34**

9           **that lens, for example. 11:36:36**

10          Q.     Are patent figures normally drawn to 11:36:39

11          scale? 11:36:42

12          **A.     In all of the patents that I have 11:36:42**

13          **done where I've been the author, when I include 11:36:47**

14          **lens schematics, I output them directly from 11:36:51**

15          **the optical design program. So although they 11:36:54**

16          **may not be perfectly scaled in X and Y, they're 11:36:57**

17          **relatively well scaled. 11:37:00**

18          Q.     But what do you mean not perfectly 11:37:02

19          scaled in X and Y? 11:37:04

20          **A.     Yes. Well, you can have printing 11:37:05**

21          **errors which contract the length of the -- of 11:37:07**

22          **one axis with respect to the other. It's 11:37:09**

1       called anamorphism.   So it might be slightly       11:37:11

2       anamorphic because of printing errors.               11:37:14

3               But ultimately it is intended to be       11:37:16

4       a proper representation of the relative heights   11:37:18

5       and positions of the lenses.                       11:37:20

6               Q.       But you wouldn't give this figure,       11:37:22

7       for example, Figure 16 from the '990 patent, to   11:37:25

8       someone to build a lens system, right?           11:37:29

9               MR. MURRAY:   Objection to form.           11:37:33

10              Also I'm not sure it's in the scope of the   11:37:37

11             declaration.                               11:37:40

12       BY MR. BREGMAN:                               11:37:40

13              Q.       You can answer.               11:37:41

14              A.       Could you repeat the question,       11:37:43

15       please?                                       11:37:44

16              Q.       Would you feel comfortable giving   11:37:44

17       Figure 16 from the '990 patent to a lens       11:37:47

18       manufacturer to build this lens?               11:37:51

19              MR. MURRAY:   Same objections.           11:37:54

20              THE WITNESS:   Is there something in   11:37:55

21       my declaration that you -- that you're       11:38:10

22       discussing --                               11:38:13

40

1 BY MR. BREGMAN: 11:38:13

2 Q. I'm asking -- I'm asking you a 11:38:14

3 question about the Figure 16. Would you -- 11:38:15

4 **A. Are you asking me that in general or 11:38:17**

5 **in the specific context of this patent? 11:38:20**

6 Q. Would you feel comfortable giving a 11:38:23

7 figure like this, Figure 16, to a lens 11:38:24

8 manufacturer to build a lens? 11:38:27

9 MR. MURRAY: Same objections. 11:38:30

10 THE WITNESS: When I design optical 11:38:32

11 systems, and I have them manufactured, I 11:38:38

12 often include a schematic that looks like 11:38:41

13 this in the information packet that's given 11:38:43

14 to the manufacturer. 11:38:45

15 BY MR. BREGMAN: 11:38:52

16 Q. So I'm not asking if you'd give it 11:38:52

17 in a packet that includes other things. 11:38:54

18 My question is: Would you take 11:38:56

19 Figure 16 and feel comfortable using that to 11:38:58

20 build a lens? That's your roadmap, that's your 11:39:03

21 blueprint. Figure 16, a figure from a patent, 11:39:08

22 would you be comfortable manufacturing a lens 11:39:10



41

1 taken from a figure from a patent? 11:39:14

2 **A. No.** 11:39:17

3 MR. MURRAY: Objection to form. 11:39:18

4 THE WITNESS: To change -- to change 11:39:19

5 the perspective a little bit, you could say 11:39:21

6 could you take Figure 16 and make a lens 11:39:28

7 which could make a proper image with no 11:39:31

8 other information than that shown in 11:39:34

9 Figure 16 and making no assumptions? And 11:39:36

10 the answer is no. 11:39:40

11 But you could reasonably start from 11:39:42

12 Figure 16 and create a lens that could make 11:39:45

13 a perfectly good image. 11:39:48

14 BY MR. BREGMAN: 11:39:50

15 Q. Now, you said the X and Y dimensions 11:39:50

16 may not be correct, there may be printing 11:39:52

17 errors. 11:39:56

18 **A. Sure.** 11:39:56

19 Q. How -- how could you be sure there 11:39:57

20 are not printing errors when using this 11:40:01

21 Figure 16 from the '990 patent to build a lens, 11:40:03

22 an actual lens? 11:40:08

1           A.     I think in your mind you are           11:40:09  
2           thinking that there is a specific lens which       11:40:11  
3           you're trying to recreate with only the           11:40:14  
4           information in Figure 16.                       11:40:16

5                     And I think that would be difficult.   11:40:19  
6           But one could make a lens which performed the   11:40:21  
7           function of a wide field imaging system with no   11:40:27  
8           more information than that shown in Figure 16   11:40:30  
9           and the other content of the specification.       11:40:33

10           Q.     So you would feel comfortable taking   11:40:38  
11           dimensions off Figure 16 to use in building a   11:40:41  
12           lens?   11:40:46

13                     MR. MURRAY:  Objection to form.  And   11:40:48  
14           outside the scope.                               11:40:51

15                     THE WITNESS:  Okay.  Let me -- let   11:40:55  
16           me answer it this way.                           11:40:57

17                     I have taken figures like this, and   11:40:58  
18           know of their information, and reverse           11:41:02  
19           engineered lenses that performed pretty       11:41:05  
20           well in order to understand how well that       11:41:07  
21           particular lens form should work.  That's       11:41:10  
22           not building.  That's creating a model.       11:41:15

1                   So is there enough information in           11:41:17  
2           Figure 16 that I could create a model?           11:41:19  
3           Absolutely.           11:41:21  
4   BY MR. BREGMAN:           11:41:23  
5           Q.    So what's the difference between           11:41:23  
6           building a lens and making a model?           11:41:24  
7           **A.    A model is a computer**           11:41:27  
8           **representation --**           11:41:47  
9                   **(Audio technical difficulties;**           11:41:50  
10                   **stenographer asks for**           11:41:50  
11                   **clarification.)**           11:41:51  
12           THE WITNESS: Can we repeat the           11:41:51  
13           question?           11:41:53  
14   BY MR. BREGMAN:           11:41:53  
15           Q.    So what's the difference between           11:41:53  
16           building a lens and making a model?           11:41:55  
17           **A.    Oh, I see the confusion. By "model"**   11:41:56  
18           **I mean a computer model.**           11:42:00  
19                   **I'm just turning my laptop back on**   11:42:05  
20           **so I can see my documents. It timed out.**   11:42:05  
21           **Yeah.**           11:42:06  
22           Q.    A model could be a theoretical lens,   11:42:06

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1 right? 11:42:11

2 **A. When I'm referring to a model, I'm** 11:42:11

3 **describing a specific kind of model which is a** 11:42:14

4 **computer representation of a lens.** 11:42:17

5 Q. And it's a theoretical lens, right? 11:42:20

6 **A. That's correct. It's a computer** 11:42:23

7 **simulation. It could be used to manufacture a** 11:42:30

8 **lens. It could be a model based on actual** 11:42:33

9 **measurements of lenses, or it could be just** 11:42:37

10 **a -- a model that's being used to figure out a** 11:42:42

11 **particular problem that I'm trying to solve.** 11:42:46

12 Q. So you -- there are instances where 11:42:48

13 you would not take a theoretical lens from a 11:42:50

14 model and actually build the lens? 11:42:54

15 **A. I didn't understand that question.** 11:43:00

16 Q. Do you always -- 11:43:01

17 **A. Can you repeat it?** 11:43:02

18 Q. Do you always have to take your 11:43:03

19 model and build the lens in the real world, or 11:43:06

20 do you often work with models that are 11:43:08

21 theoretical? 11:43:10

22 **A. Well, in my work --** 11:43:11

1 MR. MURRAY: Objection. 11:43:18

2 THE WITNESS: -- I am almost always 11:43:19

3 designing lenses that I intend to build. 11:43:23

4 There are occasionally times when I will 11:43:26

5 build a model to understand how an optical 11:43:28

6 aberration performs over angles or in some 11:43:31

7 specific configuration. 11:43:34

8 In my class, my tutorial class, for 11:43:36

9 example, we frequently build models we 11:43:39

10 never intend to build. 11:43:41

11 BY MR. BREGMAN: 11:43:43

12 Q. So I could build a model 11:43:44

13 theoretically that has characteristics that may 11:43:46

14 not even exist in the real world? For example, 11:43:50

15 I may -- I may invent, I may think that I've 11:43:54

16 got a new material, for example, and run that 11:43:59

17 through a simulation or model to see how that 11:44:03

18 theoretical lens would operate, right? 11:44:08

19 MR. MURRAY: Objection to form. 11:44:13

20 THE WITNESS: I don't think I've 11:44:14

21 ever done that. 11:44:24

22 ///

1 BY MR. BREGMAN: 11:44:25

2 Q. I'm not asking whether you've done 11:44:25

3 it. I'm asking: Is that a possibility? 11:44:26

4 MR. MURRAY: Objection to form. 11:44:31

5 THE WITNESS: So you're asking in 11:44:31

6 the general, hypothetical context, could 11:44:35

7 someone build a Zemax or Code V model of a 11:44:37

8 lens which was based on some fiction? 11:44:43

9 BY MR. BREGMAN: 11:44:43

10 Q. Correct. 11:44:46

11 **A. Is that the question?** 11:44:46

12 Q. Yeah. 11:44:47

13 **A. I suppose that's always possible.** 11:44:54

14 Q. So returning to Figure 16, just so 11:44:55

15 I'm clear on this before we move on. You 11:44:57

16 believe that although patent figures are 11:45:02

17 generally not drawn to scale, you would be 11:45:06

18 comfortable taking dimensions off of figures, 11:45:09

19 such as Figure 16, and using that as an 11:45:12

20 accurate representation of the lens depicted in 11:45:15

21 that figure; is that right? 11:45:21

22 MR. MURRAY: Objection to form. 11:45:22

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1 THE WITNESS: In the case of the 11:45:24  
2 '990 patent, I would have no reason to do 11:45:26  
3 that. 11:45:28

4 In other cases, though, when I've 11:45:30  
5 been attempting to reverse engineer someone 11:45:33  
6 else's patent, this may be all I have to 11:45:35  
7 start from, just a schematic. 11:45:38

8 And I'll do the best I can to 11:45:41  
9 recreate that and then start varying things 11:45:44  
10 that I know could be variable and try to 11:45:46  
11 design a lens that is what I'll call in the 11:45:49  
12 family of the design that was described in 11:45:51  
13 the patent. 11:45:55

14 That doesn't mean I've recreated a 11:45:56  
15 specific lens. I've created a member of an 11:45:59  
16 ensemble of possible solutions. 11:46:02

17 Is that more clear? 11:46:06

18 BY MR. BREGMAN: 11:46:06

19 Q. Yeah. So figure -- just to be 11:46:08  
20 clear, Figures 15, 16, and 17 for that matter, 11:46:10  
21 are not lenses that are covered by the claims 11:46:13  
22 that we are discussing today -- right? -- 11:46:17

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1 Claims 5 and 21 of the '990 patent? 11:46:20

2 MR. MURRAY: Objection to form. 11:46:24

3 Outside the scope of the declaration. 11:46:26

4 BY MR. BREGMAN: 11:46:28

5 Q. Let me back up a little bit. 11:46:28

6 So you've given opinions with regard 11:46:30

7 to the patentability of certain claims in this 11:46:32

8 patent; is that right? 11:46:36

9 A. I'm sorry. Could you repeat the 11:46:37

10 question? I was thinking about your other 11:46:41

11 question. 11:46:43

12 Q. No problem. 11:46:44

13 You provided opinions regarding the 11:46:45

14 patentability of certain claims in the '990 11:46:47

15 patent; is that right? 11:46:51

16 A. I've provided a declaration 11:46:51

17 analyzing the arguments made by Dr. Chipman 11:46:56

18 that certain claims in the patent were obvious 11:47:02

19 or anticipated. 11:47:04

20 Q. And it's your belief that those 11:47:08

21 claims are neither obvious nor anticipated, 11:47:10

22 right? 11:47:14



1           **A.     I believe that I've correctly**           11:47:14  
2           **refuted Dr. Chipman's arguments.**           11:47:17

3           Q.     So you believe that those claims are   11:47:19  
4           neither obvious or anticipated, right?       11:47:23

5           **A.     I believe that his arguments are**       11:47:24  
6           **inadequate.**                                   11:47:26

7           Q.     So you do not take a position on       11:47:28  
8           whether the claims are obvious or anticipated,   11:47:30  
9           you only rebutted Dr. Chipman's positions; is   11:47:33  
10          that right?                                   11:47:37

11                   MR. MURRAY:  Objection to form.       11:47:37

12                   THE WITNESS:  I believe that the       11:47:38  
13                   grounds that have been provided are       11:47:40  
14                   insufficient to call those claims obvious.   11:47:41

15           BY MR. BREGMAN:                           11:47:47

16           Q.     So do you have an opinion on whether   11:47:47  
17           the claims are obvious or anticipated?       11:47:49

18                   MR. MURRAY:  Objection to form.       11:47:52

19                   THE WITNESS:  All I can do is repeat   11:47:53  
20                   what I've already said.  This is the third   11:47:58  
21                   time you've asked the same question.       11:48:00

22           ///

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1 BY MR. BREGMAN: 11:48:01

2 Q. And if you gave me a straight 11:48:01

3 answer, we could move on to the next question. 11:48:03

4 MR. MURRAY: Objection. 11:48:05

5 BY MR. BREGMAN: 11:48:06

6 Q. Do you have an opinion on whether 11:48:07

7 the claims are obvious or anticipated? 11:48:08

8 MR. MURRAY: Same objections. 11:48:10

9 THE WITNESS: I don't recall if I 11:48:11

10 wrote in my declaration a specific opinion 11:48:16

11 on the -- on the claims themselves. I only 11:48:20

12 recall writing a document that was refuting 11:48:25

13 the arguments that had been made by 11:48:29

14 Dr. Chipman. 11:48:32

15 BY MR. BREGMAN: 11:48:33

16 Q. So as you sit here today, you don't 11:48:33

17 recall whether or not you have an opinion on 11:48:35

18 whether the claims are obvious or anticipated; 11:48:37

19 is that correct? 11:48:41

20 MR. MURRAY: Object to form. 11:48:41

21 Please give me a chance to object, 11:48:42

22 Dr. Aikens. 11:48:47

1 THE WITNESS: I'm sorry. 11:48:47

2 MR. MURRAY: No problem. 11:48:48

3 THE WITNESS: Well, here. Let me 11:48:49

4 take a quick look. I've gotten all 11:48:50

5 flustered and my pages are all shuffled 11:49:01

6 together. I'm sorry. 11:49:04

7 BY MR. BREGMAN: 11:49:04

8 Q. No problem. Take your time. 11:49:04

9 A. I've actually mixed it in with the 11:49:06

10 patent at this point. Okay. So let's see. 11:49:08

11 (Pause in testimony.) 11:49:17

12 As I'm looking through my 11:50:07

13 declaration, I do not see a stated opinion 11:50:08

14 regarding the general obviousness or 11:50:10

15 patentability of those claims. 11:50:17

16 I have to point out that I'm expert. 11:50:21

17 I'm not a lawyer. So something like 11:50:25

18 patentability or validity or any of that, that 11:50:27

19 would be a -- that's a legal issue that really 11:50:33

20 is out of my purview. 11:50:35

21 What I do is I -- I'm an expert in 11:50:37

22 optical design, and I can talk to the technical 11:50:40

1       **information that's -- that's been provided to**       11:50:44

2       **me and that I've found on my own.**                       11:50:47

3           Q.       That's -- I'm not -- Mr. Aikens, I'm       11:50:49

4       not accusing you of anything. I'm just asking       11:50:55

5       you whether you have an opinion on whether the       11:50:58

6       Claims 5 and 21 of the '990 patent are               11:51:00

7       nonobvious, not anticipated. That's all. If       11:51:07

8       you don't have an opinion on that, that's fine.       11:51:09

9           **A.       I think the answer is I do not have**       11:51:11

10       **an opinion on that at this time.**                       11:51:14

11          Q.       Okay. So which -- which claims of       11:51:15

12       the patent -- is it fair to say that the claims       11:51:26

13       that Dr. Chipman has provided an opinion on are       11:51:28

14       Claims 5 and 21 of the '990 patent?               11:51:35

15           **A.       That's correct.**                       11:51:38

16          Q.       And is it fair to say that your       11:51:39

17       rebuttal of Dr. Chipman's opinions relate to       11:51:44

18       those same claims?                               11:51:52

19           **A.       Yes.**                               11:51:57

20          Q.       Are there any other claims that you       11:51:58

21       provided any opinions on?                       11:52:00

22           **A.       Just a moment. I just want to give**       11:52:05

1       you a correct answer. I want to find the       11:52:20  
2       section where I described it.               11:52:25  
3               I think actually -- so the claims       11:52:28  
4       that are under discussion here are dependent on   11:52:33  
5       other claims that are also discussed here.       11:52:37  
6               Was that what you meant?               11:52:40  
7       Q.     Yes.                               11:52:42  
8       A.     So yes.                             11:52:44  
9       Q.     So you've provided opinions on       11:52:44  
10       Claims 5 and 21 and the claims that they depend   11:52:46  
11       from, right?                             11:52:50  
12       A.     That's correct.                   11:52:51  
13               MR. MURRAY: Objection to form.       11:52:53  
14       BY MR. BREGMAN:                       11:52:54  
15       Q.     You haven't provided an opinion on       11:52:54  
16       any other claims than those, right?           11:52:55  
17       A.     Those were the specific claims that   11:53:03  
18       Dr. Chipman mentioned in his report, and those   11:53:05  
19       were the ones that I focused my attention on,   11:53:07  
20       yes.                                     11:53:09  
21       Q.     Okay. And just returning to       11:53:09  
22       Figures 15 and 16, do you agree that this       11:53:13

1 schematic lens that's shown in Figures 15 and 11:53:17  
2 16 of the '990 patent, Exhibit 1001, are not 11:53:20  
3 covered by Claims 5 and 21, right? 11:53:24

4 MR. MURRAY: Objection to form. And 11:53:29  
5 outside the scope of the declaration. 11:53:30

6 THE WITNESS: I believe that's 11:53:33  
7 incorrect. Figures 15 and 16 are described 11:53:34  
8 as a cross section of the first embodiment 11:53:38  
9 of the nonlinear panoramic objective lens 11:53:40  
10 according to the present invention, and an 11:53:43  
11 exploded cross section of the system of 11:53:45  
12 lenses present in the panoramic objective 11:53:47  
13 lens. 11:53:50

14 BY MR. BREGMAN: 11:53:50

15 Q. So it's your belief that claims -- 11:53:50  
16 Figures 15 and 16 -- sorry -- 15, 16, and 17 11:53:52  
17 are indeed covered by Claims 5 and 21 of the 11:54:00  
18 patent, right? 11:54:04

19 MR. MURRAY: Same objections. 11:54:04

20 THE WITNESS: Figures 15 and 16, and 11:54:09  
21 I'm not sure 17. Figures 15, 16, and 17 11:54:11  
22 are described in the patent as 11:54:16

1           representations of the first embodiment of 11:54:19  
2           the patent. 11:54:21

3       BY MR. BREGMAN: 11:54:26

4           Q.     And are you saying that the first 11:54:26  
5           embodiment of the patent is covered by Claims 5 11:54:28  
6           and 21 of the patent? 11:54:31

7           **A.     I'm saying the first embodiment is 11:54:34  
8           the first embodiment. It is an embodiment of 11:54:36  
9           the invention. 11:54:38**

10                   **Claims are not embodiments. Claims 11:54:39  
11           are statements of invention. 11:54:42**

12           Q.     So let's go back to my question 11:54:44  
13           again. And I'm asking whether Figures 15 and 11:54:46  
14           16 are covered by Claims 5 and 21 of the 11:54:49  
15           patent. 11:54:53

16                   MR. MURRAY: Objection to form. And 11:54:58  
17           outside the scope of the declaration. 11:54:59

18                   THE WITNESS: I don't understand 11:55:02  
19           what you mean by the term "covered." 11:55:02

20       BY MR. BREGMAN: 11:55:03

21           Q.     Well, do they fall within the scope 11:55:03  
22           of the claims? 11:55:06

1 MR. MURRAY: Same objections. 11:55:06

2 THE WITNESS: I don't know how to 11:55:07

3 answer it except to say that these -- 11:55:09

4 Figures 15 and 16 are meant to be cross 11:55:12

5 section and exploded cross section of the 11:55:17

6 first embodiment of the invention. 11:55:19

7 BY MR. BREGMAN: 11:55:22

8 Q. Okay. Is it -- 11:55:23

9 **A. The claims are -- the claims are** 11:55:23

10 **related to the embodiment through the** 11:55:25

11 **specification.** 11:55:28

12 Q. And which of the figures in the 11:55:28

13 patent relate to the first embodiment of the 11:55:30

14 invention? 11:55:33

15 MR. MURRAY: Objection. Form. And 11:55:36

16 outside the scope. 11:55:38

17 THE WITNESS: Reading the 11:55:39

18 descriptions of the figures, Figures 5 and 11:55:47

19 6 relate to the image points and object 11:55:56

20 angles information. 7A and 7B show a first 11:56:03

21 example of the nonlinearity of a panoramic 11:56:12

22 objective lens. 11:56:16



1 BY MR. BREGMAN: 11:56:17

2 Q. When you say "first example," that's 11:56:17

3 the first embodiment? 11:56:20

4 A. It's described as the first example 11:56:21

5 in the specification. 11:56:24

6 Q. Okay. 11:56:25

7 A. Figure 8 shows a second example of 11:56:29

8 nonlinearity. 11:56:31

9 Figure 9 shows a third example of 11:56:32

10 the nonlinearity. 11:56:35

11 Figure 10 shows a system for 11:56:36

12 displaying the panoramic image. 11:56:38

13 Figure 11 schematically shows the 11:56:40

14 first embodiment of the correction method. 11:56:42

15 Figure 12 is a flowchart. 11:56:45

16 Figure 13 schematically shows a 11:56:48

17 second embodiment of the correction method. 11:56:50

18 Figure 14 shows a flowchart. 11:56:53

19 Figure 15 is a cross section of a 11:56:55

20 first embodiment of a nonlinear panoramic 11:56:58

21 objective lens according to the present 11:57:02

22 invention. 11:57:05

1                   **And then Figure 16 is an exploded**                   11:57:05  
2                   **cross section of the system of lenses shown in**                   11:57:08  
3                   **Figure 15.**                   11:57:11  
4                   Q.       And how do -- Figures 7A, 8, and 9,                   11:57:12  
5                   which one of those falls within the scope of                   11:57:17  
6                   the Claims 5 and 21?                   11:57:20  
7                   MR. MURRAY:   Objection.   Form.                   11:57:23  
8                   Outside the scope.                   11:57:25  
9                   THE WITNESS:   Could you repeat the                   11:57:27  
10                  question again, please?                   11:57:29  
11                  BY MR. BREGMAN:                   11:57:29  
12                  Q.       Out of Figures 7B, 8, and 9, do any                   11:57:31  
13                  of those figures fall within the scope of                   11:57:35  
14                  Claims 5 and 21 of the '990 patent?                   11:57:37  
15                  MR. MURRAY:   Same objections.                   11:57:39  
16                  THE WITNESS:   I'm not sure I                   11:57:48  
17                  understand what you're trying to ask.   What                   11:57:55  
18                  do you mean by "is it within the scope"?                   11:57:59  
19                  The claims are the claims, and the                   11:58:01  
20                  specification is the specification, and                   11:58:05  
21                  they're related through the '990 patent.                   11:58:07  
22                  ///

1 BY MR. BREGMAN: 11:58:09

2 Q. And which figure shows what's 11:58:10

3 being -- what's being claimed in Claims 5 and 11:58:12

4 Claim 21? 11:58:17

5 MR. MURRAY: Same objections. 11:58:18

6 BY MR. BREGMAN: 11:58:21

7 Q. Let's take them one at a time. 11:58:21

8 Does Figure 4B, is that -- is that 11:58:23

9 covered by -- does that show a representation 11:58:26

10 of what's in Claims 5 and 21? 11:58:30

11 MR. MURRAY: Same objections. 11:58:33

12 THE WITNESS: It is a figure that 11:58:34

13 helps illustrate the concept of the 11:58:37

14 linearity of field relationships. 11:58:39

15 BY MR. BREGMAN: 11:58:40

16 Q. Okay. Do the claims cover a linear 11:58:41

17 diagram as shown in Figure 4B? 11:58:48

18 **A. I don't understand what you mean by 11:58:50**

19 **"cover." Are you trying to get -- 11:58:52**

20 Q. Figure 4B is the prior art. So if 11:58:53

21 you are you saying that the prior art is the 11:58:55

22 claims, is a depiction of what's being claimed, 11:58:59

60

1 well, then you guys have got a problem. So I'm 11:59:03  
2 trying to understand which figures cover the 11:59:05  
3 embodiment that's being claimed. 11:59:09  
4 MR. MURRAY: Objection to form. 11:59:12  
5 Outside the scope. 11:59:14  
6 BY MR. BREGMAN: 11:59:18  
7 Q. You tell me Figure 4B, that's it, 11:59:18  
8 that's what's being claimed, then that's fine. 11:59:21  
9 I just want to know which figure best 11:59:23  
10 represents what is being shown in the claims -- 11:59:27  
11 MR. MURRAY: Same objections. 11:59:29  
12 BY MR. BREGMAN: 11:59:30  
13 Q. -- what is being claimed in Claims 5 11:59:30  
14 and 21 of the '990 patent, Exhibit 1001. 11:59:34  
15 MR. MURRAY: Same objections. 11:59:38  
16 THE WITNESS: Are you asking me to 11:59:39  
17 interpret these claims? 11:59:50  
18 BY MR. BREGMAN: 11:59:50  
19 Q. Yes, I'm asking you to interpret the 11:59:54  
20 claims. 11:59:55  
21 A. I don't believe I included that 11:59:57  
22 anywhere in my report. 11:59:58

1 Q. Okay. Do you know what Claim 5 11:59:59  
2 means? 12:00:01  
3 MR. MURRAY: Objection to form. 12:00:03  
4 BY MR. BREGMAN: 12:00:04  
5 Q. Let's go to Claim 5. Let's go to 12:00:05  
6 Claim 5. Claim 5 depends upon Claim 1, so 12:00:07  
7 everything in Claim 1 plus Claim 5. 12:00:14  
8 Do you have an understanding of what 12:00:16  
9 that claim means? 12:00:17  
10 MR. MURRAY: Objection to form. 12:00:18  
11 THE WITNESS: Sorry. I was getting 12:00:19  
12 to the page. What was the question? 12:00:23  
13 BY MR. BREGMAN: 12:00:23  
14 Q. Do you have an understanding of what 12:00:24  
15 Claim 5 means? 12:00:27  
16 MR. MURRAY: Same objection. 12:00:28  
17 THE WITNESS: I believe I have a 12:00:28  
18 general idea of what Claim 5 means. 12:00:44  
19 BY MR. BREGMAN: 12:00:47  
20 Q. Okay. Can you tell me what that 12:00:47  
21 general idea is? 12:00:48  
22 A. **The general idea, not a specific** 12:00:49

1 interpretation of the claim, but the general 12:00:53  
2 idea of this patent is to have a lens which is 12:00:55  
3 capable of having a compressed zone at the 12:01:05  
4 center of the image, and a compressed zone at 12:01:07  
5 the edge of the image, and an expanded zone 12:01:13  
6 between the two in order to provide more 12:01:15  
7 information content in the expanded zone at the 12:01:19  
8 expense of the compressed zones, and that to 12:01:22  
9 achieve that is the description given in 12:01:24  
10 Claims 1 and 5. 12:01:30

11 Q. And when you said you have a general 12:01:32  
12 idea of the patent, there are other embodiments 12:01:33  
13 in the patent that do not have a compressed 12:01:36  
14 zone at the center and at the edge and expanded 12:01:39  
15 zone between the two, right? 12:01:42

16 A. I believe that's correct. 12:01:47

17 Q. So the patent describes many 12:01:49  
18 different embodiments, only one of which is 12:01:50  
19 being claimed in Claim 5, right? 12:01:53

20 MR. MURRAY: Objection to form. 12:01:54

21 THE WITNESS: The embodiment is just 12:01:58  
22 an embodiment, and a claim is a claim. So 12:02:00

1           the claim -- the embodiment is meant to be 12:02:02  
2           a -- as I said before, a member of the 12:02:04  
3           ensemble. It is a representative example 12:02:07  
4           showing the invention. 12:02:12  
5       BY MR. BREGMAN: 12:02:14  
6           Q.     Could I pick up this document, if I 12:02:14  
7           was a person of skill in the art, read Claim 5, 12:02:16  
8           read Claim 21, and build a lens per the 12:02:20  
9           description in this patent? 12:02:26  
10           MR. MURRAY:  Objection to form. 12:02:28  
11           Outside the scope of the declaration. 12:02:29  
12           THE WITNESS:  Could you repeat the 12:02:33  
13           question again, please? 12:02:38  
14       BY MR. BREGMAN: 12:02:38  
15           Q.     Could I pick up this document if I 12:02:39  
16           was a person of skill in the art at the 12:02:41  
17           relevant time period, read Claim 5, read 12:02:46  
18           Claim 21, and build a lens per the description 12:02:49  
19           in this patent? 12:02:51  
20           MR. MURRAY:  Same objections. 12:02:52  
21           THE WITNESS:  Well, to be more 12:02:53  
22           specific, I do believe that a person of 12:02:54

1 ordinary skill in the art could read the 12:02:59  
2 '990 patent and could recreate the 12:03:00  
3 invention that's been embodied in that 12:03:06  
4 patent and, therefore, you could recreate a 12:03:09  
5 lens which met the criteria of Claims 5 and 12:03:11  
6 17. 12:03:14  
7 BY MR. BREGMAN: 12:03:14  
8 Q. Okay. And as a person of skill in 12:03:14  
9 the art, which you told me that you meet those 12:03:18  
10 qualifications -- 12:03:20  
11 A. Uh-huh. 12:03:20  
12 Q. -- can you walk me through the steps 12:03:21  
13 of how you would recreate the invention 12:03:22  
14 embodied in Claims 5 and 21? 12:03:27  
15 MR. MURRAY: Objection to form. 12:03:30  
16 This is going way outside the scope of the 12:03:32  
17 declaration. 12:03:34  
18 MR. BREGMAN: Are you instructing 12:03:34  
19 your witness not to answer? 12:03:35  
20 MR. MURRAY: At this point, I will. 12:03:36  
21 MR. BREGMAN: Okay. Let's go off 12:03:38  
22 the record, please. 12:03:39



1                   And can the witness -- can you                   12:03:40  
2                   please leave the room for a few minutes,                   12:03:42  
3                   Mr. Aiken [as spoken]?                   12:03:51  
4                   THE WITNESS:    Sure.                   12:03:51  
5                   MR. BREGMAN:    Just give us five                   12:03:51  
6                   minutes.                   12:03:53  
7                   (Pause in testimony.)                   12:03:54  
8                   (Mr. Aikens leaves the room.)                   12:04:01  
9                   (Whereupon, discussion held off the                   12:14:09  
10                   record.)                   12:14:40  
11                   (Whereupon, a break for lunch was                   12:14:40  
12                   taken from 12:14 p.m. to 12:58 p.m.)                   12:46:00  
13                   BY MR. BREGMAN:                   12:58:41  
14                   Q.        So, Mr. Aiken, why don't we turn to                   12:58:43  
15                   Exhibit 2009. That's your declaration we were                   12:58:49  
16                   talking about a little bit earlier.                   12:58:51  
17                   **A.        Yes, yes.**                   12:58:53  
18                   Q.        Can you turn to page -- why don't,                   12:58:54  
19                   just for convenience, we'll talk about the page                   12:59:01  
20                   number being 7 of 94 instead of the actual                   12:59:03  
21                   document number.                   12:59:06  
22                   **A.        Okay.**                   12:59:08

1 Q. So page 7 of 94. 12:59:08

2 **A. Yes.** 12:59:13

3 Q. Paragraph 11, you say, "In forming 12:59:13

4 my opinions expressed in this declaration, I've 12:59:17

5 considered and relied upon my education, 12:59:19

6 background, and experience. In addition, I 12:59:22

7 have reviewed and in some cases relied upon the 12:59:25

8 following list of materials in preparation of 12:59:27

9 this declaration." 12:59:29

10 Do you see that? 12:59:30

11 **A. Yes.** 12:59:30

12 Q. And what follows is a list of all of 12:59:31

13 the documents that you've considered in 12:59:35

14 reaching your conclusions in your declaration; 12:59:38

15 is that correct? 12:59:41

16 **A. Yes.** 12:59:41

17 Q. And is this list complete? 12:59:42

18 **A. I believe so, yes.** 12:59:45

19 Q. Exhibit 1013, can I presume that's a 12:59:53

20 typo, "Dave from Code V analysis"? 12:59:57

21 **A. Yeah. That should be "data."** 01:00:03

22 Q. Let's go to page 12 of 94. This is 01:00:07

1 under a heading that says level of skill in the 01:00:24  
2 art. 01:00:27  
3 Do you see that? 01:00:27  
4 **A. I do.** 01:00:28  
5 Q. So paragraph 24, one, two, three, 01:00:29  
6 four -- fifth -- sixth line down says, "While I 01:00:32  
7 do not necessarily agree with Dr. Chipman's 01:00:36  
8 opinion." 01:00:39  
9 Which opinion are you talking about? 01:00:41  
10 His definition of a person of ordinary skill in 01:00:43  
11 the art? 01:00:49  
12 **A. Yes.** 01:00:49  
13 Q. All right. And what is it that you 01:00:50  
14 don't agree with about his opinion? 01:00:52  
15 **A. As I said in the report, it doesn't 01:00:53  
16 materially affect the analysis. So for the 01:00:56  
17 purposes of the document, I used Dr. Chipman's 01:00:58  
18 definition of a POSA.** 01:01:02  
19 Q. Okay. But I would like to know 01:01:04  
20 why -- what it is that you don't necessarily 01:01:06  
21 agree with. 01:01:08  
22 **A. I haven't thought about it in 01:01:10**

1 careful enough detail to give you a specific 01:01:12  
2 reason why I would or would not like his 01:01:14  
3 definition. 01:01:17  
4 I just don't necessarily agree with 01:01:17  
5 it. I didn't consider for myself, in studying 01:01:20  
6 the documents, what I would recommend as a 01:01:24  
7 POSA. I simply used Dr. Chipman's 01:01:27  
8 recommendation. 01:01:29  
9 Q. I see. So you didn't -- 01:01:30  
10 (Audio technical difficulties; 01:01:39  
11 stenographer asks for 01:01:39  
12 clarification.) 01:01:39  
13 BY MR. BREGMAN: 01:01:39  
14 Q. So it's not that you disagree with 01:01:40  
15 Dr. Chipman's opinion; it's just that you 01:01:42  
16 haven't formed your own position on it; is that 01:01:46  
17 right? 01:01:49  
18 A. It is just that I do not necessarily 01:01:49  
19 agree. 01:01:51  
20 Q. And why don't you necessarily agree? 01:01:51  
21 A. Because I have not come to a 01:01:53  
22 conclusion of what kind of a POSA I would like 01:01:58

1       to have for reading the '990 patent. It was       01:02:00  
2       immaterial to my report.                               01:02:03

3             Q.     Okay. Go down to paragraph 25. The     01:02:05  
4       third full sentence, it says, "That is an image     01:02:14  
5       points relative distance DR from the image         01:02:17  
6       center should equal the field angle."             01:02:21

7                     Do you see that?                     01:02:24

8             **A.     Yes.**                                 01:02:25

9             Q.     What do you mean by "DR"? Where is     01:02:26  
10       that in Figure 5?                                 01:02:29

11            **A.     The image point relative distance is**     01:02:30  
12       **shown as D1, D2, and negative D1, negative D2**     01:02:37  
13       **in this case. Those are the image distances.**     01:02:42

14            Q.     Okay. Let's go to paragraph 28.         01:02:44  
15       The second sentence says, "The '990 patent's         01:02:50  
16       solution offers an objective lens that has a         01:02:55  
17       nonlinear image point distribution function         01:03:00  
18       with a maximum divergence of at least             01:03:02  
19       plus/minus 10 percent," et cetera.             01:03:06

20                     Do you see that?                     01:03:10

21            **A.     Yes.**                                 01:03:11

22            Q.     What is -- what is an image point         01:03:11

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1 distribution function? 01:03:14

2 **A. The image point distribution** 01:03:47

3 **function is the distribution of image points** 01:03:49

4 **with respect to field angle such as that shown** 01:03:51

5 **in Figure 4B just above it.** 01:03:54

6 Q. So the line shown in Figure 4B with 01:03:57

7 a reference numeral attached it, FDC, that 01:04:04

8 linear line is an image point distribution 01:04:08

9 function? 01:04:10

10 **A. That's correct.** 01:04:12

11 Q. And the phrase "image point 01:04:15

12 distribution function" is something that the 01:04:21

13 inventors of the '990 patent conceived of? 01:04:26

14 MR. MURRAY: Objection to form. 01:04:29

15 THE WITNESS: Could you repeat the 01:04:30

16 question? 01:04:31

17 BY MR. BREGMAN: 01:04:31

18 Q. The phrase "image point distribution 01:04:32

19 function," is that a phrase that the inventors 01:04:36

20 of the '990 patent conceived of? 01:04:43

21 MR. MURRAY: Objection to form. 01:04:48

22 THE WITNESS: "Image point 01:04:49

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1 distribution function" is not a standard 01:04:50  
2 term in the art. 01:04:51  
3 BY MR. BREGMAN: 01:04:53  
4 Q. Was it a term that you were familiar 01:04:55  
5 with prior to the '990 patent? 01:04:57  
6 **A. I don't believe so, no.** 01:05:00  
7 Q. And is it a common term that's used 01:05:06  
8 in optics today? 01:05:11  
9 **A. Again, it is not a term used in the** 01:05:14  
10 **art.** 01:05:17  
11 Q. So is it your belief that the 01:05:18  
12 inventors of the '990 patent coined the phrase? 01:05:22  
13 **A. I don't know that that's the case.** 01:05:28  
14 Q. But you had never heard of it before 01:05:30  
15 the patent? 01:05:34  
16 **A. I don't believe so, no.** 01:05:34  
17 Q. Have you heard of it absent the '990 01:05:36  
18 patent in the work you've done related to it? 01:05:39  
19 Have you heard that term being used at any 01:05:42  
20 point in your career? 01:05:45  
21 **A. I may have, but I don't recall.** 01:05:58  
22 Q. What is a "maximum divergence"? 01:06:00

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LGE Exhibit 1018

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1           A.     The divergence is shown in the           01:06:04  
2     Figure 8 on page 15 of 94.  You can see from       01:06:12  
3     that figure, there is a different image point       01:06:18  
4     distribution function, and the point of maximum     01:06:21  
5     divergence is the point where the image point       01:06:26  
6     distribution function deviates the most from a       01:06:28  
7     linear distribution.                                   01:06:33

8           Q.     And what is that maximum divergence     01:06:40  
9     in Figure 8?   01:06:41

10          A.     The greatest relative distance           01:06:45  
11     between image point distribution function FD2       01:06:51  
12     and the linear distribution function FDC is           01:06:54  
13     found at 70 degrees and is the distance between     01:06:57  
14     PD1 -- or PDL, I'm not sure which that is --       01:07:03  
15     and PD.  And it would be related in percentage     01:07:08  
16     usually.    01:07:13

17          Q.     So here it would be 0.777 minus 0.3?   01:07:15

18          A.     Not exactly.  There's an equation       01:07:26  
19     for it that's given in the patent, and I simply     01:07:29  
20     followed the same mathematical methodology.        01:07:32  
21     It's also the same equation that shows up in        01:07:35  
22     Dr. Chipman's report.                                 01:07:38



1 Q. And that equation is an equation 01:07:40  
2 that is not standard in the field of optics? 01:07:42

3 A. It is -- in fact, I think it 01:07:47  
4 actually shows up in the patent itself in the 01:07:53  
5 claims, but I'm not certain of that. 01:07:55

6 It is a -- it's a -- it's a method 01:07:57  
7 of creating ratio and then turning it into a 01:08:01  
8 percentage, which is not very sophisticated. 01:08:04  
9 The primary concept here is the quantifying the 01:08:08  
10 distance, the maximum distance from a linear 01:08:13  
11 distribution a given image point distribution 01:08:16  
12 has. 01:08:20

13 We can find that equation if you 01:08:22  
14 like. 01:08:24

15 Q. Sure. 01:08:25

16 A. It's probably in my report 01:08:26  
17 somewhere. 01:08:27

18 Q. We can go to the patent. I'm just 01:08:29  
19 going to open the patent seeing that you 01:08:30  
20 mentioned it was there. 01:08:32

21 A. Sure. 01:08:34

22 Q. See if we can find this. This is 01:08:34

1 Exhibit 1001. 01:08:36

2 So I see an equation on line 2 01:08:44

3 around about line 40? 01:08:47

4 **A. No. That's a linear distribution.** 01:08:53

5 Q. Hold on. So I'm -- let's come back 01:09:01

6 to this in a second. But you told me when we 01:09:03

7 were looking at it a moment ago in your 01:09:06

8 declaration that -- that the Figure 4B was a 01:09:08

9 linear distribution function -- sorry -- was 01:09:17

10 a -- was a -- was an image point distribution 01:09:20

11 function. 01:09:24

12 Is that incorrect? Figure 4B is 01:09:26

13 actually a linear distribution function? 01:09:29

14 **A. Figure 4B is an image point** 01:09:33

15 **distribution function which is linear.** 01:09:37

16 Q. Okay. And that figure has the 01:09:40

17 equation which was -- I just referred to in 01:09:44

18 Column 2, line 40, right? 01:09:48

19 **A. The equation you're referring to is** 01:09:52

20 **DR equals FDC alpha equals K alpha. That's** 01:09:54

21 **just describing a line. And that line is the** 01:09:59

22 **line in Figure 4.** 01:10:04

1 Q. Okay. And that's -- that's an image 01:10:05  
2 point distribution function? 01:10:07

3 **A. Which is linear.** 01:10:09

4 Q. Which is linear. 01:10:10  
5 So that is the equation for image 01:10:12  
6 point distribution function? 01:10:14

7 **A. No. That's not correct.** 01:10:16

8 MR. MURRAY: Objection. 01:10:18

9 THE WITNESS: That is an equation of 01:10:18  
10 a line. 01:10:19

11 Perhaps the easiest way to find it 01:10:25  
12 would be to refer to Dr. Chipman's 01:10:27  
13 declaration, because I know where it is in 01:10:28  
14 that. Would that be all right with you? 01:10:30

15 BY MR. BREGMAN: 01:10:32

16 Q. I would like to stick with the 01:10:33  
17 patent seeing that's what we're talking about. 01:10:34  
18 So let's try and find it in the patent looking 01:10:35  
19 through it as well. 01:10:41

20 Is this maybe Column 8, line 56? 01:10:41

21 **A. Yes, that's it.** 01:10:51

22 Q. That starts with -- 01:10:53

1	<b>A. The max percentage.</b>	01:10:56
2	Q. -- the max percentage equals. So	01:10:57
3	that's the maximum -- now, is the maximum	01:10:59
4	divergence the same thing as the maximum -- let	01:11:02
5	me go back to your declaration -- the same	01:11:09
6	thing as the maximum -- oh, it is the maximum	01:11:11
7	divergence. Okay.	01:11:14
8	So that equation is the maximum	01:11:14
9	divergence that you were discussing in	01:11:17
10	paragraph 28 of your declaration?	01:11:20
11	<b>A. In percent, yes, that's correct.</b>	01:11:22
12	Q. And is the maximum divergence claims	01:11:24
13	in Claims 5 and 21 of the patent?	01:11:29
14	MR. MURRAY: Objection to form.	01:11:36
15	THE WITNESS: Where in my	01:11:37
16	declaration are you referring to?	01:11:44
17	BY MR. BREGMAN:	01:11:44
18	Q. I'm referring to paragraph 28 where	01:11:45
19	you've got maximum divergence.	01:11:47
20	<b>A. Paragraph 30 cites, "The only claims</b>	01:11:50
21	<b>at issue in this proceeding, Claims 5 and 21,</b>	01:11:58
22	<b>recite that a lens compresses the center of the</b>	01:12:01

1 image and the edges of the image and expands 01:12:04  
2 the intermediate zone of the image located 01:12:06  
3 between the center and the edges of the image." 01:12:08  
4 Q. And Claim 5 includes Claim 1? 01:12:13  
5 A. That's correct. 01:12:16  
6 Q. Is that correct? 01:12:17  
7 I'm going to go back to Claim 1. 01:12:20  
8 This is in Exhibit 1001, Column 19. 01:12:26  
9 If you look just before where it 01:12:31  
10 says plus or minus 10 percent, it says, "The 01:12:32  
11 distribution function having a maximum 01:12:34  
12 divergence of at least plus or minus 01:12:37  
13 10 percent." 01:12:39  
14 Do you see that? 01:12:39  
15 A. Yes, I do. 01:12:40  
16 Q. So where the claim is talking about 01:12:41  
17 the maximum divergence, we should basically 01:12:43  
18 substitute the equation from the stand of what 01:12:47  
19 the maximum divergence is into this claim? 01:12:52  
20 A. I used the equation that was shown 01:12:58  
21 that we were just discussing to calculate my 01:13:01  
22 maximum divergence in considering Dr. Chipman's 01:13:04

1 **assessment of Claims 1 and 5.** 01:13:10

2 Q. And that's because the inventors of 01:13:12

3 the patent defined what the maximum divergence 01:13:16

4 is with an equation in the patent, right? 01:13:18

5 MR. MURRAY: Objection to form. 01:13:21

6 THE WITNESS: I just followed 01:13:22

7 Dr. Chipman's lead. He used that equation. 01:13:27

8 I used the same equation. It seemed 01:13:29

9 logical. 01:13:31

10 BY MR. BREGMAN: 01:13:31

11 Q. So you do not dispute the fact that 01:13:31

12 Dr. Chipman's position that the maximum 01:13:37

13 divergence as mentioned in the claim is -- is 01:13:41

14 taken from the equation in the patent for 01:13:45

15 maximum divergence, right? 01:13:48

16 A. **I just followed Dr. Chipman's lead.** 01:13:53

17 **He used the same equation.** 01:13:58

18 Q. Okay. So you have no opinion on 01:14:00

19 whether -- whether the equation in the patent 01:14:01

20 provides a definition of maximum deviation in 01:14:06

21 the claims? 01:14:12

22 MR. MURRAY: Objection. 01:14:13

1 THE WITNESS: I was not -- I was not 01:14:14  
2 asked to do claim construction. 01:14:15  
3 BY MR. BREGMAN: 01:14:17  
4 Q. But you adopted claim construction, 01:14:17  
5 right? Your declaration says you adopted claim 01:14:19  
6 construction. So you're applying a claim 01:14:22  
7 construction. 01:14:24  
8 MR. MURRAY: Objection to form. 01:14:25  
9 BY MR. BREGMAN: 01:14:25  
10 Q. Is that correct? 01:14:26  
11 A. **Could you show me where that is in** 01:14:27  
12 **my dec?** 01:14:28  
13 Q. Sure can. It's on page 10. I'm not 01:14:29  
14 sure what -- it's regular page 10. 01:14:48  
15 A. **Regular page 10.** 01:14:50  
16 Q. Yeah. So this is on page 13 of 94. 01:14:55  
17 A. **Uh-huh.** 01:15:00  
18 Q. Patent claim summary. And then if 01:15:00  
19 go down, sorry, page 16 of 94, it's got claim 01:15:05  
20 construction. 01:15:09  
21 A. **Yeah. My paragraph 32 says, "I** 01:15:16  
22 **understand that the petitioner proposed** 01:15:19

1       **constructions for a number of the terms in**       01:15:20  
2       **Claims 5 and 21. While I do not agree with the**       01:15:22  
3       **interpretation set forth by the petitioner, it**       01:15:25  
4       **does not materially affect my analysis.**       01:15:28  
5               **"Accordingly, for the purposes of my**       01:15:31  
6       **declaration, I have adopted the petitioner's**       01:15:34  
7       **claim construction."**       01:15:36  
8               Q.       So you say you do not agree with the       01:15:38  
9       interpretation set forth by the petitioner.       01:15:42  
10               What are your -- what don't you       01:15:45  
11       agree with?       01:15:46  
12               A.       I was not asked to construct these       01:15:46  
13       claims. I simply work from the assumptions       01:15:48  
14       that the petitioner had provided.       01:15:51  
15               Q.       But you say you don't agree to it.       01:15:53  
16       So in your declaration, you don't say I wasn't       01:15:55  
17       asked and I just applied those constructions;       01:15:58  
18       you said you do not agree with the       01:16:01  
19       interpretations.       01:16:03  
20               It's your position. I would like to       01:16:04  
21       know why you do not agree with the       01:16:05  
22       interpretations set forth by the petitioner.       01:16:06



1	MR. MURRAY: Objection.	01:16:09
2	THE WITNESS: I don't agree or	01:16:09
3	disagree. I have no opinion.	01:16:10
4	BY MR. BREGMAN:	01:16:12
5	Q. I see.	01:16:12
6	So where it says here you don't	01:16:13
7	agree, that's not accurate. It should say that	01:16:14
8	you don't agree or disagree; is that correct?	01:16:18
9	MR. MURRAY: Objection.	01:16:19
10	THE WITNESS: I don't actively	01:16:19
11	agree. Yes, you could say I don't	01:16:21
12	necessarily agree would probably be a	01:16:22
13	perfectly acceptable modification.	01:16:24
14	MR. MURRAY: I have an objection.	01:16:28
15	Instruction provided to the witness.	01:16:32
16	Please let me have a second to enter an	01:16:33
17	objection.	01:16:35
18	THE WITNESS: Sorry.	01:16:35
19	BY MR. BREGMAN:	01:16:37
20	Q. Give me one second.	01:16:42
21	Go to paragraph 29 of your	01:17:45
22	declaration.	01:17:48

1	<b>A. Yes.</b>	01:17:51
2	Q. Just before we get that, if we look	01:17:52
3	at Figure 8 above -- above paragraph 29, would	01:17:55
4	you agree that that figure does not embody the	01:18:00
5	claims of the -- Claims 5 and 21 of the patent?	01:18:06
6	MR. MURRAY: Objection to form.	01:18:10
7	THE WITNESS: Can you show me where	01:18:11
8	in my declaration I said that?	01:18:13
9	BY MR. BREGMAN:	01:18:13
10	Q. Well, you told me earlier that the	01:18:14
11	claims require a center compressed zone and	01:18:16
12	external or periphery compressed zone and an	01:18:21
13	expanded zone between the two; is that right?	01:18:25
14	<b>A. The method according to Claim 1</b>	01:18:27
15	<b>wherein the objective lens compresses the</b>	01:18:31
16	<b>center of the image and the edges of the image</b>	01:18:33
17	<b>and expands the intermediate zone of the image</b>	01:18:35
18	<b>located between the center and the edges of the</b>	01:18:38
19	<b>image. That's an exact listing of Claim 5.</b>	01:18:40
20	Q. Does Figure 8 -- does Figure 8 do	01:18:44
21	that?	01:18:46
22	<b>A. I've not done a claims construction.</b>	01:18:46

1	<b>I haven't analyzed these claims.</b>	01:18:49
2	Q. So you can't tell from looking at	01:18:51
3	Figure 8 where the center of the lens is	01:18:54
4	compressed, the edges compressed, and the zone	01:18:57
5	between the center and the edge is expanded?	01:19:01
6	You can't tell that from Figure 8?	01:19:04
7	MR. MURRAY: Objection to form.	01:19:05
8	THE WITNESS: Removing -- sorry,	01:19:06
9	Steve.	01:19:08
10	MR. MURRAY: Objection to form.	01:19:09
11	THE WITNESS: I'm sorry. Go ahead.	01:19:10
12	MR. MURRAY: No, I made an	01:19:11
13	objection. Go ahead.	01:19:12
14	THE WITNESS: Okay.	01:19:13
15	Removing the reference to the '990	01:19:15
16	patent and simply looking at that image	01:19:18
17	distribution function, just irrespective of	01:19:20
18	claims, that image point distribution	01:19:22
19	function does not show a compressed area at	01:19:24
20	the edge.	01:19:27
21	BY MR. BREGMAN:	01:19:27
22	Q. Okay. So you would agree that	01:19:27

1       embodiments in the '990 patent that is depicted   01:19:30  
2       in Figure 8 does not have a compressed center   01:19:35  
3       portion, a compressed edge, and an intermediate   01:19:41  
4       zone that is expanded; is that correct?       01:19:45  
5               MR. MURRAY:  Objection to form.       01:19:48  
6               THE WITNESS:  Once again, Figure 8,   01:19:50  
7               the Figure 8 that's shown in my declaration 01:19:53  
8               does not show a compressed zone at the   01:19:55  
9               edge.                                   01:19:57  
10       BY MR. BREGMAN:                               01:19:59  
11               Q.       By "the edge," you mean close to 90   01:19:59  
12               degrees?                               01:20:02  
13               **A.       Precisely.**                       01:20:02  
14               Q.       Now, paragraph 29 you're saying,   01:20:03  
15               "Image zone is expanded, and it covers a   01:20:11  
16               greater number of pixels on an image sensor   01:20:14  
17               than it would with a linear distribution lens   01:20:17  
18               and it is compressed when it covers fewer image 01:20:19  
19               sensor pixels."                       01:20:24  
20               Do you see that?                       01:20:27  
21               MR. MURRAY:  Object to form.       01:20:27  
22               THE WITNESS:  Yes.                   01:20:28

1 BY MR. BREGMAN: 01:20:28

2 Q. Can you give me a little bit more 01:20:29

3 understanding of what you're talking about 01:20:30

4 there? 01:20:32

5 A. The image point distribution 01:20:34

6 function is a representation of where the 01:20:38

7 field, the object field points map onto the 01:20:41

8 sensor. 01:20:44

9 If the image point distribution 01:20:46

10 function is a line, then it would be shown as 01:20:49

11 FDC, for example, where as you move linearly in 01:20:54

12 field angle, you move linearly on the sensor. 01:20:59

13 In each area of the sensor, the 01:21:04

14 pixels are equally distributed. So if that 01:21:06

15 line is -- if the line has a lower slope, then 01:21:10

16 it means that there is more pixels covering 01:21:15

17 that same -- I'm sorry -- there is less pixels 01:21:20

18 covering that angular range from zero to 70 01:21:23

19 degrees, for example. The expanded zone is the 01:21:26

20 one which covers the greater number of pixels. 01:21:32

21 Q. So you're taking the same light 01:21:36

22 that's reflected from some surface, it comes, 01:21:39

1 it hits the lens, you can either compress that 01:21:42  
2 light onto fewer pixels or you can expand that 01:21:46  
3 light onto more pixels; is that right? 01:21:49

4 A. The image is formed based on the 01:21:56  
5 angular spectrum of the object being mapped 01:22:00  
6 onto the image plane. In a typical rectilinear 01:22:03  
7 camera image, like the one in your phone, for 01:22:09  
8 example, that image point distribution function 01:22:12  
9 is  $H$  is equal to  $F$ , the focal length of the 01:22:13  
10 lens times the tangent of the angle in object 01:22:17  
11 space. 01:22:19

12 The problem is that function goes to 01:22:19  
13 infinity at 90 degrees. So we can't use that 01:22:21  
14 rectilinear description if we're going to do a 01:22:25  
15 very wide angle lens. 01:22:30

16 Q. Uh-huh. 01:22:32

17 A. So we choose a different function. 01:22:32  
18 And the function that most wide angle lenses 01:22:34  
19 use is a linear distribution by adding a 01:22:38  
20 certain amount of distortion to the lens to 01:22:42  
21 create a distorted image that at least fits 01:22:45  
22 onto the sensor. 01:22:48

1                   **So that distorted image is a**                   01:22:51  
2                   **manifestation of the image point distribution**                   01:22:56  
3                   **function, which is linear with respect to field**                   01:22:58  
4                   **point.**                   01:23:01

5                   Q.       Again, I'm not understanding that.                   01:23:04  
6                   So if you've got a linear distribution --                   01:23:06

7                   **A.       Uh-huh.**                   01:23:08

8                   Q.       -- doesn't it mean the incoming rays                   01:23:09  
9                   are spread basically equally across the image                   01:23:11  
10                  sensor? There's no compression or expansion?                   01:23:16

11                  **A.       With respect to a linear**                   01:23:20  
12                  **distribution, there is no expansion or**                   01:23:22  
13                  **compression.**                   01:23:24

14                  Q.       So I thought a moment ago you said                   01:23:25  
15                  if you've got linear distribution, you get some                   01:23:27  
16                  distortion, which I'm not following what                   01:23:29  
17                  distortion you get if the same light is spread,                   01:23:36  
18                  you know, evenly across the sensor. All rays                   01:23:39  
19                  are spread evenly across the sensor?                   01:23:42

20                  **A.       When I'm using the term "distortion"**                   01:23:45  
21                  **in this case, I'm referring to the optical**                   01:23:48  
22                  **aberration distortion as described by Seidel**                   01:23:51

1 back in the 1860s. 01:23:55

2 It's a fairly common term in the art 01:23:56

3 to represent the distortion of the image with 01:23:59

4 respect to what the user would expect to see, 01:24:01

5 which is  $F$  times the tangent of the angle, not 01:24:05

6  $F$  times the angle. 01:24:08

7 If you see a fish-eye lens image, 01:24:10

8 for example -- 01:24:16

9 Q. Uh-huh. 01:24:16

10 A. -- you would see something that 01:24:16

11 looks almost like a ball. And that's because 01:24:18

12 the edges of the field have been compressed in 01:24:21

13 order to fit them onto the sensor. 01:24:27

14 So that -- although it looks 01:24:30

15 compressed to us, it is a linear distribution 01:24:33

16 with respect to the angle. It's just that we 01:24:35

17 see trigonometrically, not radially, so we're 01:24:38

18 not used to viewing fields like that. 01:24:42

19 Q. So does that mean that the 01:24:46

20 distortion on a linear distribution, that the 01:24:47

21 distortion is the same across the entire lens? 01:24:53

22 A. It's actually kind of neat. When we 01:24:56



1 discuss an F-theta lens like the image 01:25:00  
2 distribution function shown in Figure 4B -- 01:25:04  
3 Q. Uh-huh. 01:25:06  
4 A. -- the optical designer has added 01:25:06  
5 enough distortion of the type, the barrel 01:25:10  
6 distortion, in order to move from an F10 theta 01:25:12  
7 function, which is trigonometrically correct, 01:25:16  
8 to a linear distribution function, which is not 01:25:19  
9 trigonometrically correct. If you think about 01:25:23  
10 it, angles should be related by the tangent, 01:25:27  
11 not by -- not by the angle itself. 01:25:31  
12 So we refer to that as an F-theta 01:25:33  
13 lens. F-theta lenses are used in a couple of 01:25:35  
14 applications. One of them is wide angle 01:25:37  
15 viewings, which is panoramic imaging. Another 01:25:39  
16 one, though, is laser scanning systems for 01:25:42  
17 welding where you want to keep that weld plane 01:25:45  
18 flat. 01:25:47  
19 Q. What -- what difference does that 01:25:48  
20 constant that you put in front of it make, like 01:25:51  
21 the slope of that linear function? 01:25:54  
22 A. The slope of the function in these 01:25:58

1       curves that we're looking at, the -- the Y axis 01:26:02  
2       is actually a relative distribution, which 01:26:06  
3       means it always goes to 1 at the top. 01:26:08  
4           Q.     Uh-huh. 01:26:11  
5           A.     So that's -- so the constant that's 01:26:11  
6       involved is where -- where 1 is for that 01:26:14  
7       particular imager. 01:26:18  
8           Q.     Uh-huh. 01:26:20  
9           A.     And that determines the slope of 01:26:22  
10       that line plotted against angle. 01:26:23  
11          Q.     So the linear distribution, if 01:26:26  
12       you've got a lens that, as much of the image 01:26:28  
13       you can see is 90 degrees, it will -- the 01:26:33  
14       linear distribution slope won't change. It 01:26:36  
15       will always go from 00 to 91; is that right? 01:26:40  
16          A.     For linear distribution, that's 01:26:43  
17       correct. 01:26:46  
18          Q.     Okay. Okay. And why back in 01:26:46  
19       Figure 8 where you get some expansion and 01:26:52  
20       compression, why does it always at the end go 01:26:54  
21       back to that linear line again? Or does it not 01:26:58  
22       necessarily need to go back to the linear line 01:27:04

1 again? 01:27:06

2 **A. It's a normalized term, so the edge** 01:27:07

3 **of the sensor must always necessarily be 1.** 01:27:11

4 Q. Uh-huh. So is it sort of like a 01:27:16

5 zero sum game? If I add some compression, I 01:27:19

6 need to also add some expansion, ultimately, 01:27:22

7 because it's sort of a zero sum game and the 01:27:29

8 lines have to come back to 1 and whatever the 01:27:32

9 field is? 01:27:35

10 MR. MURRAY: Objection to form. 01:27:38

11 THE WITNESS: The plot that the -- 01:27:41

12 the plot that's shown in Figure 8 and 01:27:42

13 elsewhere in -- throughout my declaration, 01:27:45

14 and that of Dr. Chipman's, we have used the 01:27:47

15 convention of always having the upper right 01:27:51

16 corner be consistent with the linear 01:27:54

17 distribution function. 01:27:55

18 BY MR. BREGMAN: 01:27:56

19 Q. Uh-huh. To me, at least, that seems 01:27:59

20 logical, because that's the -- that's the 01:28:00

21 biggest field of angle you've got, and that's a 01:28:04

22 normalized distance on the left. So it will 01:28:06

1 always come back to 1 and whatever the maximum 01:28:10  
2 field angle is, right? 01:28:13  
3 **A. That's correct.** 01:28:15  
4 Q. Okay. Let me go down to just above 01:28:15  
5 paragraph 31, the reproduced Figure 9 from the 01:28:30  
6 patent. 01:28:34  
7 Do you see that? 01:28:34  
8 **A. I do.** 01:28:35  
9 Q. And can you tell me what's going on 01:28:37  
10 in this -- in this figure? 01:28:39  
11 **A. This figure shows a -- an image 01:28:41  
12 point distribution function which is 01:28:46  
13 compressing from zero to 30 degrees, and 01:28:48  
14 expanding from 30 to 70 degrees, and then 01:28:52  
15 compressing again from 70 to 90 degrees. 01:28:55**  
16 Q. So this would meet -- if we go up a 01:29:00  
17 little bit to paragraph 30, this would meet the 01:29:04  
18 limitation of the claim that you have in 01:29:06  
19 paragraph 30 where it says, "The lens 01:29:09  
20 compresses the center of the image and the 01:29:11  
21 edges of the image and expands an intermediate 01:29:13  
22 zone"; is that correct? 01:29:17

1           **A.     The language of Claims 5 and 21 is**     01:29:18  
2           **right there in paragraph 30, yes.**             01:29:20

3           Q.     And that's Figure 9 shows an example     01:29:22  
4           of that, right?                                     01:29:28

5           **A.     Yes.**   01:29:29

6           Q.     And so up to zero to 30 we've got         01:29:29  
7           compression. From 30 degrees to 70 degrees,     01:29:34  
8           we've got expansion. And then from 70 degrees     01:29:38  
9           to 90 degrees, we've got compression again,     01:29:41  
10          right?   01:29:48

11          **A.     Yes, that's correct.**                     01:29:48

12          Q.     And, again, as we discussed             01:29:49  
13          before -- of course, if you have some             01:29:53  
14          compression, some expansion, you have to have     01:29:56  
15          some more compression.                             01:29:59

16                 Whatever you do, you have to -- the     01:30:01  
17          linear -- sorry -- the image point distribution   01:30:04  
18          function always starts at 00 and always will     01:30:08  
19          end at 1 and whatever the field angle is,         01:30:12  
20          right?   01:30:17

21                 MR. MURRAY: Objection to form.             01:30:17

22                 THE WITNESS: I suppose you could           01:30:18

1 draw all sorts of different kinds of image 01:30:21  
2 point distribution functions. But for the 01:30:24  
3 purposes of this report, yes, all of the 01:30:25  
4 image point distribution functions go from 01:30:27  
5 00 to 1 max field angle, whatever that may 01:30:29  
6 be, 90 degrees. In some cases, 58.5 01:30:33  
7 degrees. 01:30:37  
8 BY MR. BREGMAN: 01:30:38  
9 Q. But it would always be the case if 01:30:38  
10 you've got a normalized distance on the Y axis, 01:30:40  
11 that you would have to come back to 1 and 01:30:44  
12 whatever the field angle is of the lens 01:30:47  
13 ultimately at the end, correct? 01:30:49  
14 A. I'm not sure that's correct. I can 01:30:52  
15 imagine having a sensor which didn't 01:30:56  
16 actually -- an image that didn't cover the 01:30:59  
17 whole sensor or something like that, or some 01:31:01  
18 even 2D distribution. 01:31:03  
19 For the purposes of this report, 01:31:06  
20 though, we can always say that the image point 01:31:08  
21 distribution function starts at 00 and ends at 01:31:10  
22 1 maximum field angle. 01:31:14

1           Q.     When you say the purpose of this           01:31:16  
2     report, you mean the purposes of the '990           01:31:18  
3     patent, correct?           01:31:21  
4           **A.     No. I mean for the purposes of my**           01:31:21  
5     **declaration.**           01:31:24  
6           Q.     Okay. And for the purposes of the           01:31:24  
7     '990 patent, if you've got a normalized Y axis,           01:31:25  
8     by definition, the linear -- I'm sorry -- the           01:31:35  
9     image point distribution function must end at 1           01:31:38  
10    because it's normalized. You'd agree with           01:31:41  
11    that?           01:31:43  
12           **A.     Are you discussing something**           01:31:44  
13    **specific in the '990 patent?**           01:31:47  
14           Q.     I'm looking at Figure 9.           01:31:50  
15           **A.     Looking at Figure 9.**           01:31:52  
16           Q.     Still looking at Figure 9 and trying           01:31:52  
17    to figure out, you said it's possible that you           01:31:54  
18    never reach -- that the -- that the image point           01:31:57  
19    distribution function does not always start at           01:32:03  
20    00 and end at 1 and the field angle.           01:32:07  
21                   And I'm trying to figure out how           01:32:12  
22    that's even possible if the whole point of           01:32:14

1 normalizing the Y axis requires that you end at 01:32:15  
2 whatever the distance is. That's a normalized 01:32:21  
3 distance. 01:32:25

4 A. I think you're probably right. I 01:32:26  
5 think it -- but this is a -- and so right and 01:32:29  
6 wrong. 01:32:34

7 For all of these radial image point 01:32:34  
8 distribution functions, I -- I can't imagine a 01:32:36  
9 case where I would want to not go to 1 at the 01:32:41  
10 edge. 01:32:44

11 But I could image a two-dimensional 01:32:45  
12 image point distribution function, for example. 01:32:49  
13 And there, if I plotted the horizontal and 01:32:50  
14 vertical image point distribution functions, 01:32:53  
15 they would not go to 1 because 1 would be the 01:32:55  
16 radial case going to the corner. 01:32:58

17 Q. What do you mean by the -- I don't 01:32:59  
18 understand what you mean by two-dimensional 01:33:01  
19 system. 01:33:04

20 A. Well, for example, let's say I had 01:33:05  
21 a -- an HD sensor, so it's 16 by 9 aspect 01:33:11  
22 ratio. 01:33:16



1 Q. Yes. Okay. Carry on. 01:33:17

2 **A. Are you following me?** 01:33:19

3 Q. Yes. Claim 9 is not the sensor, has 01:33:21

4 nothing to do with the sensor, right? This is 01:33:23

5 only the lens is my understanding. 01:33:26

6 **A. You mean Figure 9?** 01:33:28

7 Q. Figure 9, sorry. Figure 9. 01:33:29

8 **A. Well, you were trying to generalize** 01:33:30

9 **in terms of image point distribution functions** 01:33:33

10 **always doing something or never doing** 01:33:34

11 **something.** 01:33:36

12 **I'm trying to explain how there is a** 01:33:36

13 **clear case that I could give you where I could** 01:33:38

14 **draw an image point distribution function which** 01:33:41

15 **did not go to 1.** 01:33:42

16 Q. For a lens or for a sensor? 01:33:44

17 **A. For the image point distribution** 01:33:46

18 **function. You'd want to map it in two** 01:33:46

19 **dimensions, for example. I might even want to** 01:33:54

20 **add anamorphic power to my lens so that I get** 01:33:56

21 **different image point distribution functions** 01:33:59

22 **than X and Y.** 01:34:01

1                   **That would be a much more**                   01:34:02

2       **complicated image point distribution function.**       01:34:03

3       **And a linear graph of that might not go to 1.**       01:34:06

4           Q.       So is there any description in the       01:34:11

5       '990 patent of any of these systems that you       01:34:14

6       just described where the linear point                   01:34:17

7       distribution function does not return to -- I'm       01:34:20

8       sorry, the image point distribution function       01:34:25

9       doesn't return back to 1 and the field angle?       01:34:27

10           A.       **All of the plots that are in the**           01:34:33

11       **'990 patent look like this. They all go to the**       01:34:37

12       **edge.**   01:34:40

13           Q.       Something that sort of I am                   01:34:42

14       struggling to understand, maybe you can help me       01:34:52

15       with. So if you've got an expanded area,           01:34:54

16       doesn't that mean that the same light that           01:34:57

17       would have normally hit the sensor in that area       01:35:01

18       is now spread out amongst more pixels so,           01:35:02

19       therefore, less light will be hitting the           01:35:07

20       sensor from an expanded zone?                       01:35:09

21           A.       **Not necessarily. Depends on the**           01:35:15

22       **design of the lens. Assuming that there's no**           01:35:17

1 vignetting across the lens and the pupil is 01:35:19  
2 perfectly centered and has no -- no anamorphic 01:35:23  
3 distortion, like, it's a typical round pupil. 01:35:30  
4 Q. Uh-huh. 01:35:33  
5 A. You would actually still see a 01:35:33  
6 falloff in signal across the aperture just 01:35:35  
7 because of the cosign to the fourth effect. So 01:35:38  
8 you would not get uniform illumination 01:35:41  
9 necessarily. 01:35:44  
10 Q. Uh-huh. 01:35:45  
11 A. But I think what you're really 01:35:45  
12 asking is, in an expanded zone, do you need to 01:35:48  
13 be careful about not having as much light. And 01:35:50  
14 the answer is yes, you have to be careful of 01:35:54  
15 that. 01:35:56  
16 Q. Uh-huh. I guess conversely, if 01:35:56  
17 you've got a compressed zone, you will probably 01:35:58  
18 get more light? 01:36:01  
19 A. All things being equal, yes. If you 01:36:03  
20 have a uniform illuminated field, for example, 01:36:05  
21 then it would tend to be brighter in compressed 01:36:08  
22 zones. 01:36:12

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1 Q. Uh-huh. 01:36:12

2 A. But there are other physics effects 01:36:13

3 going on like I said. The -- the angle of the 01:36:15

4 pupil with respect to the field angle decreases 01:36:19

5 by the cosign of that angle. So that decreases 01:36:25

6 the amount of light that can necessarily get to 01:36:27

7 the image plane. 01:36:29

8 Q. So in paragraph 31, the last part of 01:36:31

9 your sentence -- or the last sentence says, 01:36:33

10 "The result is a high definition intermediate 01:36:36

11 zone which lends itself well to digital 01:36:40

12 enlargements because it occupies more pixels." 01:36:43

13 What do you mean by that? 01:36:46

14 A. Just what it says. Because in the 01:36:48

15 expanded zone you have more pixels per degree, 01:36:53

16 you have more definition in the angular 01:36:56

17 spectrum. So that would give you more 01:37:01

18 information content. So if you're going to 01:37:04

19 digitally display that, you don't have to 01:37:06

20 interpolate as much. 01:37:09

21 Q. When you say "enlargements," you 01:37:10

22 mean sort of zooming in on the image? What do 01:37:12

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1 you mean by "enlargements"? 01:37:14

2 **A. In this case, yes, that's what I'm** 01:37:16

3 **referring to.** 01:37:20

4 Q. Let's go to paragraph 33. 01:37:21

5 **A. Uh-huh. Yes.** 01:37:28

6 Q. So here you mention two programs, 01:37:30

7 Code V and Zemex, which are optical design 01:37:36

8 software programs; is that right? 01:37:40

9 **A. Colloquially it's referred to as** 01:37:42

10 **"Code 5," even though it is written Code V for** 01:37:45

11 **the court reporter.** 01:37:49

12 Q. I see. 01:37:50

13 So Code V and Zemax are optical 01:37:51

14 design software programs? 01:37:53

15 **A. That's correct.** 01:37:54

16 Q. And what -- what does a person of 01:37:55

17 ordinary skill in the art do with these 01:38:01

18 programs? 01:38:02

19 **A. These are really quite complex** 01:38:02

20 **modeling codes. They are very specific to the** 01:38:05

21 **optical industry, specifically the optical** 01:38:07

22 **design industry, in fact.** 01:38:10

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1                   The best way to explain it to                   01:38:12  
2           someone who doesn't use them is it's sort of           01:38:13  
3           like SOLIDWORKS is for the mechanical                   01:38:16  
4           engineers, or SPICE is for the electrical               01:38:19  
5           engineers. It's the way they model lenses               01:38:22  
6           for -- for optical design purposes and optical           01:38:26  
7           analysis.   01:38:29  
8           Q.       So does sort of all sorts of finite           01:38:30  
9           element analysis type calculations?                       01:38:34  
10           A.       The optical version of that, yeah.           01:38:36  
11           Q.       I see.   01:38:37  
12           A.       Not finite element, per se. That's           01:38:38  
13           a -- that's a mechanical thing.                           01:38:40  
14           Q.       Yeah, yeah.                                       01:38:42  
15           A.       But, like, OPD maps and ray maps and           01:38:43  
16           wave front maps and other things that are sort           01:38:47  
17           of the optical analogy.                                       01:38:49  
18           Q.       Now, both you and Dr. Chipman used,           01:38:56  
19           should I say, modern versions of the code; is           01:39:05  
20           that correct?   01:39:08  
21           A.       I don't recall what Dr. Chipman               01:39:08  
22           said, but I certainly used the latest edition           01:39:10

1 of Zemax, yes. 01:39:12

2 Q. And is it your understanding that 01:39:14

3 circa May 2000- -- I think it's 2001 -- the 01:39:19

4 same capabilities were available in Zemax? 01:39:26

5 A. The capabilities that I used in this 01:39:30

6 analysis were available in the 2001 version, 01:39:34

7 and you can look at the 2001 user's guide for 01:39:37

8 comparison. 01:39:40

9 Q. Uh-huh. 01:39:40

10 A. I believe the same thing's true of 01:39:40

11 Dr. Chipman and his Code V analysis. 01:39:43

12 Q. And what has changed from 2001 to 01:39:47

13 2020 in the software? 01:39:50

14 A. Oh, heavens. They do three or four 01:39:52

15 releases a year. They're constantly adding new 01:39:55

16 functionality, new features, new analysis 01:39:58

17 routines, different kinds of surface types that 01:40:01

18 can be modeled. 01:40:05

19 They just recently -- the latest 01:40:07

20 announcement was that Zemax now has a faster 01:40:09

21 optimization method, which is kind of exciting. 01:40:13

22 They're changing constantly. Both codes 01:40:16





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1 (Pause in testimony while witness 01:41:47  
2 reconnects to meeting.) 01:41:48  
3 BY MR. BREGMAN: 01:43:02  
4 Q. We're talking about some excerpts 01:43:02  
5 from the Zemax manual. I went back to the 01:43:05  
6 materials considered, which is on page 8 of 94, 01:43:08  
7 and I see something there, Exhibit 2011, 01:43:10  
8 excerpts from Zemax optimal design program; is 01:43:13  
9 that correct? 01:43:17  
10 A. It must be mislabeled -- 01:43:17  
11 Q. I'm sorry. Say that again? 01:43:19  
12 A. Sorry. Yes, that's correct. 01:43:20  
13 It's -- I was reading paragraph 35 and seeing 01:43:23  
14 Exhibit 2010, but that's actually my analysis. 01:43:27  
15 The Zemax manual was Exhibit 2011. 01:43:30  
16 Q. Okay. Why don't we go to 01:43:34  
17 paragraph 36. 01:43:42  
18 A. Yes. 01:43:42  
19 MR. BREGMAN: And, Jessica, sorry. 01:43:47  
20 If you can tell us roughly when we're at 01:43:48  
21 two hours. I know we were on for about an 01:43:50  
22 hour before. 01:43:53

1 BY MR. BREGMAN: 01:43:54

2 Q. Okay. So in paragraph 36, you say, 01:43:54

3 "Tada addresses a retrofocus type of lens with 01:44:00

4 a front group with negative power and a rear 01:44:04

5 lens group of positive power." 01:44:08

6 You lost me at "retrofocus" there. 01:44:09

7 If you could maybe just give me a little bit of 01:44:17

8 an explanation of what you meant? 01:44:18

9 A. Yeah. A retrofocus lens is -- 01:44:19

10 retrofocus is a class of lens. When we do lens 01:44:21

11 design, we frequently try to group them into 01:44:24

12 families or classes or types. 01:44:27

13 So it's just a label for a type of 01:44:29

14 design we do. It's called a retrofocus. It's 01:44:31

15 also called a reverse telephoto by some people. 01:44:35

16 But it is characterized by a front negative 01:44:39

17 group and a rear positive group. 01:44:42

18 Q. And a negative group means what and 01:44:45

19 a positive group means what? 01:44:47

20 A. A negative lenses. So lenses with 01:44:48

21 negative power -- 01:44:51

22 Q. Uh-huh. 01:44:52

1           **A.     -- imaging lenses. And positive**           01:44:53  
2           **group has positive power and, therefore, is a**       01:44:55  
3           **converging lens.**                                       01:44:57  
4           **Q.     And you would agree that Tada is a**       01:44:59  
5           **wide angle lens, discusses a wide angle lens**       01:45:09  
6           **like the '990 patent?**                               01:45:13  
7           **A.     Tada discusses a retrofocus type**       01:45:16  
8           **wide angle lens. I think Tada refers to it as**       01:45:20  
9           **a -- something else, a super wide or an ultra**       01:45:23  
10          **wide or something.**                               01:45:26  
11          **Q.     Okay.**                                       01:45:27  
12          **A.     It is a wide angle lens. It is**           01:45:27  
13          **actually more -- more accurately, it is a**       01:45:29  
14          **retrofocus lens. All of his solutions are**       01:45:31  
15          **retrofocus.**                                       01:45:33  
16          **Q.     Uh-huh. The last sentence of this**       01:45:34  
17          **paragraph says, "The first lens element is**       01:45:36  
18          **typically a negative meniscus lens" --**           01:45:38  
19   01:45:48  
20   01:45:49  
21          **BY MR. BREGMAN:**                               01:45:49  
22          **Q.     "The first lens element is typically**       01:45:49

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1 a negative meniscus lens because it can 01:45:50  
2 advantageously reduce due to the shape thereof 01:45:53  
3 a stigmatism and distortion of a bundle of 01:45:58  
4 light chiefly at a large angle of view." 01:46:02  
5 Do you see that? 01:46:04  
6 **A. Yes.** 01:46:05  
7 **Q. And how is it reducing distortion?** 01:46:07  
8 **A. I'm just quoting from Tada. But a** 01:46:09  
9 **meniscus lens tends to introduce less of that** 01:46:16  
10 **Seidel aberration distortion that I was talking** 01:46:19  
11 **about earlier.** 01:46:22  
12 **Q. That's reducing distortion at large** 01:46:26  
13 **angles?** 01:46:30  
14 **A. Compared to a plano concave lens,** 01:46:31  
15 **yeah. When you -- so we think of it as bending** 01:46:34  
16 **the lens.** 01:46:37  
17 **If you have a plano concave lens of** 01:46:37  
18 **some power, let's say it's a negative 5 mm** 01:46:40  
19 **focal length, and I then bend that lens so that** 01:46:46  
20 **it still has exactly the same focal length, the** 01:46:49  
21 **bent version, which is meniscus, a convex on** 01:46:52  
22 **the outside and concave on the inside, has less** 01:46:56

1 of the optical aberration distortion and 01:46:58  
2 astigmatism than the plano concave version of 01:47:02  
3 exactly the same focal length. 01:47:06

4 Q. If you -- we've been talking a 01:47:08  
5 little bit about compression and expansion. 01:47:10  
6 Those are also forms of distortion, I assume, 01:47:12  
7 right? 01:47:17

8 A. Everything about this case is 01:47:17  
9 related to distortion. The optical distortion 01:47:21  
10 of a typical rectilinear lens, which is what 01:47:26  
11 Tada was describing in his patent, is analyzed 01:47:29  
12 differently than the kinds of distortion 01:47:34  
13 from -- deviating from an F-theta line. 01:47:37

14 So we use the term distortion to 01:47:42  
15 mean something that's different, but we also 01:47:44  
16 use it in a very specific technical way 01:47:47  
17 optically. 01:47:49

18 So it is -- could you say that the 01:47:51  
19 expansion and compression are distortions from 01:47:54  
20 an F-theta line? And the answer is yes, 01:47:58  
21 colloquially you could say that. 01:48:03

22 But from an optical design, optical 01:48:04

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1       engineering point of view, you would not say       01:48:06  
2       that has more or less distortion.               01:48:09

3           Q.       Is that because the compression and       01:48:12  
4       expansion is a desired feature when you're       01:48:15  
5       designing it? That's the other distortion that       01:48:20  
6       you have is undesired -- undesirable?           01:48:22

7           A.       No. We really just don't think of       01:48:25  
8       it this way. It's just not the way we think.       01:48:28  
9       The optical design codes don't report an image       01:48:32  
10       point distribution function, for example. So       01:48:35  
11       we don't do this analysis. We do an analysis       01:48:37  
12       where we map the image field height against the       01:48:41  
13       field angle.                                       01:48:46

14          Q.       Uh-huh.                               01:48:48

15          A.       And then we see how far that bends.       01:48:48  
16       And we got to try to keep that to less than       01:48:50  
17       4 percent for something that someone's going to       01:48:53  
18       visually use, or 10 percent in some binocular       01:48:55  
19       cases. But it's the deviation from the           01:48:59  
20       equation  $H$  equals  $F \sin \theta$ , and we try to       01:49:01  
21       minimize that.                                   01:49:06  
22                   So in Tada's plots of his               01:49:07

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1 distortion, he actually shows it versus the F10 01:49:11  
2 theta line. So that is classical Seidel 01:49:13  
3 distortion. 01:49:17

4 But all the optical design codes 01:49:18  
5 allow you to instead look at the distortion 01:49:20  
6 with respect to an F-theta line, so you choose 01:49:23  
7 a different calibration for your distortion 01:49:27  
8 term. 01:49:30

9 But we would still refer to it as 01:49:30  
10 what is the maximum point deviating from 01:49:32  
11 this -- this target plane. So we're almost 01:49:35  
12 always looking at the very edge. 01:49:39

13 Q. If you had a lens that was poorly 01:49:41  
14 built and you got some compression where you 01:49:44  
15 didn't want it, you would still say that 01:49:46  
16 there's distortion in that zone, right? 01:49:48

17 A. So, first of all, distortion doesn't 01:49:52  
18 change much with tolerances. It mostly is 01:49:56  
19 driven by the first order surface properties. 01:49:59

20 So -- but I'll take your question to 01:50:03  
21 mean if you designed a lens that had some 01:50:05  
22 distortion in it, and it had -- it had a 01:50:08

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1 compressed area somewhere in that distortion, I 01:50:11  
2 might view that as a good thing. I might view 01:50:14  
3 it as a bad thing. 01:50:16  
4 Most of the time, any deviation from 01:50:18  
5 F10 theta or F-theta is considered a bad thing. 01:50:21  
6 Q. Uh-huh. 01:50:25  
7 A. In conventional optical design, we 01:50:26  
8 are always trying to reduce distortion, but 01:50:28  
9 it's confusing because we reduce it with 01:50:30  
10 respect to a target distribution, and there are 01:50:32  
11 two choices for target distribution. 01:50:35  
12 Q. I think I heard you say you do not 01:50:37  
13 typically get any expansion or compression from 01:50:42  
14 manufacturing; is that correct? 01:50:45  
15 A. I said you don't get much change in 01:50:48  
16 distortion with tolerance. So if you buy 50 -- 01:50:50  
17 50 Cannon lenses, for example -- 01:50:55  
18 Q. Yeah. 01:50:55  
19 A. -- and you measure their distortion, 01:50:58  
20 they'll all be about the same. They're not 01:50:59  
21 going to change much. 01:51:01  
22 Whereas they might have very 01:51:02



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1 different wave front quality, or they could 01:51:04  
2 even have variations in focal length. But the 01:51:06  
3 distortion tends -- it just generally tends not 01:51:09  
4 to be as affected by manufacturing tolerances. 01:51:11  
5 That's -- that's not always the case, but 01:51:15  
6 that's often the case. 01:51:17  
7 Q. I see. 01:51:18  
8 But, I mean, there could be a 01:51:19  
9 lens that -- I'm not saying between lenses is 01:51:21  
10 there a change in distortion. 01:51:23  
11 I'm saying if a lens was badly 01:51:24  
12 designed or there was something in the 01:51:26  
13 manufacturing process that all lenses that were 01:51:30  
14 made all had some compression or expansion 01:51:32  
15 maybe where I didn't want it to be, would an 01:51:35  
16 optics engineer say that those areas where 01:51:38  
17 there's expansion and compression that I didn't 01:51:42  
18 want it introduces distortion into the lens? 01:51:45  
19 A. No, I don't think so. Again, 01:51:49  
20 optical designers think of the term 01:51:51  
21 "distortion" to mean a very specific technical 01:51:52  
22 term. 01:51:55

1 Q. Uh-huh. Why don't we go to 01:51:56  
2 paragraph 42. 01:52:31

3 **A. Yes.** 01:52:34

4 Q. "Each embodiment is described by 01:52:35  
5 'prescription' in the form of a table including 01:52:37  
6 the focal length F (set to 1 in all cases), a 01:52:40  
7 half field of view W, a radius -- sorry -- a 01:52:47  
8 radius of curvatures R for all surfaces in the 01:52:53  
9 distance to the next surface, index of 01:52:57  
10 refraction and dispersion at the helium D line 01:53:00  
11 (which I will explain further below) for each 01:53:04  
12 element," et cetera. 01:53:08

13 What do you mean by "prescription" 01:53:12  
14 in quotes? 01:53:16

15 **A. "Prescription" is another one of 01:53:16  
16 those ambiguous terms. It can mean a lot of 01:53:17  
17 different things. In optics, we usually use 01:53:21  
18 the term "prescription" to mean the way we are 01:53:25  
19 describing the design information of the lens. 01:53:28**

20 Q. And how much of a prescription is 01:53:33  
21 enough when designing a lens? 01:53:36

22 **A. Different tasks actually require 01:53:40**

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1 different prescriptions. So, for example, I 01:53:45  
2 have a function on Zemax -- I don't know if 01:53:48  
3 this exists in Code V -- where it's called 01:53:49  
4 prescription. 01:53:53  
5 And I can select that function, and 01:53:53  
6 it generates a text file with the prescription 01:53:56  
7 of the length. But there's about 20 features 01:53:58  
8 that I can turn on and off for that 01:54:01  
9 prescription depending upon the application. 01:54:04  
10 I might DNDT information. I might 01:54:06  
11 need partial dispersion. I might need a whole 01:54:09  
12 bunch of other things, TCEs and -- and specific 01:54:11  
13 weight. I mean, I have to print out the 01:54:15  
14 centers of gravity for some of my satellite 01:54:18  
15 optical systems I did. 01:54:20  
16 Q. Uh-huh. 01:54:22  
17 A. So the prescription can be quite 01:54:22  
18 complex, and quite long, or it can be fairly 01:54:24  
19 simple for simple applications. 01:54:29  
20 Q. And somewhere in the middle of that 01:54:31  
21 sentence, we -- you mention something called a 01:54:33  
22 helium D line. Can you tell me what that 01:54:35

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1 means. 01:54:38

2 A. Sure. French physicist named 01:54:39

3 Fraunhofer originally started mapping the 01:54:43

4 spectrum of the sun a long time ago. I think 01:54:46

5 it was in the 1800s. 01:54:48

6 And he identified a bunch of lines 01:54:50

7 associated with specific elements. And we 01:54:53

8 still use these references to this day in most 01:54:55

9 physics publications. 01:54:59

10 And he assigned letters to the 01:55:01

11 different lines for a given atom. So, for 01:55:04

12 example, the helium D line is Fraunhofer's 01:55:09

13 fourth line that he measured. 01:55:14

14 I think it goes from -- I don't 01:55:17

15 remember if it goes from left to right or right 01:55:19

16 to left. But it was the fourth one in 01:55:20

17 Fraunhofer's description of the heat -- the 01:55:23

18 atom helium, the atomic spectrum of the atom 01:55:25

19 helium. 01:55:31

20 Q. When you say "line," do you mean 01:55:31

21 wavelength? 01:55:33

22 A. Yeah. Helium D line is a specific 01:55:34

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1 wavelength. 01:55:38

2 Q. How is that related to helium? 01:55:38

3 A. It is -- if you take a container of 01:55:45

4 helium and heat it up into a plasma, it emits 01:55:49

5 light. Imagine making like a helium neon or 01:55:52

6 a -- like a neon light. 01:55:57

7 You have a discharge lamp or 01:55:58

8 something. Fill it with compact helium, you 01:56:00

9 light it up, and then you analyze that spectra 01:56:04

10 and see what wavelengths are being emitted by 01:56:06

11 the helium. 01:56:10

12 And those lines are very, very thin. 01:56:11

13 They're specific to the specific atoms that are 01:56:17

14 involved in the emission spectrum. 01:56:19

15 Q. And there's only one wavelength of 01:56:20

16 light that's emitted from the plasma helium? 01:56:22

17 A. No. There are a bunch of lines. 01:56:26

18 The helium D line is one of the peaks of the 01:56:28

19 emission spectrum. 01:56:32

20 Q. All right. The next sentence says, 01:56:33

21 "The shape of object surface of the second lens 01:56:39

22 element for each embodiment is also given in 01:56:43

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1 the form of 'sag' tables." 01:56:45

2 Do you see that? 01:56:51

3 **A. Yes.** 01:56:55

4 Q. What are these -- what are these sag 01:56:55

5 tables? 01:56:58

6 **A. Sag tables are a listing of the -- 01:56:59**

7 **the sagittal deviation, the distance from a 01:57:05**

8 **plane or any -- actually from any surface. The 01:57:12**

9 **sag table could be -- well, okay, I'm getting 01:57:15**

10 **off track.** 01:57:18

11 **The sag table is a listing of the -- 01:57:19**

12 **think of it as the height of the material of 01:57:21**

13 **the lens with a respect to displacement from 01:57:23**

14 **the optical axis.** 01:57:27

15 Q. Why don't we jump to paragraph 108. 01:57:29

16 I'll give you a page number in a minute. 01:57:41

17 Actually not. Let's not do that. Hold on one 01:57:49

18 second. 01:57:52

19 MR. BREGMAN: Why don't we take a 01:58:01

20 break now for a few minutes. 01:58:02

21 (Whereupon, a recess was taken at 01:58:05

22 1:58 p.m.) 02:02:29

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1 BY MR. BREGMAN: 02:02:29

2 Q. Why don't we turn to page 24 of 94 02:02:29

3 of your declaration, paragraph 50. Let me know 02:02:32

4 when you're there. 02:02:39

5 **A. Yes, I'm there.** 02:02:41

6 Q. So you say, "Like Nagaoka" -- that's 02:02:42

7 N-a-g-a-o-k-a -- "Baker," B-a-k-e-r, "laments 02:02:45

8 that, 'The valuable content from the peripheral 02:02:53

9 areas lacks in potential image quality 02:02:57

10 (resolution) mapping because the imaging device 02:03:02

11 and system does not differentiate between these 02:03:08

12 areas in the central areas of less valuable 02:03:11

13 detail,'" period, close quotes. 02:03:15

14 Do you see that? 02:03:20

15 **A. Yes, I do.** 02:03:20

16 Q. What do you mean by the valuable 02:03:21

17 content? Or what do you think Baker means by 02:03:23

18 the valuable content? 02:03:25

19 MR. MURRAY: Objection to form. 02:03:27

20 THE WITNESS: We can look at the 02:03:27

21 patent to see what the -- what the exact 02:03:32

22 information is in Baker. 02:03:35

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1                   In general, Nagaoka and Baker both   02:03:41  
2                   do not like the compression of the data at   02:03:43  
3                   the edge of the field, so they -- they are   02:03:45  
4                   referring -- so Baker is very much           02:03:48  
5                   concerned about trying to improve the data   02:03:52  
6                   density at the periphery. And he's doing   02:03:56  
7                   that at the expense of the inner part of   02:03:58  
8                   the field of view.                           02:04:01

9                   BY MR. BREGMAN:                           02:04:02

10                  Q.       If I recall, Baker is like a           02:04:02  
11                  videoconferencing system, and it has a lens   02:04:05  
12                  sort of pointing up at the ceiling, and then   02:04:12  
13                  people would be sitting around a boardroom   02:04:16  
14                  table or something.                   02:04:19

15                               And my assumption is that the           02:04:19  
16                  valuable content is trying to see the people   02:04:21  
17                  sitting around the boardroom table; is that   02:04:23  
18                  accurate?                           02:04:26

19                  **A.       That sounds like a reasonable           02:04:27**  
20                  **summary, yes.                           02:04:29**

21                  Q.       So you would really want to see -- I   02:04:30  
22                  guess you wouldn't be that interested in seeing   02:04:34



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1 the table surface. You want to see sort of -- 02:04:35  
2 the most valuable part is shoulders and head of 02:04:38  
3 individuals, right? 02:04:41

4 **A. Well, that's interesting. I thought** 02:04:42  
5 **it was pointing up. So it would be, like, the** 02:04:44  
6 **ceiling would be in the middle and then around** 02:04:47  
7 **the edges would be all the people. But I might** 02:04:48  
8 **be envisioning that wrong. That's what I had** 02:04:51  
9 **in mind.** 02:04:53

10 **Q. I think we're on the same page.** 02:04:54  
11 **Ceiling is the middle and then horizon is the** 02:04:57  
12 **edges.** 02:05:01

13 **Is that what you're saying?** 02:05:02

14 **A. That's how I'm seeing it in my head.** 02:05:03

15 **Q. I think we're seeing it correctly.** 02:05:05

16 **And when it -- wants more detail or** 02:05:07  
17 **the valuable content, it's really the people's** 02:05:10  
18 **heads that are sitting slightly above the** 02:05:13  
19 **horizon, right?** 02:05:16

20 **A. I believe throughout Baker he's** 02:05:18  
21 **talking about the -- the information in the** 02:05:20  
22 **periphery. I think in the next line, I have** 02:05:22

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1 another quote from him. 02:05:25

2 "The image content of the periphery 02:05:27

3 of a conventional fish-eye lens is so degraded 02:05:28

4 in comparison with the central area that the 02:05:32

5 lens allows for only minimal area of the 02:05:35

6 periphery to be recorded by the film or 02:05:38

7 electronic imager." 02:05:40

8 So that's that compression we're 02:05:41

9 talking about. 02:05:43

10 Q. So it's really not that interested 02:05:44

11 with the center, which is the ceiling. It 02:05:46

12 cares about the people at the periphery. 02:05:49

13 Am I reading that correctly? 02:05:51

14 A. Baker is primarily focused on that 02:05:57

15 compression at the edge, yes. 02:06:00

16 Q. So Baker discusses expanding a lens 02:06:01

17 at the zone where the valuable content is 02:06:05

18 located, right? 02:06:07

19 A. He discusses specifically trying to 02:06:08

20 change the distortion so that he has more 02:06:12

21 pixels at the periphery. 02:06:14

22 Q. But he's trying to capture the 02:06:21

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1 valuable content? That's what he cares about; 02:06:23  
2 is that correct? 02:06:24  
3 **A. In his case, that's all at the 02:06:24**  
4 **periphery, yes. 02:06:25**  
5 Q. And a person of skill in the art 02:06:27  
6 would know from Baker how to do that? 02:06:31  
7 **A. Know how to do what? 02:06:33**  
8 Q. How to build a lens that expands the 02:06:34  
9 lens at wherever the valuable content is. 02:06:40  
10 **A. I don't recall. I don't -- I 02:06:43**  
11 **didn't -- I didn't analyze Baker to decide if a 02:06:48**  
12 **POSA would or would not be able to properly 02:06:51**  
13 **recreate his invention. 02:06:54**  
14 **I was focused more on what was the 02:06:58**  
15 **point of Baker and how was that teaching the 02:07:01**  
16 **patent by Tada, specifically Russ Chipman's 02:07:04**  
17 **declaration. 02:07:11**  
18 Q. If we go to your paragraph 51, you 02:07:11  
19 again quote Baker in that first sentence. I'm 02:07:15  
20 just going to read the second part of the 02:07:17  
21 sentence starting with line 3. Actually the 02:07:18  
22 end of line 2. 02:07:21

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LGE Exhibit 1018

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1 "And thus provide greater resolution 02:07:22  
2 with existing imaging devices for the relevant 02:07:24  
3 visual information in the scene." 02:07:28

4 Do you see that? 02:07:32

5 **A. Uh-huh. Yes.** 02:07:33

6 Q. What do you mean -- what do you 02:07:33  
7 think Baker means by that? 02:07:36

8 **A. Well, as it says in the next line,** 02:07:38  
9 **"If the conventional wide angle lens 'focuses** 02:07:42  
10 **the lowest 15 degrees up from the horizon on** 02:07:45  
11 **10 percent of the imager,'" Baker is trying to** 02:07:48  
12 **focus that same 15 degrees on, say, 50 percent** 02:07:50  
13 **of the imager. That would give a fivefold** 02:07:53  
14 **improvement in the resolution of the periphery** 02:07:58  
15 **at the expense of the center.** 02:08:00

16 Q. I see. 02:08:02

17 So at the expense of the center, it 02:08:03  
18 expands 15 degrees so that it gets greater 02:08:05  
19 resolution of what it calls the relevant visual 02:08:09  
20 information in the scene; is that correct? 02:08:12

21 **A. Yes, that's right.** 02:08:14

22 MR. MURRAY: Object to form. 02:08:17

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1 BY MR. BREGMAN: 02:08:19

2 Q. Okay. 02:08:22

3 A. I'm sorry. What was the question 02:08:22

4 again? Can you repeat it? 02:08:23

5 Q. So at the expense of the center, 02:08:26

6 Baker expands 15 degrees so that it gets 02:08:38

7 greater resolution of what it calls the 02:08:42

8 relevant information in the scene; is that 02:08:44

9 correct? 02:08:46

10 A. Yes. It focuses the lowest 15 02:08:46

11 degrees up from the horizon on more of the 02:08:54

12 sensor. In Baker's words, 50 percent of the 02:08:56

13 imager is used? 02:08:59

14 Could you hold on for just a moment? 02:09:00

15 I need to close my door. 02:09:03

16 (Pause in testimony.) 02:09:05

17 Q. Let's go to paragraph 54. 02:09:21

18 A. Just a moment. Yes, I'm there. 02:09:31

19 Q. And you say, "I agree that, as 02:09:35

20 Dr. Chipman says, 'the disclosure of Tada 02:09:37

21 includes schematic views of the lens 02:09:41

22 arrangements, diagrams of the aberrations," et 02:09:45

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1 cetera. 02:09:51

2 "And tables of measurements of the 02:09:51

3 lens that allow one of ordinary skill in the 02:09:53

4 art to reconstruct the exact lens system 02:09:55

5 described in Tada," closed quote. 02:09:58

6 Do you see that? 02:10:02

7 **A. Yes.** 02:10:02

8 Q. So, again, you're talking about Tada 02:10:02

9 including schematic views. Is that the same -- 02:10:09

10 are those the same type of views, the same 02:10:11

11 schematics that we discussed earlier with 02:10:14

12 respect to the '990 patent, or is the term 02:10:15

13 "schematic" being used here any different? 02:10:20

14 **A. I'm using this term in the -- in the 02:10:22**

15 **colloquial optical design sense as a lens 02:10:24**

16 **schematic.** 02:10:28

17 Q. I see. 02:10:28

18 Bottom of page 28 of 94. 02:10:44

19 **A. I'm sorry. What was that again?** 02:10:48

20 Q. 28 of 94. 02:10:50

21 **A. 28 of 94, yes, I'm there.** 02:10:52

22 Q. You say, "His, quote, 'recreation,' 02:10:54

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1 closed quote, is just a creation of a lens that 02:11:00  
2 was never intended to be exemplary in Tada's 02:11:03  
3 invention." 02:11:06  
4 Do you see that? 02:11:06  
5 **A. Yes, I do.** 02:11:08  
6 Q. First of all, have you ever spoken 02:11:09  
7 to Mr. Tada? 02:11:14  
8 **A. No.** 02:11:16  
9 Q. And how do you know what his 02:11:17  
10 intention is? 02:11:20  
11 **A. We can presume that the inventor 02:11:21  
12 intended to make a lens that would work.** 02:11:27  
13 Q. And the lens with respect to Table 5 02:11:29  
14 is incapable of working? 02:11:33  
15 **A. As I show in my report, it can't 02:11:35  
16 make a decent image.** 02:11:41  
17 Q. But it can make an image, right? 02:11:42  
18 **A. Not per se, no.** 02:11:45  
19 Q. It cannot -- it cannot make an 02:11:46  
20 image? 02:11:49  
21 **A. It would make this blurry mess with 02:11:49  
22 some parts of the field of view being able to 02:11:52**

1       **be resolved and most of the field of view being** 02:11:54  
2       **unusable.** 02:11:58

3           Q.     So it's just not a -- it's not a 02:12:00  
4       great lens is what you're saying? 02:12:01

5           A.     **It's not what Tada would have** 02:12:03  
6       **intended since Tada was trying to describe** 02:12:05  
7       **working lenses that actually had meaningful** 02:12:08  
8       **fields of view and good image quality. And he** 02:12:10  
9       **specifically balances things like astigmatism** 02:12:13  
10       **and distortion versus the manufacturing costs.** 02:12:16

11           So, yeah, it's -- it's quite clear 02:12:20  
12       that the lens shown in my picture under 02:12:22  
13       paragraph 57, that's -- that is not a useful 02:12:28  
14       lens. 02:12:31

15           Q.     Are there physical lenses in a 02:12:33  
16       patent, or are they just words on a piece of 02:12:36  
17       paper? 02:12:38

18           A.     **I'm sorry. It is not -- it is not a** 02:12:39  
19       **schematic of a useful lens.** 02:12:42

20           Q.     Okay. So can you point me to where 02:12:44  
21       in Mr. Tada's invention, in his -- in his 02:12:50  
22       patent he says that? 02:12:56



1           **A.**     **He says what, that the lens should**     02:13:00  
2     **work?**   02:13:02

3           **Q.**     **That he says that the lens of**             02:13:03  
4     **Figure 5 is not a useful lens.**                             02:13:05

5           **A.**     **The lens -- the lens -- the lens**             02:13:08  
6     **that he intended as his embodiment No. 3 is a**             02:13:12  
7     **perfectly useful lens, but there was a**                     02:13:14  
8     **typographical error in his American patent.**             02:13:17  
9     **Thankfully it wasn't also in the Japanese**                 02:13:20  
10    **priority patent. So we were able to**                         02:13:25  
11    **reconstruct Embodiment 3.**                                     02:13:28

12                    **My point here is just that that's**             02:13:29  
13    **not what Dr. Chipman was doing. Dr. Chipman**             02:13:30  
14    **made his own lens because of a typographical**             02:13:32  
15    **error that had nothing to do with the**                     02:13:34  
16    **embodiment of Tada.**   02:13:36

17           **Q.**     **So Mr. Tada never says that he**             02:13:37  
18    **has -- that his lens described in Table 5 is an**             02:13:43  
19    **unsuitable lens, does he?**                                     02:13:47

20           **A.**     **Again, Table 5 has a typographical**             02:13:49  
21    **error. Tada would not have intended a**                     02:13:53  
22    **typographical error, don't you think?**                     02:13:55

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1 Q. I don't know. I've never spoken to 02:13:58

2 Mr. Tada. 02:13:59

3 Your thought is that -- your opinion 02:14:01

4 is that Tada would not have created the lens in 02:14:04

5 Table 5; is that correct? 02:14:08

6 A. I don't think anyone deliberately 02:14:11

7 puts in typographical errors, no. 02:14:13

8 Q. And how did you discover this 02:14:15

9 purported typographical error? 02:14:21

10 A. Well, I describe my methodology in 02:14:23

11 great detail in my report. I took a series of 02:14:25

12 steps. 02:14:30

13 First, my first effort was simply to 02:14:30

14 recreate Dr. Chipman's work but do it in Zemax, 02:14:33

15 because that's the program that I use. So I 02:14:37

16 didn't have his Code V model to convert, so I 02:14:38

17 basically had to follow his methodology and 02:14:42

18 recreate it. 02:14:44

19 And so I did what he said. I did 02:14:45

20 exactly what he described in his report and 02:14:47

21 took the information in Table 5 and typed it 02:14:50

22 all in and got the lens that's shown on page 29 02:14:53

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1 of 94. 02:15:00

2 Q. Uh-huh. 02:15:03

3 A. And I could see right away that it 02:15:03

4 didn't look right. And the easiest way to see 02:15:05

5 that it didn't look right is I could zoom into 02:15:08

6 the area near the sensor and see that it wasn't 02:15:11

7 making a proper image. It couldn't be right. 02:15:15

8 Q. Because you zoomed in on your model 02:15:20

9 or on the diagram in the patent? 02:15:23

10 A. No. The model that I had created 02:15:26

11 based on Table 5 following Dr. Chipman. 02:15:28

12 Assuming I did exactly what Dr. Chipman did, 02:15:32

13 which he was fairly explicit about what he did. 02:15:35

14 So I just followed him exactly, and 02:15:37

15 what I got was a lens that couldn't have 02:15:40

16 worked. And so it could not have been the 02:15:42

17 intent of Tada. 02:15:46

18 Q. I'm not understanding what you're 02:15:47

19 saying, what you mean by "couldn't have 02:15:48

20 worked"? Light couldn't pass through the lens? 02:15:50

21 A. It couldn't make an image. That's 02:15:52

22 the primary job of a lens, right? 02:15:53

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1 Q. It couldn't make any image? 02:15:56

2 A. Like I said, it couldn't make a 02:15:57

3 usable image. It would have some -- I don't 02:15:59

4 actually know. I haven't built the lens. I 02:16:01

5 didn't analyze it in detail. 02:16:03

6 But it was so clearly wrong, there 02:16:05

7 was no point in spending more time on it. I 02:16:07

8 wanted to understand how this lens could be so 02:16:09

9 wrong and be in the patent. It just didn't 02:16:13

10 make sense to me. 02:16:15

11 Q. And how long did it take you to 02:16:16

12 figure that out? 02:16:18

13 A. It took me a few hours. 02:16:19

14 Q. Like, five hours? 02:16:21

15 A. Probably three, I would say. 02:16:22

16 Q. And then that was the end of your 02:16:25

17 analysis? 02:16:27

18 A. No, not at all. So the first thing 02:16:28

19 I did is I recognized that there had to be 02:16:32

20 something wrong with the aspheric coefficients. 02:16:37

21 This is almost always where problems occur. 02:16:40

22 It is possible that I had made a -- 02:16:44

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1 an incorrect lens, like, maybe I typed in an 02:16:48  
2 index wrong or I typed in a radius wrong, but 02:16:52  
3 almost always it's the aspheric coefficients 02:16:55  
4 that you get wrong. 02:16:58

5 So I carefully checked and made sure 02:16:59  
6 that I had typed in the values that were in 02:17:01  
7 Table 5. I verified all the radiuses, all the 02:17:03  
8 spacings. 02:17:06

9 So the first thing I did was assume 02:17:07  
10 I had made a mistake and checked my work 02:17:09  
11 carefully. And once I proved to myself that I 02:17:11  
12 had typed everything in correctly, I noticed 02:17:14  
13 that the shape of the aspheric lens in my 02:17:17  
14 schematic did not look like Tada's. 02:17:23

15 Q. Uh-huh. 02:17:26

16 A. I show that in my figures on page 30 02:17:26  
17 of 94. So I -- so let me back up. 02:17:29

18 So the first thing I did is I zoomed 02:17:34  
19 in on the backend and saw that it wasn't making 02:17:36  
20 an image. I then ran some typical optical 02:17:38  
21 design analysis, OPDs, field curvature 02:17:42  
22 distortion, just to -- just a general suite of 02:17:47

1 standard operations that we do when we're 02:17:51

2 designing a lens. 02:17:52

3 Q. Uh-huh. 02:17:53

4 A. And it was -- it was terrible. It 02:17:54

5 was just not working very well. So -- so then 02:17:56

6 I tried to debug what I had done wrong. First 02:17:59

7 I thought maybe I typed something in wrong. 02:18:02

8 Then I noticed that this aspheric shape was 02:18:04

9 different. 02:18:08

10 And so I thought, okay, well, maybe 02:18:08

11 there's a typo on the -- on the aspherics, or 02:18:11

12 maybe Tada is not very good. So the next thing 02:18:16

13 I actually did was I actually went back and 02:18:19

14 modeled Embodiment 1 and Embodiment 2, and they 02:18:21

15 worked fine. 02:18:24

16 Then I noticed that when I was 02:18:25

17 typing in Embodiment 2 from Table 3, the 02:18:27

18 aspheric coefficients were exactly the same as 02:18:30

19 in Table 5, and that's never true. That could 02:18:33

20 not be right. So then I knew that the aspheric 02:18:36

21 shape had to be wrong. 02:18:41

22 And fortunately we had some things 02:18:43

1 to use here. One is there's a sag table in 02:18:44  
2 Table 6. So I could verify that the shape of 02:18:48  
3 the surface was not what Tada intended as an 02:18:51  
4 Embodiment 3. That's shown in paragraph 62. 02:18:54  
5 And you can see the dots represent 02:18:58  
6 the points on the sag table. And the line 02:18:59  
7 indicates the shape of the actual surface based 02:19:03  
8 on the aspheric coefficients in Table 5. 02:19:06  
9 And then I remembered that there 02:19:09  
10 were all these other equations in Tada. So 02:19:11  
11 there were other ways to check on what the 02:19:13  
12 aspheric coefficients could be. 02:19:16  
13 Q. Uh-huh. 02:19:18  
14 A. And sure enough, they didn't match 02:19:19  
15 the numbers in Table 5. But I -- when I typed 02:19:21  
16 in the values that I got from the sag table, 02:19:25  
17 when I typed in the values that I got from -- 02:19:29  
18 sorry, from Table 9 -- I actually got much 02:19:32  
19 closer to the aspheric shape described in the 02:19:34  
20 sag table. 02:19:37  
21 Unfortunately, Tada didn't include a 02:19:38  
22 constraint on his A10 term, so that I had to 02:19:42

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1 optimize to find. But I just entered the 27 02:19:45  
2 points on the sag table into the optimizer, 02:19:50  
3 theoried the A10 term, and bam, dropped right 02:19:54  
4 in. 02:19:57

5 Q. And at that point you were convinced 02:19:58  
6 that there was an error in the patent? 02:20:00

7 A. Well, it was clear there was an 02:20:01  
8 error in the patent as soon as I looked at the 02:20:03  
9 sag table. And then it's confirmed when you 02:20:05  
10 look at Table 9. 02:20:08

11 Because the focal length is 1, 02:20:09  
12 Table 9 rather conveniently gives you the 02:20:12  
13 aspheric coefficients for each of the four 02:20:15  
14 embodiments, and it matches correctly for 1, 2 02:20:18  
15 and 4 and is totally wrong for 3. 02:20:20

16 Q. So you could just look at the sag 02:20:22  
17 tables? You don't need to plug those into 02:20:24  
18 Zemax? 02:20:27

19 A. I actually just looked at the bottom 02:20:27  
20 term in the sag table and then looked at my sag 02:20:29  
21 table, basically compared the sag table from 02:20:34  
22 Zemax to the sag table in Tada and just looked 02:20:37



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1 at the bottom number, and it was so radically 02:20:40  
2 off that it was obvious. 02:20:42

3 Q. And how long did all of this take 02:20:43  
4 you? 02:20:46

5 A. Like I said, a few hours. 02:20:46

6 Q. So all of this was just three hours? 02:20:48

7 A. No. I would say -- I had figured 02:20:51  
8 out that something was wrong probably within 02:20:53  
9 two to three hours. Then modeling the other 02:20:58  
10 embodiments, that took time. And then 02:21:00  
11 continuing to try to understand how to recreate 02:21:04  
12 the surface, that took more time. 02:21:07

13 Q. Uh-huh. 02:21:09

14 A. It wasn't until the -- 02:21:10

15 Q. I'm not -- how much time in total do 02:21:11  
16 you think you spent -- 02:21:14

17 (Audio technical difficulties; 11:10:06  
18 stenographer asks for 11:10:06  
19 clarification.) 11:10:06

20 BY MR. BREGMAN: 02:21:25

21 Q. I said how much time overall did it 02:21:25  
22 take you to figure out the purported error? 02:21:27

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1           **A.**     And it was how many hours total did   02:21:31  
2           I spend creating the correct Embodiment 3       02:21:50  
3           model? Probably about 10 hours, maybe 12.       02:21:56  
4           **Q.**     And whose idea was it to look at the   02:22:00  
5           Japanese priority application?                   02:22:05  
6           **A.**     I asked the attorneys to get me the   02:22:09  
7           Japanese patent.                               02:22:11  
8           **Q.**     And you can read Japanese?           02:22:12  
9           **A.**     I can read numbers.                   02:22:14  
10          **Q.**     And you knew which table was which?   02:22:16  
11          **A.**     It's pretty obvious. I have -- I       02:22:18  
12          have that printed out here. But you can see   02:22:24  
13          the tables themselves are all exactly the same   02:22:27  
14          as the tables in the American patent with one   02:22:29  
15          very big difference.                         02:22:33  
16          **Q.**     And did you have that translated       02:22:34  
17          into English?                                 02:22:36  
18          **A.**     I did not. I think the attorneys       02:22:37  
19          did, though.                                   02:22:38  
20          **Q.**     Did you read the translated copy?       02:22:40  
21          **A.**     I don't remember. I remember           02:22:42  
22          looking at the Japanese version, and that's    02:22:44

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1 where I pulled the numbers from. But I don't 02:22:47  
2 recall if I -- I think I did read the 02:22:49  
3 translated version as well. 02:22:51  
4 Q. Let's look at your -- top of page 30 02:22:52  
5 of 94. You may want to read the entire 02:23:02  
6 sentence that starts on the previous page -- 02:23:06  
7 A. Okay. 02:23:09  
8 Q. -- and then I'll ask you my 02:23:09  
9 question. 02:23:11  
10 A. Sure. Just give me a moment. 02:23:11  
11 (Pause in testimony.) 02:23:28  
12 A. Yes, I see it. 02:23:28  
13 Q. You say you wanted to confirm that 02:23:29  
14 there was no gross difference between the 02:23:31  
15 target design and the model, right? 02:23:33  
16 A. Correct. 02:23:35  
17 Q. Why did you have the word "gross" in 02:23:36  
18 there? Why were they any different? 02:23:39  
19 A. If the radius of curvature of a lens 02:23:45  
20 is, say, 1.011, and what I typed in was 1.101, 02:23:47  
21 I might not be able to see that. It's such a 02:23:53  
22 subtle difference that I probably wouldn't be 02:23:56

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1 able to see it in the layout or the schematic. 02:23:57

2 But if the radius were 11 and I 02:23:59

3 typed in 1, that would create a gross error 02:24:03

4 that would be obvious. I should be able to see 02:24:06

5 that in the layout. 02:24:08

6 So the first thing you do is you 02:24:09

7 look at the 2D layout of the lens and see, you 02:24:11

8 know, does it look right? I think that might 02:24:14

9 be Kingslake's first law, but I don't remember. 02:24:19

10 Q. And by how much did you have to blow 02:24:21

11 up these figures to see the purported 02:24:26

12 differences in shape? 02:24:30

13 A. Well, the Zemax allows you to just 02:24:31

14 zoom in arbitrarily. So I just zoomed into 02:24:33

15 the -- starting at the detector where I could 02:24:36

16 see the massive error. And then moving my 02:24:38

17 cursor back across the screen in kind of a pan, 02:24:41

18 looking at the top edge of the lenses. 02:24:47

19 Q. I'm sorry. I'm looking at the 02:24:49

20 figures above paragraph 59. 02:24:50

21 A. Yeah. 02:24:52

22 Q. Neither of those are Zemax, right? 02:24:52

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1	<b>A. No.</b>	02:24:55
2	Q. One is a lens, and the other is	02:24:55
3	Figure 11 from the patent. So how much -- how	02:24:57
4	much did you need to blow these up so that you	02:24:59
5	could see the purported error?	02:25:02
6	<b>A. My apologies. This may be unclear.</b>	02:25:04
7	<b>When I called the left-hand picture</b>	02:25:07
8	<b>Dr. Chipman's lens, I meant that was my model</b>	02:25:10
9	<b>of the Table 5 only embodiment. So I was</b>	02:25:12
10	<b>recreating Dr. Chipman's lens, but that is</b>	02:25:18
11	<b>actually a Zemax picture.</b>	02:25:20
12	Q. I see.	02:25:22
13	So by how much did you need to blow	02:25:23
14	up your reproduction of the lens and Figure 11	02:25:25
15	from the Tada patent to see the purported error	02:25:32
16	in the shape of the lenses?	02:25:36
17	<b>A. You could notice it pretty well just</b>	02:25:38
18	<b>without any magnification at all. But zooming</b>	02:25:42
19	<b>in allowed you to really see the differences.</b>	02:25:46
20	Q. And we know that Figure 11 of Tada	02:25:48
21	is a schematic, right?	02:25:52
22	<b>A. Well, that is an aspheric shape. So</b>	02:25:59

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1 the fact that the surface is, in fact, aspheric 02:26:02  
2 whereas the others are sort of spherical kind 02:26:05  
3 of tells you that they did what I would have 02:26:07  
4 done which is to export the figure directly 02:26:09  
5 from an optical design program. 02:26:11  
6 Q. So is it your belief that the 02:26:13  
7 Figure 11 of Tada is drawn to scale? 02:26:19  
8 A. It doesn't need to be as long as it 02:26:25  
9 has reasonable representations of the lenses. 02:26:28  
10 And this was not -- this was simply an example. 02:26:31  
11 I wanted to explain how I got there, but this 02:26:34  
12 would not be convincing to me if I didn't do 02:26:38  
13 further analysis. 02:26:40  
14 Q. Okay. Paragraph 59, second sentence 02:26:42  
15 says, "Surface 2 of the lens too is also 02:26:47  
16 different, but is less obviously wrong," 02:26:51  
17 period. 02:26:55  
18 Do you see that? 02:26:56  
19 A. Uh-huh. That's correct. 02:26:56  
20 Q. Okay. Can you tell me where you 02:26:58  
21 describe what is wrong with surface 2 of 02:26:59  
22 lens 2? 02:27:06

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1           A.     Yeah.  You can actually see from           02:27:07  
2           this image.  I tried to scale them exactly the       02:27:08  
3           same, and you can see that the radius of           02:27:11  
4           curvature of Surface 2 is too steep compared to   02:27:13  
5           Tada's Figure 11.                                   02:27:17

6           Q.     Is that described in your               02:27:18  
7           declaration?                                       02:27:20

8           A.     I -- I think only in that one line       02:27:20  
9           where it's -- I think it's -- it would be           02:27:27  
10          obvious to someone skilled in the art that it    02:27:30  
11          was also wrong.  But it's less obvious.  The     02:27:32  
12          front asphere is really quite distinct, because   02:27:34  
13          we have the first lens and the second lens       02:27:38  
14          coming so close together.                        02:27:40

15                   I have to correct myself.  When I       02:27:46  
16          say Dr. Chipman's lens in this figure, it is,     02:27:48  
17          in fact, Dr. Chipman's schematic.  That is not   02:27:52  
18          my recreation.  But they look exactly the same.   02:27:54

19          Q.     Hold on a minute.  So you're            02:27:58  
20          comparing Dr. Chipman's schematic with --        02:28:01

21                   (Simultaneous unreportable            02:28:11  
22                   cross-talk occurs among parties.)       02:28:11

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1 (Stenographer requests one speaker 02:28:11  
2 at a time.) 02:28:11  
3 BY MR. BREGMAN: 02:28:11  
4 Q. So I said you were actually 02:28:11  
5 comparing Dr. Chipman's schematic with 02:28:13  
6 Figure 11 from Tada; is that correct? 02:28:17  
7 **A. That is correct. I misspoke 02:28:19  
8 earlier. 02:28:21**  
9 Q. Where is the lens that you created 02:28:22  
10 or tried to reproduce of Dr. Chipman's lens? 02:28:28  
11 Do you have that anywhere in here? 02:28:33  
12 **A. Not zoomed in like that, but it is, 02:28:34  
13 in fact, the previous page. And you can see it 02:28:37  
14 right there. To one skilled in the art, that's 02:28:45  
15 obvious. 02:28:48**  
16 I mean, I'm looking at the two 02:28:51  
17 figures side by side right now, Figure 11 and 02:28:53  
18 my version of Chipman's lens, and you can -- 02:28:56  
19 you can see clearly that aspheric surface is 02:28:59  
20 wrong. Has to be. 02:29:03  
21 Q. Let's go to paragraph 60 on page 31 02:29:05  
22 of 94. It's one, two, three, four, five, six, 02:29:13



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1 seven -- eight lines from the bottom. Just to 02:29:19  
2 find it easy, you'll see 19 in the very 02:29:22  
3 left-hand -- 02:29:24  
4 **A. Yes. I have it.** 02:29:25  
5 Q. -- and just the sentence after that. 02:29:26  
6 It says, "In addition, the sign of each term is 02:29:29  
7 important and is easy to get incorrect." 02:29:34  
8 Do you see that? 02:29:38  
9 **A. Yes, I do.** 02:29:38  
10 Q. Did Dr. Chipman get the sign 02:29:39  
11 incorrect in any of his calculations? 02:29:43  
12 **A. No. He simply typed in the wrong** 02:29:45  
13 **number.** 02:29:47  
14 Q. He typed in the number from the -- 02:29:47  
15 from Tada? 02:29:50  
16 **A. He typed in the incorrect typo, yes.** 02:29:51  
17 Q. He used the numbers in Tada, right? 02:29:54  
18 **A. The reason I mention this was this** 02:29:57  
19 **is the explanation for why we always look at** 02:29:59  
20 **the sag table. It is -- it is really easy to** 02:30:02  
21 **get a sign error in the aspheric coefficients.** 02:30:06  
22 **It's easy to get typos in the aspheric** 02:30:10

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1       mechanical model or whatever, people who are       02:30:55  
2       using that information need to be able to check       02:30:58  
3       to make sure the aspheric coefficients are       02:31:01  
4       correct. So you always provide a sag table       02:31:04  
5       with an asphere.       02:31:06  
6             Q.       And if you didn't provide a sag       02:31:07  
7       table, it wouldn't be a reliable way of       02:31:09  
8       making -- or understanding a lens -- right? --       02:31:13  
9       to make sure the lens is correct?       02:31:16  
10            MR. MURRAY:   Objection to form.       02:31:18  
11            THE WITNESS:   I should never say       02:31:18  
12       things like -- sorry, Steve. Go ahead.       02:31:19  
13            MR. MURRAY:   Go ahead. Just slow       02:31:22  
14       down -- mostly for Jessica's benefit, but       02:31:24  
15       also so I can make an objection.       02:31:26  
16            THE WITNESS:   My apologies. I get       02:31:29  
17       so excited about the optical design stuff.       02:31:31  
18            So, okay. So what was the question       02:31:34  
19       again? I think it was always --       02:31:36  
20       BY MR. BREGMAN:       02:31:39  
21             Q.       If you were to build or reproduce a       02:31:41  
22       lens accurately, you would need a sag table,       02:31:45

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1 right? 02:31:48

2 MR. MURRAY: Objection to form. 02:31:48

3 THE WITNESS: Well, once again, when 02:31:48

4 I make lenses, lens designs, when I design 02:31:50

5 lenses and I report their characteristics 02:31:54

6 including the surface prescriptions and so 02:31:57

7 forth, I always provide a sag table if 02:32:00

8 there are any aspheres in the design. 02:32:02

9 Now, it's not actually required, but 02:32:05

10 it's just a really good safety check. 02:32:09

11 BY MR. BREGMAN: 02:32:13

12 Q. Okay. So if you didn't have a sag 02:32:13

13 table -- let me rephrase that. 02:32:16

14 So you -- you're really using the 02:32:20

15 sag table as a safety check? That's the -- 02:32:24

16 that's the purpose of the sag table? 02:32:26

17 **A. Yes.** 02:32:28

18 Q. Did Dr. Chipman incorrectly type in 02:32:34

19 any of the values from Table 5, as far as you 02:32:37

20 can tell, into Code V? 02:32:40

21 **A. As far as I can tell, the only** 02:32:42

22 **mistake that Dr. Chipman made in terms of the** 02:32:46

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1 data entry was using the wrong aspheric 02:32:51  
2 coefficients. 02:32:56

3 Q. So that's not an error in data 02:32:57  
4 entry, right? That's an error, you are saying, 02:32:59  
5 in the patent. 02:33:01

6 I'm asking, was there any errors in 02:33:02  
7 data entry that Dr. Chipman made with respect 02:33:05  
8 to using Table 5 in his analysis? 02:33:07

9 A. There may have been, but I -- I 02:33:14  
10 think I observed all of the places where 02:33:17  
11 Dr. Chipman and I did things differently in my 02:33:19  
12 declaration. 02:33:23

13 So I -- I took it at face value that 02:33:23  
14 he made reasonable assumptions when he was 02:33:26  
15 entering his data. I had no reason to question 02:33:29  
16 that. And that I didn't see any other obvious 02:33:31  
17 deviations in terms of the schematics. 02:33:35

18 Unfortunately, Dr. Chipman didn't 02:33:39  
19 include his optical analysis, which -- which 02:33:40  
20 would have been informative, because as I show 02:33:44  
21 in my report, it would have -- it would have 02:33:48  
22 clued him in that there was an error. 02:33:52

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1 Q. Let's turn to the table that you 02:33:54  
2 include on the top of page 32 of 94. 02:34:04  
3 **A. I'm there.** 02:34:10  
4 Q. And what is this table? 02:34:11  
5 **A. That's a sag table. I just wanted** 02:34:15  
6 **to include it as an example.** 02:34:17  
7 Q. This is a sag table that relates to 02:34:19  
8 Embodiment 3 of Tada? 02:34:23  
9 **A. I don't recall. Standard sag table** 02:34:25  
10 **produced by Zemax through the command analysis** 02:34:31  
11 **surface sag table. It is the sag table of the** 02:34:34  
12 **first surface of lens 2 using the incorrect** 02:34:36  
13 **aspheric coefficients.** 02:34:40  
14 Q. So this is a sag table for some of 02:34:44  
15 the lenses in Embodiment 3 of Tada? 02:34:47  
16 **A. For the very specific lens of** 02:34:49  
17 **surface -- surface 1 of lens 2 of Embodiment 3** 02:34:52  
18 **with the incorrect aspheric coefficients.** 02:34:58  
19 Q. Now, a couple of lines down I see a 02:35:01  
20 file name, title, dates, units in millimeters, 02:35:11  
21 slope units, et cetera. Then I see algorithm 02:35:16  
22 assumes positive Z goes from -- 02:35:18



1 convention. Glass is -- is sort of a generic 02:36:16  
2 term in this case for high index to low index 02:36:20  
3 material. 02:36:23

4 So it's going from the air, which is 02:36:24  
5 represented in Zemax as a space, to the glass, 02:36:27  
6 which in this case may or may not be glass. In 02:36:31  
7 fact, it's PMMA, I'm pretty sure, but Tada 02:36:34  
8 doesn't say. 02:36:38

9 And so it is -- a better way to read 02:36:39  
10 that is plus Z goes from air to inside the 02:36:42  
11 material, but that's cumbersome. So we just 02:36:46  
12 use the shorthand term "glass." 02:36:49

13 Q. And what is the best foot sphere 02:36:52  
14 radius? 02:36:59

15 A. That is the -- it's just what it 02:36:59  
16 sounds like. It's the -- it takes this 02:37:01  
17 aspheric shape and fits it to a sphere 02:37:03  
18 mathematically, gets the best fit shape, and 02:37:08  
19 then subtracts that to generate the sag 02:37:11  
20 deviations. 02:37:13

21 Q. And all these numbers in the table 02:37:14  
22 are -- these are the mechanical points on a 02:37:19



1 lens, or mechanical characteristics? 02:37:21

2 A. The left-hand column is the Y 02:37:23

3 coordinates, so that's the distance above the 02:37:30

4 optical axis. 02:37:32

5 Q. Uh-huh. 02:37:33

6 A. In Tada, he doesn't tell us what his 02:37:33

7 actual focal length or scale is. So I've 02:37:38

8 assumed millimeters, so these are all in 02:37:41

9 millimeters, but the lens scales regardless. 02:37:44

10 The focal length is 1, so you can scale it to 02:37:47

11 centimeters or inches or whatever you want to 02:37:50

12 do. 02:37:51

13 But in my model, I left the scale as 02:37:52

14 millimeters. So these are in millimeters from 02:37:54

15 the optical axis -- that's the top number -- to 02:37:56

16 the edge of the lens, which is 2.7 mms above 02:37:59

17 the optical axis. 02:38:03

18 Q. Uh-huh. 02:38:04

19 A. The next column is the sag or 02:38:04

20 distance for that surface from a plane which is 02:38:07

21 perpendicular to the optical axis at the 02:38:14

22 vertex. 02:38:17

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1                   And then it does this best fit                   02:38:20

2       sphere calculation.   The next column is the sag       02:38:22

3       of the best fit sphere.   And then deviation is       02:38:26

4       the difference between those two numbers.   And       02:38:29

5       the rest probably isn't that important for us.       02:38:34

6       It's just another deviation.                   02:38:37

7           Q.       So none of these relate to                   02:38:38

8       wavelength?   This is all just the shape of the       02:38:40

9       lens?   02:38:43

10           A.       This is all just the shape of the       02:38:43

11       lens; that's right.                                   02:38:45

12                   MR. BREGMAN:   Why don't we take a                   02:38:46

13       break now seeing that we got a call in a           02:38:47

14       couple of minutes, and then we will resume.       02:38:50

15                   THE WITNESS:   Okay.                                   02:38:53

16                   (Whereupon, a recess was taken at                   02:38:57

17                   2:38 p.m.)   02:38:57

18                   (The following portion of the record               02:38:57

19                   is the phone call with the judge.                   02:38:57

20                   Witness was not present.)                           02:47:01

21                   JUDGE DERRICK:   This is Judge Derek.               02:47:01

22                   With me on the line is Judges Kalan and             02:47:03

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1 McGraw. We are here in a conference call 02:47:06  
2 in cases IPR 2020-00179 and 00195. 02:47:08  
3 Before we get started, I'd ask that 02:47:15  
4 counsel for Petitioner, LG Electronics, 02:47:17  
5 identify themselves. 02:47:20  
6 MR. BREGMAN: Sure. This is Dion 02:47:23  
7 Bregman, Your Honors. I'm not sure if Brad 02:47:25  
8 Cangro and Collin Park are on as well. 02:47:28  
9 MR. PARK: This is Collin Park. I'm 02:47:32  
10 on as well. 02:47:34  
11 MR. CANGRO: And this is Brad. 02:47:35  
12 JUDGE DERRICK: Thank you. Welcome. 02:47:36  
13 And who do we have on the line for 02:47:37  
14 Patent Owner Immervision? 02:47:40  
15 MR. MURRAY: Good afternoon, Your 02:47:42  
16 Honor. Stephen Murray on behalf of 02:47:43  
17 Immervision. And with me is also John 02:47:45  
18 Simmons. 02:47:47  
19 JUDGE DERRICK: Okay. Thank you. 02:47:51  
20 And also I assume we have a court reporter 02:47:53  
21 on the line? 02:47:55  
22 THE STENOGRAPHER: Yes, I am here. 02:47:57

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1 JUDGE DERRICK: Okay. I think I 02:48:01  
2 hear someone there. 02:48:03  
3 So we understand the parties have a 02:48:04  
4 dispute regarding instructions to a witness 02:48:07  
5 during a deposition, in particular, not to 02:48:09  
6 answer certain questions. 02:48:11  
7 Mr. Bregman, I believe this regards 02:48:17  
8 your deposition. 02:48:19  
9 MR. BREGMAN: Yes, yes. Do you want 02:48:23  
10 me to jump in and give you a little bit of 02:48:25  
11 the background? 02:48:28  
12 JUDGE DERRICK: Yes. So if you 02:48:28  
13 could please describe briefly what the 02:48:31  
14 problem is here, and then after that I will 02:48:32  
15 want to have counsel for Patent Owner 02:48:34  
16 probably -- I guess it's Mr. Murray -- to 02:48:37  
17 step in and prescribe -- or set forth their 02:48:39  
18 input in this as well. 02:48:42  
19 MR. MURRAY: All right. I'll start. 02:48:45  
20 So we are about -- now about two and 02:48:48  
21 a half hours into a deposition of patent 02:48:51  
22 owner's expert who has provided a 94-page 02:48:54

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1 declaration on the patent and the prior 02:48:59  
2 art. 02:49:03  
3 I had asked him the following 02:49:03  
4 question: Can you walk me through the 02:49:05  
5 steps of how you would recreate the 02:49:08  
6 invention embodied in Claims 5 and 21? 02:49:11  
7 Those are claims that he's provided 02:49:14  
8 opinions on. And Mr. Murray instructed him 02:49:16  
9 not to answer that question as being beyond 02:49:20  
10 the scope of his declaration. 02:49:24  
11 I, of course, disagree. Mr. Aiken 02:49:25  
12 has discussed at least the types of 02:49:29  
13 information that is required in reproducing 02:49:31  
14 a lens in the prior art, and I think it's 02:49:33  
15 only fair for me to understand what kind of 02:49:35  
16 information is described at that same level 02:49:39  
17 that they are saying is required in the 02:49:42  
18 prior art, what is described in the patent. 02:49:44  
19 And that is as simple as that, Your Honor. 02:49:48  
20 JUDGE DERRICK: Okay. Thank you. 02:49:51  
21 Mr. Murray, could you please explain 02:49:54  
22 why you think that the witness should not 02:49:58

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1 answer this question? 02:50:01

2 MR. MURRAY: Yes, Your Honor. Thank 02:50:02

3 you. 02:50:05

4 So this was a sequence of questions 02:50:05

5 which culminated in just prior to the 02:50:09

6 question that Mr. Bregman read for you. He 02:50:11

7 asked, "Could I pick up the patent if I was 02:50:15

8 a person of skill in the art at the 02:50:18

9 relevant time period, read Claim 5, read 02:50:21

10 Claim 21 and build a lens per the 02:50:23

11 description in this patent?" 02:50:25

12 And then, of course, the follow-up 02:50:26

13 which Mr. Bregman read. 02:50:28

14 This -- Mr. Aikens, who is our 02:50:29

15 expert, provided a declaration which was 02:50:33

16 rebutting the opinions of Petitioner's 02:50:35

17 expert as to obviousness, and this line of 02:50:39

18 questioning is clearly an attempt to get 02:50:43

19 into an enablement defense being asserted 02:50:45

20 by LG in a parallel district court 02:50:48

21 litigation which is currently stayed 02:50:51

22 pending this IPR. 02:50:54

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1                   And because Mr. Aikens' declaration   02:50:55  
2                   doesn't get into whether or not the claims   02:51:00  
3                   of this patent are enabled, allowing one of   02:51:04  
4                   the ordinary skill in the art to build the   02:51:10  
5                   lenses that were described, we felt it was   02:51:11  
6                   outside of the scope, and at that point we   02:51:16  
7                   felt it was more appropriate to have the   02:51:19  
8                   board's involvement to resolve this issue.   02:51:22  
9                   MR. BREGMAN:   And, Your Honors, if I   02:51:26  
10                   could have just a very short rebuttal on   02:51:28  
11                   that.   This has nothing to do with district   02:51:30  
12                   court.   02:51:32  
13                   Their expert has taken the position   02:51:32  
14                   that the prior art doesn't have enough   02:51:34  
15                   information in it to, and that information   02:51:35  
16                   in it is incorrect to allow a person of   02:51:39  
17                   skill in the art to understand what the   02:51:41  
18                   patent is talking about, and that there are   02:51:42  
19                   errors in the prior art.                       02:51:45  
20                   All I want to know is what sort of   02:51:46  
21                   information does the patent provide that   02:51:50  
22                   leads you to the exact same place.   Because   02:51:52

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1 the patent doesn't describe even half the 02:51:55  
2 amount of information that's in the prior 02:51:58  
3 art, and I'd like to juxtapose that. 02:52:00  
4 So I -- I don't see how that's 02:52:02  
5 anything but asking questions about the 02:52:05  
6 patent which their expert has provided an 02:52:07  
7 opinion on, and as such, it's fair game. 02:52:10  
8 MR. MURRAY: If I could just make 02:52:14  
9 one brief remark -- 02:52:16  
10 JUDGE DERRICK: Yes. 02:52:17  
11 MR. MURRAY: -- in response to that, 02:52:17  
12 Your Honor. 02:52:19  
13 Mr. Aikens has not opined that the 02:52:19  
14 prior art reference at issue lacks 02:52:24  
15 insufficient information. He has opined 02:52:28  
16 that there's an error that would have been 02:52:29  
17 obvious to one of ordinary skill in the 02:52:31  
18 art, readily apparent to one of ordinary 02:52:34  
19 skill in the art. 02:52:36  
20 So what's disclosed in one section 02:52:37  
21 of that reference is an erroneous 02:52:38  
22 embodiment, and Mr. Aikens has explained 02:52:41



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1           how that could be found and fixed. He has 02:52:46  
2           not opined that there's not enough 02:52:49  
3           information in Tada to build the lens. 02:52:51  
4                    JUDGE DERRICK: So but -- so just to 02:52:56  
5           make sure that we understand what the 02:53:00  
6           particular fact situation here is. 02:53:04  
7                    So he's being asked to opine -- go 02:53:06  
8           through and explain the steps that would be 02:53:10  
9           necessary to make the invention as set 02:53:13  
10          forth in Claims 5 and -- I'm not sure I 02:53:16  
11          remember the other claim. 02:53:20  
12                   MR. BREGMAN: Claim 21. 02:53:23  
13                   JUDGE DERRICK: Okay, 5 and 21? 02:53:24  
14                   MR. BREGMAN: Yeah. 02:53:28  
15                   JUDGE DERRICK: And the reason we 02:53:28  
16          got to this question was because he was 02:53:32  
17          pointing to an error in the prior art, and 02:53:35  
18          he indicated that what? That would have 02:53:40  
19          been apparent or not apparent to one of 02:53:45  
20          ordinary skill in the art at the time of 02:53:48  
21          the invention, what that error was? 02:53:51  
22                   MR. MURRAY: Right. So the claims 02:53:53

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1           require some characteristics of a lens,           02:53:55  
2           which is a lens in like a cell phone           02:53:58  
3           camera, for example.           02:54:01  
4                    JUDGE DERRICK: Right.           02:54:01  
5                    MR. MURRAY: Or any digital camera.   02:54:01  
6           So there's some inherent characteristics of   02:54:03  
7           the lens. And to get to those inherent       02:54:06  
8           characteristics, both sides have said that   02:54:08  
9           you need some -- some information to get     02:54:10  
10          there.           02:54:13  
11                   Prior art teaches some information.   02:54:13  
12          Patent owners have taken the position that   02:54:16  
13          that information is wrong. They said you     02:54:18  
14          got to look at all this other information,   02:54:20  
15          you got to go look at a priority, prior art   02:54:22  
16          Japanese application to try and figure out   02:54:26  
17          where these errors are, and it's not enough   02:54:28  
18          information.           02:54:30  
19                   All we're asking is how much           02:54:31  
20          information is described in the patent that   02:54:33  
21          would allow someone to determine these       02:54:35  
22          exact same characteristics. And I'd           02:54:37

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1 like -- I'd like the witness to point out 02:54:39

2 where in the patent that information is. 02:54:41

3 So I'm just asking questions about 02:54:44

4 the patent. I'm not reading the patent at 02:54:45

5 all. I'm asking about what's in the four 02:54:48

6 corners of the document of the patent. 02:54:51

7 JUDGE DERRICK: Mr. Murray, do you 02:54:54

8 have anything to add? We're going to take 02:54:55

9 a brief break here, but do you have 02:54:57

10 anything to add before we do that? 02:55:00

11 MR. MURRAY: So just to clarify the 02:55:01

12 issue, the prior art reference that we're 02:55:03

13 discussing has multiple tables of 02:55:05

14 information, and their expert, in his 02:55:08

15 declaration, testified that he took the 02:55:12

16 information from one of those tables, 02:55:16

17 entered it into a computer and built a 02:55:19

18 model of a lens. 02:55:22

19 We are not -- our expert has not 02:55:23

20 opined that there was anything wrong with 02:55:26

21 that process, per se. The problem is that 02:55:28

22 there is a typographical error in the data 02:55:32



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1	MR. BREGMAN: Thanks.	02:56:46
2	(Pause in testimony.)	02:56:48
3	JUDGE DERRICK: Okay. Thank you for	03:09:55
4	waiting. Is counsel for Petitioner and	03:09:57
5	Patent Owner still on the line?	03:09:59
6	MR. BREGMAN: Yes, I'm on for	03:10:02
7	Petitioner.	03:10:04
8	MR. MURRAY: Yes, Your Honor.	03:10:04
9	JUDGE DERRICK: Thank you.	03:10:06
10	So we have conferred. And the	03:10:07
11	witness needs to answer a question	03:10:14
12	according to the trial -- the Consolidated	03:10:18
13	Trial Practice Guide and the guidelines for	03:10:22
14	testimony, in particular, Item 4 of those	03:10:24
15	guidelines; that counsel may instruct a	03:10:30
16	witness not to answer only when it's	03:10:34
17	necessary to preserve a privilege, to	03:10:37
18	enforce a limitation ordered by the board,	03:10:38
19	or present a motion to terminate or limit	03:10:41
20	the testimony here.	03:10:44
21	And then Item 9, a motion to	03:10:48
22	terminate or limit testimony is only on the	03:10:52

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1 ground that it's being conducted in bad 03:10:57  
2 faith or in a manner that unreasonably 03:10:58  
3 annoys, embarrasses, or oppresses a witness 03:11:01  
4 or a party. 03:11:04

5 Here on what we've heard, we don't 03:11:05  
6 see that it rises to that level, although 03:11:08  
7 we would emphasize that the scope of 03:11:11  
8 cross-examination is, in fact, limited to 03:11:18  
9 the direct testimony. 03:11:20

10 And so to the extent this reasonably 03:11:22  
11 is limited to the direct testimony, we do 03:11:28  
12 not see that it is improper, and as such, 03:11:31  
13 the witness should answer the question -- 03:11:39  
14 the question. 03:11:43

15 Does anybody need some clarification 03:11:44  
16 on that, or is that sufficiently clear? 03:11:48

17 MR. MURRAY: This is -- sorry. Go 03:11:52  
18 ahead. 03:11:59

19 MR. BREGMAN: I said sufficiently 03:11:59  
20 clear to Petitioner's counsel, Your Honors. 03:12:00

21 MR. MURRAY: So just for -- yeah, 03:12:02  
22 just for Patent Owner's counsel, so the 03:12:04

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1 witness will answer the question, but we'd 03:12:10  
2 like to maintain our objection that it's 03:12:14  
3 outside of the scope. 03:12:17  
4 Can we have authorization to file a 03:12:19  
5 motion to strike after the deposition is 03:12:21  
6 over? 03:12:24  
7 JUDGE DERRICK: You can -- you can 03:12:26  
8 seek authorization to -- for a motion to 03:12:28  
9 strike. 03:12:31  
10 MR. MURRAY: Okay. Thank you, Your 03:12:33  
11 Honor. 03:12:35  
12 JUDGE DERRICK: Is there anything 03:12:37  
13 else then? 03:12:39  
14 MR. MURRAY: Not from Patent Owner. 03:12:41  
15 MR. BREGMAN: And nothing else for 03:12:43  
16 Petitioner. 03:12:45  
17 JUDGE DERRICK: Okay. Thank you, 03:12:47  
18 all. This call then is concluded. 03:12:49  
19 MR. BREGMAN: Thank you, Your Honor. 03:12:55  
20 MR. MURRAY: Thank you, Your Honor. 03:12:55  
21 (Whereupon, phone call concludes.) 03:12:58  
22 ///

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1 BY MR. BREGMAN: 03:15:42

2 Q. So, Mr. Aikens, we just completed a 03:15:46

3 call with the board, and they said that you 03:15:48

4 need to answer the question I had asked, so 03:15:50

5 let's -- let's sort of step back a little bit, 03:15:53

6 and we'll take it one step at a time. 03:15:55

7 I'd like you to go back to 03:15:57

8 Exhibit 1001, and that's the patent, the '990 03:16:00

9 patent. Let me know when you're there. 03:16:05

10 **A. I have it.** 03:16:07

11 Q. So if you can go to page 23 of 27 in 03:16:07

12 the bottom right-hand corner. I think we 03:16:10

13 previously established that the two claims at 03:16:15

14 issue per your declaration are Claims 5 and 21. 03:16:17

15 You would agree with that? 03:16:21

16 **A. I think you mean page 22?** 03:16:23

17 Q. Page 23 of 25. 03:16:26

18 **A. I have page 22 of 27 in my exhibit.** 03:16:29

19 Q. I'm sorry. That's what I meant. 03:16:31

20 **A. Column 19?** 03:16:33

21 Q. Yep. Column 19 has Claim 5. 03:16:34

22 Do you see that? 03:16:36

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1	<b>A. Yes.</b>	03:16:37
2	Q. And Claim 5 is a method according to	03:16:38
3	Claim 1.	03:16:41
4	Do you see that?	03:16:41
5	<b>A. Yes.</b>	03:16:44
6	Q. And Claim 1 is a method for	03:16:45
7	capturing a digital panoramic image, et cetera.	03:16:47
8	Do you see that?	03:16:50
9	<b>A. Yes.</b>	03:16:50
10	Q. Claims 1 and 5 are method claims.	03:16:50
11	Would you agree with that?	03:16:53
12	<b>A. They both contain the word "method."</b>	03:16:54
13	Q. A method for doing something, right?	03:16:57
14	<b>A. Presumably. But please recall, I</b>	03:17:03
15	<b>did not do any claims construction for this.</b>	03:17:05
16	Q. Okay. Claim 21 is a little bit	03:17:07
17	different. That depends on Claim 17. Both of	03:17:10
18	those claims are directed to a panoramic	03:17:12
19	objective lens.	03:17:15
20	Do you see that?	03:17:17
21	<b>A. I do.</b>	03:17:17
22	Q. Okay. So that's a lens. You got	03:17:18

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1       some claims directed to the actual lens and       03:17:20  
2       some claims directed to a method.       03:17:23  
3                Would you agree with that?       03:17:27  
4                **A.     I see that 17 talks about a**       03:17:30  
5                **panoramic objective lens comprising, and then**       03:17:31  
6                **has a paragraph. And 21 you said is also a**       03:17:34  
7                **paragraph -- a panoramic objective lens**       03:17:37  
8                **according to Claim 17.**       03:17:40  
9                Q.     Now, I'd like you to point me to       03:17:41  
10               whatever you can in the patent that would allow       03:17:45  
11               a person of skill in the art to build a lens       03:17:52  
12               claimed in Claim 21?       03:18:01  
13               **A.     I'm sorry. You broke up there.**       03:18:03  
14               Q.     To build the lens claimed in       03:18:04  
15               Claim 21.       03:18:07  
16               MR. MURRAY: Objection to form. And       03:18:09  
17               beyond the scoped.       03:18:11  
18               You may answer.       03:18:12  
19       BY MR. BREGMAN:       03:18:19  
20               Q.     Does the '990 patent contain any       03:18:19  
21               tables of lens characteristics?       03:18:22  
22               MR. MURRAY: Are you withdrawing the       03:18:26

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1 previous question? 03:18:27

2 MR. BREGMAN: I am. 03:18:28

3 MR. MURRAY: Okay. 03:18:29

4 BY MR. BREGMAN: 03:18:29

5 Q. Does the '990 patent contain any 03:18:29

6 tables that give you lens characteristics? 03:18:32

7 MR. MURRAY: Objection to form. 03:18:37

8 THE WITNESS: In preparing my 03:18:38

9 declaration, I did not do any modeling of 03:18:45

10 lenses in the '990 patent. 03:18:49

11 BY MR. BREGMAN: 03:18:52

12 Q. Okay. Do you feel that you 03:18:53

13 understand the '990 patent? 03:18:54

14 **A. I feel I understand it well enough 03:18:57**

15 **to discuss my declaration and that of Russell 03:18:59**

16 **Chipman. 03:19:02**

17 Q. Okay. So you've read the '990 03:19:03

18 patent. How many times would you say you've 03:19:04

19 read it? 03:19:07

20 **A. Recently. I think I read it 03:19:08**

21 **yesterday. 03:19:10**

22 Q. Okay. So you've read it maybe more 03:19:11

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1 than five times? 03:19:13

2 **A. Probably three or four.** 03:19:13

3 Q. Okay. And you said earlier that you 03:19:15

4 are at least a person of ordinary skill in the 03:19:21

5 art; is that correct? 03:19:23

6 **A. Yes, I am.** 03:19:23

7 Q. Okay. So I'm going to ask you as a 03:19:25

8 person of ordinary skill in the art who has 03:19:27

9 provided a declaration related to the '990 03:19:28

10 patent, can you point to me any tables -- 03:19:33

11 there's not that many columns in this -- any 03:19:39

12 tables that contain information or data from 03:19:41

13 which you can build a lens? 03:19:43

14 MR. MURRAY: Objection to form. 03:19:48

15 Outside the scope. 03:19:49

16 THE WITNESS: Once again, I have not 03:19:51

17 tried to model any of the lenses in the 03:19:53

18 '990 patent, so I don't want to speculate 03:19:55

19 on what is or is not in here as far as 03:19:58

20 content to provide guidance for that. 03:20:01

21 BY MR. BREGMAN: 03:20:05

22 Q. So you can't tell me what's in the 03:20:05

1	patent?	03:20:06
2	MR. MURRAY: Objection.	03:20:08
3	BY MR. BREGMAN:	03:20:11
4	Q. That's fine. If you can't tell me	03:20:12
5	what's in the patent, that's fine. That's the	03:20:13
6	answer that you should give me.	03:20:15
7	MR. MURRAY: Objection to form.	03:20:18
8	THE WITNESS: As I said, I'm	03:20:18
9	familiar with the patent well enough to	03:20:20
10	discuss my declaration and that of Russell	03:20:21
11	Chipman. I do not want to speculate and	03:20:23
12	give a wrong answer to the Court.	03:20:26
13	BY MR. BREGMAN:	03:20:28
14	Q. In your declaration, did you take	03:20:28
15	positions on what the numerical limitations in	03:20:31
16	the claims mean?	03:20:35
17	MR. MURRAY: Objection to form.	03:20:38
18	THE WITNESS: What are you talking	03:20:39
19	about specifically?	03:20:42
20	BY MR. BREGMAN:	03:20:42
21	Q. All right. Is there any numerical	03:20:44
22	limitations in the claims?	03:20:46



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1           **A.     I believe -- well, I can simply use**     03:21:44  
2           **Dr. Chipman's definition, and it works fine.**     03:21:48  
3           Q.     But you told me earlier that it             03:21:51  
4           comes from a -- a formula in the patent, right?     03:21:52  
5           That's what the deviation is?                     03:21:57  
6           **A.     Dr. Chipman cited a specific**             03:21:58  
7           **equation, and I think we were looking at it**     03:22:02  
8           **earlier.**   03:22:04  
9           Q.     Okay.   03:22:05  
10          **A.     I used his formalism.**                     03:22:05  
11          Q.     So you take no position on the             03:22:08  
12          meaning of anything in the patent.  You're only     03:22:12  
13          taking positions on what Dr. Chipman said; is     03:22:13  
14          that right?   03:22:16  
15                   MR. MURRAY:  Objection to form.             03:22:16  
16                   THE WITNESS:  No, that's not               03:22:16  
17                   correct.  I've written a very carefully     03:22:17  
18                   thought-out declaration --                   03:22:19  
19          BY MR. BREGMAN:                                     03:22:20  
20          Q.     Okay.   03:22:20  
21          **A.     -- specifically addressing the**             03:22:20  
22          **issues associated with Chipman's arguments.**     03:22:22

1 Q. Okay. So as you sit here today, can 03:22:24  
2 you tell me if there are any tables in the '990 03:22:26  
3 patent that contain data about lens 03:22:30  
4 characteristics? 03:22:33

5 MR. MURRAY: Objection to form. 03:22:34

6 THE WITNESS: I'm not going to 03:22:35  
7 speculate on something off the top of my 03:22:37  
8 head. 03:22:40

9 I would need to carefully go through 03:22:40  
10 the whole patent in order to form an expert 03:22:42  
11 opinion thinking about each section and 03:22:46  
12 each word and understanding in the context 03:22:47  
13 of this patent, whether or not a person of 03:22:50  
14 ordinary skill in the art could recreate 03:22:57  
15 the lenses that are described. 03:22:58

16 I did not consider that when I was 03:22:59  
17 preparing my declaration. 03:23:01

18 BY MR. BREGMAN: 03:23:02

19 Q. Does the '990 patent have any sag 03:23:02  
20 tables in it? 03:23:05

21 A. There are tables. I don't believe 03:23:06  
22 there are sag -- there is a sag table. 03:23:10



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1 Q. Does the '990 patent provide you 03:23:14  
2 with a lens schematic for a lens that's covered 03:23:19  
3 by Claims 5 and 21? 03:23:23

4 MR. MURRAY: Objection to form. 03:23:25

5 THE WITNESS: I haven't considered 03:23:29  
6 the '990 patent outside of the preparation 03:23:30  
7 of my declaration. If you can show 03:23:32  
8 something in my declaration that you would 03:23:35  
9 like to ask about, I'm happy to answer 03:23:37  
10 those questions. 03:23:39

11 BY MR. BREGMAN: 03:23:40

12 Q. I'd like to understand whether you 03:23:40  
13 have an understanding of the patent or not. I 03:23:41  
14 mean, if you are telling me you haven't read 03:23:42  
15 the patent or you don't understand it, I 03:23:44  
16 understand. But I'm asking you questions about 03:23:46  
17 the patent. You either understand it or you 03:23:47  
18 don't. 03:23:50

19 So can you tell me if there is any 03:23:50  
20 figures in this patent that show a lens 03:23:54  
21 schematic that is covered by the claims of the 03:23:59  
22 patent? 03:24:02

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1 MR. MURRAY: Objection to form. 03:24:04

2 THE WITNESS: I don't want to 03:24:04

3 mislead you. I don't want to give an 03:24:05

4 incorrect answer. This is testimony under 03:24:07

5 oath. 03:24:09

6 BY MR. BREGMAN: 03:24:10

7 Q. So you will not -- you won't answer 03:24:10

8 the question? 03:24:12

9 **A. I would happily answer anything 03:24:14**

10 **associated with my declaration, because that's 03:24:17**

11 **well thought-out expert opinion. But I do not 03:24:18**

12 **want to speculate off the fly and give a wrong 03:24:21**

13 **answer based on something I haven't prepared 03:24:25**

14 **for. 03:24:27**

15 Q. So how do you understand what the 03:24:27

16 meaning of the claims are if you can't tell me 03:24:29

17 if there are any lens schematics that relate to 03:24:31

18 the claim in the patent? 03:24:34

19 MR. MURRAY: Objection to form. 03:24:35

20 BY MR. BREGMAN: 03:24:37

21 Q. Do you understand what the claims 03:24:37

22 mean? 03:24:38

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1 MR. MURRAY: Objection to form. 03:24:39

2 THE WITNESS: In my analysis, I 03:24:40

3 merely work from Dr. Chipman. My job was 03:24:44

4 not to determine whether or not '990 had 03:24:46

5 any particular attributes outside of 03:24:50

6 Dr. Chipman's assessment that the claims 03:24:54

7 were obvious. And he made his argument 03:24:56

8 based on Tada, Tada over Nagaoka, and Tada 03:24:58

9 over Baker. 03:25:02

10 Those specific claims I analyzed. 03:25:03

11 In fact, I found his logic completely 03:25:06

12 flawed because he had made a tragic error 03:25:08

13 in creating the third -- please let me 03:25:10

14 finish -- in creating the third embodiment. 03:25:13

15 It was so wrong, that the entire 03:25:15

16 argument was specious. I did not need to 03:25:17

17 go into any details in my mind in order to 03:25:20

18 address those errors. 03:25:23

19 MR. BREGMAN: I object to the answer 03:25:24

20 as being nonresponsive. 03:25:26

21 BY MR. BREGMAN: 03:25:26

22 Q. Let's look at your declaration, 03:25:29

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1 page 13 of 94, section No. 6. I would like to 03:25:32  
2 see you point to anything from Dr. Chipman in 03:25:42  
3 that entire section. 03:25:44  
4 **A. This is, you said, 13 of 94?** 03:25:45  
5 Q. That's right. So Section 6 is 03:25:50  
6 entitled '990 Patent and Claim Summary. 03:25:53  
7 **A. Yes, I see that.** 03:25:57  
8 Q. So you have an understanding of what 03:25:59  
9 the patent means; is that correct? 03:26:02  
10 **A. I think so.** 03:26:04  
11 Q. And you have an understanding of 03:26:05  
12 what the claims mean; is that correct? 03:26:07  
13 **A. For the purposes of evaluating** 03:26:09  
14 **Dr. Chipman's assessment, yes.** 03:26:11  
15 Q. So I'm going to ask you about the 03:26:12  
16 claims, and if you tell me you don't understand 03:26:15  
17 them, then that's fine. 03:26:17  
18 So the claims claim either a method 03:26:19  
19 of doing something or a lens. You have said in 03:26:23  
20 paragraph 30 that Claims 5 and 21 recite, and 03:26:31  
21 then you quote some claim language. And then 03:26:34  
22 the next sentence you say, "An example of this 03:26:37

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LGE Exhibit 1018

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1 is shown." 03:26:40

2 Do you see that? 03:26:41

3 **A. Yes.** 03:26:41

4 Q. So you've taken a position on what 03:26:42

5 the claims include and what figures in the 03:26:45

6 patent are examples of those claims? 03:26:48

7 MR. MURRAY: Objection to form. 03:26:52

8 BY MR. BREGMAN: 03:26:53

9 Q. So you've already given an opinion 03:26:53

10 on this. I'm asking you about your opinion on 03:26:56

11 the patent. 03:26:59

12 So you have said an example of this 03:27:01

13 limitation -- this is in paragraph 30 -- is 03:27:05

14 shown in the image point distribution plot in 03:27:07

15 Figure 9. 03:27:12

16 My question is: Are there any other 03:27:13

17 figures in the patent that are also examples of 03:27:15

18 what is claimed in figures -- sorry -- Claims 5 03:27:20

19 and 21? 03:27:24

20 **A. I know that Figure 9 is an excellent 03:27:28**

21 **example of showing the compression in the 03:27:31**

22 **center and the edge which is described in the 03:27:33**

1	<b>claims.</b>	03:27:35
2	<b>I have taken the claims construction</b>	03:27:36
3	<b>that has been provided from Dr. Chipman's</b>	03:27:38
4	<b>analysis and evaluated lenses following his</b>	03:27:41
5	<b>methodology and using his equations.</b>	03:27:46
6	Q. I'm not asking you anything about	03:27:48
7	Dr. Chipman. I'm asking you about your	03:27:49
8	opinion. Nothing to do with Dr. Chipman. Your	03:27:53
9	opinion.	03:27:56
10	The entire section is talking about	03:27:57
11	the patent. It's talking about the claims.	03:27:58
12	It's talking about examples of things in the	03:28:00
13	figures that are examples of the claims.	03:28:03
14	Let's go through the figures ones at	03:28:06
15	a time and you can tell me if it's an example	03:28:09
16	of something in the claims, okay? Let's start	03:28:11
17	with Figure 1 of Exhibit 1001.	03:28:13
18	Is Figure 1 an example of the	03:28:16
19	claims?	03:28:20
20	MR. MURRAY: Objection to form.	03:28:23
21	Outside the scope.	03:28:25
22	THE WITNESS: Figure 1 is related to	03:28:26

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1 the invention in that it's a picture 03:28:34  
2 representing prior art. 03:28:37  
3 BY MR. BREGMAN: 03:28:38  
4 Q. Okay. What about Figure 2? 03:28:38  
5 MR. MURRAY: Same objection. 03:28:43  
6 THE WITNESS: Same answer. 03:28:44  
7 BY MR. BREGMAN: 03:28:45  
8 Q. So Figure 2 is also prior art; is 03:28:45  
9 that right? 03:28:46  
10 **A. It is a picture of the resultant 03:28:46**  
11 **image that's expected from a prior art lens. 03:28:52**  
12 Q. What about Figure 3? 03:28:55  
13 MR. MURRAY: Objection. Form. 03:28:58  
14 Outside the scope. 03:28:59  
15 THE WITNESS: I'm not sure. I'd 03:29:00  
16 have to carefully think about that figure. 03:29:02  
17 BY MR. BREGMAN: 03:29:04  
18 Q. What about Figure 4A and 4B? 03:29:04  
19 MR. MURRAY: Same objections. 03:29:07  
20 THE WITNESS: I believe I referenced 03:29:15  
21 4A and 4B in my report. It is an example, 03:29:16  
22 as you know, of an image point distribution 03:29:19

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1 function and a pattern to explain what an 03:29:22  
2 image point distribution function is for a 03:29:24  
3 linear distribution. 03:29:26

4 BY MR. BREGMAN: 03:29:27

5 Q. And this is a prior art lens, right? 03:29:27

6 **A. I believe that's the way it's** 03:29:36  
7 **stated, yes.** 03:29:38

8 Q. So Figures 4A and 4B can't possibly 03:29:38  
9 be examples of the language from the claim that 03:29:41  
10 you had in paragraph 30 of your declaration 03:29:44  
11 because they're the prior art; is that correct? 03:29:46

12 **A. They relate to the claims. They are** 03:29:54  
13 **the specific linear distribution from which the** 03:29:56  
14 **claims measure the deviation and the** 03:29:59  
15 **distortion.** 03:30:02

16 Q. But they do not contain a compressed 03:30:03  
17 zone, an expanded zone at all; is that correct? 03:30:09

18 **A. No. Figure 4A and B do not contain** 03:30:12  
19 **a compressed zone or an expanded zone.** 03:30:17

20 Q. And you'd agree that the Claims 5 03:30:19  
21 and 21 require two compressed zones and one 03:30:21  
22 expanded zone, right? 03:30:25



1           **A. I've done no claims construction. I** 03:30:26  
2           **haven't analyzed exactly what those terms** 03:30:29  
3           **should be read as and how they should be** 03:30:32  
4           **interpreted in the context of the** 03:30:35  
5           **specification.** 03:30:36

6           Q. You absolutely have told us in your 03:30:37  
7           declaration what the terms "expanded" and 03:30:39  
8           "compressed" mean. You want me to point you to 03:30:42  
9           that? We went through it a little bit earlier 03:30:44  
10          today. You had that in quotes. You said 03:30:47  
11          "compressed" means this, and "expanded" means 03:30:49  
12          this. 03:30:51

13          **A. What was your question again?** 03:30:52

14          Q. I want to know whether Figures 4A 03:30:54  
15          and B contain or display a zone of the lens, of 03:30:57  
16          a lens that has a compressed zone and an 03:31:06  
17          expanded zone. 03:31:09

18          **A. As I mentioned before, 4A and 4B is** 03:31:14  
19          **a picture of an image point distribution** 03:31:18  
20          **function which does not have a compressed** 03:31:20  
21          **center or edge.** 03:31:23

22          Q. Okay. 03:31:24

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1           **A.     It is linear distribution function.**     03:31:25

2           Q.     Okay.  And that would not be covered     03:31:27

3     by the claims, then, right?  Claims require     03:31:29

4     certain areas of zones to be compressed and     03:31:31

5     certain zones to be expanded; is that correct?     03:31:34

6           **A.     The Figure 9 is the one that I drew**     03:31:37

7     **from in explaining what a compressed zone at**     03:31:42

8     **the center and edge would be.  And that was**     03:31:46

9     **based on -- that's based on my understanding of**     03:31:47

10    **the language of the claims.**     03:31:49

11                   **But that understanding is based**     03:31:52

12    **completely on Russ Chipman's presumed**     03:31:55

13    **definition and claims construction.**     03:31:58

14           Q.     Which you have adopted for the     03:31:59

15    purposes of your declaration?     03:32:01

16           **A.     My report and nothing more.**     03:32:02

17           Q.     Okay.  So you said there's an     03:32:04

18    example that's Figure 9.  I'd like to know, are     03:32:07

19    there any other examples in figures that have     03:32:10

20    this, what you say in paragraph 30, the     03:32:12

21    compressed -- let me read it to you.     03:32:16

22                   "Lens compresses the center of the     03:32:19

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1 image and the edges of the image and expands an 03:32:21  
2 intermediate zone of the image located between 03:32:25  
3 the center and the edges of the image." 03:32:27

4 Are there any other figures in the 03:32:30  
5 patent that display that, that have that? 03:32:32

6 **A. As far as I can see, the only image 03:32:45**  
7 **point distribution functions shown in the '990 03:32:49**  
8 **patent which include a compressed zone at the 03:32:51**  
9 **center and the edge is Figure 9. 03:32:54**

10 Q. Thank you. 03:32:56

11 Now, what about -- you mentioned 03:32:57  
12 earlier there's something called a lens 03:32:59  
13 schematic. That's what I think you were 03:33:01  
14 referring to shown in Figures 15 and 16; is 03:33:04  
15 that right? 03:33:08

16 **A. Well, we were discussing the meaning 03:33:08**  
17 **of the term "schematic" as it's used in the 03:33:11**  
18 **'990 patent versus the way I colloquially use 03:33:14**  
19 **the term, which is a lens schematic. 03:33:17**

20 Q. Okay. Well, let's use your language 03:33:20  
21 for lens schematic. That's Figures 15 and 16 03:33:22  
22 from the '990 patent; is that right? 03:33:25

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1           **A.     Figures 15 and 16 are lens**           03:33:27

2           **schematics, yes.**                               03:33:33

3           Q.     Are there any other lens schematics   03:33:34

4           in the '990 patent other than Figures 15 and   03:33:36

5           16?   03:33:39

6           **A.     Yes.   There's another one in**           03:33:39

7           **Figure 18.**   03:33:42

8           Q.     Do any of Figures 15, 16, or 18 have   03:33:44

9           a lens with a center that is compressed, an       03:33:52

10          edge that is compressed, and an intermediate   03:33:57

11          zone that is expanded?                       03:34:00

12                   MR. MURRAY:   Objection.   Form.       03:34:03

13                   Outside the scope.                               03:34:03

14                   THE WITNESS:   I didn't model these       03:34:04

15                   lenses, so I can't speak to that.               03:34:06

16           BY MR. BREGMAN:                               03:34:09

17           Q.     Did you read the description about   03:34:09

18           these lenses?                                   03:34:11

19           **A.     The description is, "Figure 15 is a**   03:34:12

20           **cross section of the first embodiment of the**   03:34:16

21           **nonlinear panoramic objective lens according to**   03:34:18

22           **the present invention."**                       03:34:21

1                   And then Figure 16 just says that's   03:34:24  
2           an "Exploded view of the cross section of the   03:34:26  
3           system of lenses in a panoramic objective       03:34:30  
4           lens."  
5                   Is that what you meant?               03:34:34  
6           Q.       Yeah.   So do you understand what       03:34:35  
7           Figure 15 -- do you understand whether       03:34:37  
8           Figure 15 has a compressed zone at the center   03:34:43  
9           and the edge and an intermediate zone between   03:34:48  
10          those two?                                       03:34:51  
11                   MR. MURRAY:   Objection to form.           03:34:53  
12                   THE WITNESS:   As I said, I didn't       03:34:57  
13           model it, so I can only say that they are       03:34:58  
14           meant to be examples of and embodiment of       03:35:02  
15           the panoramic lens exhibiting the               03:35:07  
16           properties of the invention.                   03:35:09  
17                   So to the extent that they do that,       03:35:10  
18           one would presume that's what they do.   I       03:35:15  
19           have no reason to doubt that they would       03:35:19  
20           work.   03:35:20  
21           BY MR. BREGMAN:                               03:35:21  
22           Q.       Why don't we look at Column 16,       03:35:49

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1 line 5. 03:35:51

2 **A. Yes.** 03:36:01

3 Q. It says, "Figure 15 represents, by a 03:36:01

4 cross section, an example of an embodiment of a 03:36:04

5 nonlinear objective lens 30 according to the 03:36:08

6 present invention. The distribution function 03:36:11

7 FD obtained by means of the objective lens 30 03:36:14

8 is the function FD1 described above in relation 03:36:18

9 to Figure 7B, the objective lens 30 thus 03:36:21

10 expanding the image in the center"? 03:36:25

11 **A. Yes, I see that.** 03:36:33

12 Q. Would a lens that expands the image 03:36:34

13 in the center be covered by Claims 5 and 21? 03:36:36

14 MR. MURRAY: Objection to form. 03:36:40

15 THE WITNESS: From this description, 03:36:41

16 we can't determine if Figure 15 has only an 03:36:51

17 expanded center or if it also has a 03:36:55

18 compressed edge. It could actually have a 03:36:58

19 compressed center and a compressed edge and 03:37:03

20 an expanded center and still meet these -- 03:37:06

21 this description. 03:37:08

22 But I will say, Figure 15 -- it says 03:37:10

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1 Figure 15 corresponds to Figure 7B. 03:37:14

2 BY MR. BREGMAN: 03:37:23

3 Q. All right. So does Figure 7B, does 03:37:23

4 that provide you any more information about 03:37:25

5 whether there is a center that is compressed -- 03:37:29

6 an edge that is compressed and an intermediate 03:37:35

7 zone that is expanded? 03:37:38

8 **A. It doesn't appear to be, no.** 03:37:40

9 Q. Okay. So Figure 15, likewise 16, do 03:37:42

10 not meet the limitations of Claims 5 and 21 03:37:48

11 that require a center and edge that are 03:37:54

12 compressed and an intermediate zone that is 03:37:56

13 expanded, right? 03:38:01

14 MR. MURRAY: Objection to form. 03:38:02

15 Outside the scope. 03:38:05

16 THE WITNESS: I haven't tried to 03:38:05

17 analyze the claims and determine what is or 03:38:07

18 is not in the patent. 03:38:09

19 BY MR. BREGMAN: 03:38:09

20 Q. Okay. So as you sit here today, you 03:38:10

21 cannot tell me whether there are any lens 03:38:12

22 schematics in this patent that relate or that 03:38:15

1 are covered -- let me repeat -- let me say that 03:38:21

2 again. 03:38:23

3 So as you sit here today, you cannot 03:38:24

4 tell me whether there are any lens schematics 03:38:28

5 in the '990 patent, Exhibit 1001, that are 03:38:29

6 covered by Claims 5 and 21 of the patent; is 03:38:35

7 that correct? 03:38:43

8 MR. MURRAY: Same objection. 03:38:43

9 THE WITNESS: You're getting at 03:38:44

10 could a person of ordinary skill at the art 03:38:51

11 create a lens with a compressed center and 03:38:54

12 edge based on the content of this patent. 03:38:56

13 I believe the answer is yes. 03:38:59

14 BY MR. BREGMAN: 03:39:00

15 Q. I did not ask you that, but seeing 03:39:06

16 that you are telling me that, can you tell me 03:39:08

17 how they can use the patents to create a lens 03:39:11

18 as you just described, having a center and edge 03:39:17

19 that are compressed and an intermediate zone 03:39:20

20 that is expanded? 03:39:24

21 MR. MURRAY: Objection to form. 03:39:28

22 Outside the scope. 03:39:29



1                   THE WITNESS: A person of ordinary       03:39:29  
2                   skill in the art would learn from the '990       03:39:41  
3                   patent the advantageousness of having           03:39:42  
4                   different distribution functions of               03:39:46  
5                   distortion in a lens. That's really             03:39:51  
6                   eye-opening.                                       03:39:55  
7                   He can then look at Figures 15 and               03:39:57  
8                   16 and see a retrofocus lens which is an       03:39:59  
9                   embodiment which he could easily recreate.     03:40:02  
10                  And from that, he could then,                   03:40:04  
11                  knowing what he's looking for a priori,       03:40:06  
12                  which is a distribution function which is     03:40:09  
13                  compressed at the center and the edge, he   03:40:11  
14                  could modify this lens design to have it   03:40:14  
15                  produce a desired shape of image point     03:40:19  
16                  distribution function.                       03:40:23  
17                  BY MR. BREGMAN:                               03:40:24  
18                  Q.        So, sorry. Modify which lens       03:40:24  
19                  design?                                       03:40:25  
20                  A.        I'm just saying from my point of     03:40:26  
21                  view, if I were doing this, I would take the   03:40:28  
22                  Figure 16, I would enter a lens that looked   03:40:31

1       like that, had those lens shapes specifically       03:40:33  
2       with three negative lenses in the front, an       03:40:36  
3       outer meniscus, an inner bi- -- an inner plano       03:40:39  
4       concave and a second plano concave with the       03:40:45  
5       opposite facing.       03:40:48  
6                I would choose reasonable materials.       03:40:49  
7       I would enter the other elements, and I would       03:40:51  
8       re-optimize it and put in the merit function,       03:40:53  
9       among other things, a distribution of image       03:40:56  
10       points to reflect the compressed zones that I       03:40:59  
11       was targeting.       03:41:02  
12            Q.     So you would get all of that from       03:41:03  
13       this figure, from Figures 15 and 16 and       03:41:07  
14       Figure 9; is that right?       03:41:10  
15            A.     And my skill in the art.       03:41:11  
16            Q.     Okay. And you would play with       03:41:13  
17       different values, I guess, in Zemax or Code V       03:41:15  
18       until you got the desired output that you were       03:41:20  
19       looking for; is that right?       03:41:23  
20                MR. MURRAY: Objection to form.       03:41:26  
21                THE WITNESS: I'm saying that I       03:41:30  
22       could -- I could design a lens, starting       03:41:31

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1 from this figure, which had a compressed 03:41:34  
2 center and edge. I believe I could. I 03:41:37  
3 haven't done it, so I can't say that I 03:41:39  
4 actually can. But I believe one skilled in 03:41:42  
5 the art could do that. 03:41:45

6 BY MR. BREGMAN: 03:41:46

7 Q. But this lens doesn't have a 03:41:46  
8 compressed center. It has an expanded center. 03:41:48  
9 We just looked at Figure 7, right? 03:41:50

10 **A. But there are subtle differences.** 03:41:53  
11 **The design form is the right idea. Once you** 03:41:55  
12 **know what you're trying to do, it's actually** 03:41:58  
13 **not that hard to manipulate the lens to get it** 03:42:00  
14 **to do what you want.** 03:42:02

15 Q. So you would start with this lens -- 03:42:04

16 **A. Uh-huh.** 03:42:09

17 Q. -- that's got an expansion in the 03:42:09  
18 center and a compression at the edge -- 03:42:11

19 **A. Uh-huh.** 03:42:15

20 Q. -- and you would play around with 03:42:15  
21 the values in Zemax until you got compression, 03:42:20  
22 expansion, compression from the center to the 03:42:27

1 edge -- from the center of the lens to the edge 03:42:29  
2 of the lens; is that right? 03:42:32  
3 MR. MURRAY: Objection to form. 03:42:33  
4 Outside the scope. 03:42:34  
5 THE WITNESS: I would say that from 03:42:35  
6 the starting point of Figure 16 and 03:42:51  
7 knowledge of what kind of image point 03:42:55  
8 distribution function would be beneficial 03:42:57  
9 given the specification that's been 03:43:02  
10 provided from '990, I believe I could 03:43:04  
11 recreate that lens. I could -- or not 03:43:07  
12 recreate that lens. That's too strong. 03:43:09  
13 I could create a lens which 03:43:12  
14 exhibited the pattern of image point 03:43:13  
15 distribution that's shown in Figure 9. I 03:43:16  
16 believe I could do that. 03:43:19  
17 BY MR. BREGMAN: 03:43:20  
18 Q. And what would the lens look like? 03:43:21  
19 A. It would probably look a lot like 03:43:26  
20 **Figure 16. All of these wide angle lenses tend** 03:43:29  
21 **to have the same shape, the negative front** 03:43:37  
22 **group and the positive back group with a pupil** 03:43:40



1 from Figure 16 knowing that this has enough 03:44:29  
2 degrees of freedom that I can manipulate the 03:44:31  
3 distortion to get some values that are 03:44:37  
4 distinctly different from either linear or F10 03:44:39  
5 theta. 03:44:43  
6 And given those degrees of freedom, 03:44:44  
7 I should be able to vary that lens solution 03:44:47  
8 using optimization and other references and 03:44:49  
9 probably quite a bit of my own expertise in 03:44:52  
10 designing lenses, and I could create a 03:44:57  
11 distribution which looks like Figure 9. 03:45:00  
12 I am fairly confident I could do 03:45:03  
13 that. Not exactly, perhaps, but -- but 03:45:05  
14 something that had a compressed center and 03:45:08  
15 edge. 03:45:10  
16 Q. Would that be easy for a person of 03:45:11  
17 ordinary skill in the art to do? 03:45:15  
18 MR. MURRAY: Objection to form. 03:45:16  
19 THE WITNESS: I wouldn't say it's -- 03:45:17  
20 BY MR. BREGMAN: 03:45:18  
21 Q. I'm sorry. What's that? 03:45:19  
22 A. I wouldn't say it's easy. I would 03:45:19

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1 not say it's easy, but I would say it is -- 03:45:21  
2 it's something that I would certainly be 03:45:24  
3 comfortable in doing. 03:45:26  
4 I would want to spend some time 03:45:27  
5 really thinking about what the POSA is, and 03:45:29  
6 what the claims mean, and exactly what the 03:45:31  
7 content is of the specification and where it 03:45:33  
8 points to say necessarily, as an expert 03:45:36  
9 opinion, that a POSA could or could not 03:45:42  
10 recreate that invention. 03:45:45  
11 Q. And how long would it take you to do 03:45:46  
12 all of that, to design the lens you just 03:45:48  
13 mentioned? 03:45:51  
14 MR. MURRAY: Objection to form. 03:45:54  
15 Outside the scope. 03:45:55  
16 THE WITNESS: I really don't know 03:45:55  
17 without trying. 03:45:57  
18 BY MR. BREGMAN: 03:46:00  
19 Q. 40 hours? A hundred hours? A 03:46:00  
20 thousand hours? 03:46:02  
21 MR. MURRAY: Objection. Form. 03:46:04  
22 Outside the scope. 03:46:05

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1                   THE WITNESS: I think it would be a   03:46:05  
2                   matter of a couple days. But I haven't   03:46:10  
3                   done it, so it's just a guess.           03:46:13  
4           BY MR. BREGMAN:                   03:46:16  
5                   Q.       And in your analysis, what -- would   03:46:17  
6                   you need to use wavelengths of light to   03:46:21  
7                   determine whether or not you ended up with the   03:46:24  
8                   image point distribution as shown in Figure 9?   03:46:28  
9                   **A.       I would have to have at least one**   03:46:36  
10                   **wavelength, yes.**                   03:46:38  
11                   Q.       And what wavelength would you use   03:46:39  
12                   based on what you know from the '990 patent?   03:46:42  
13                   **A.       It would depend completely on the**   03:46:49  
14                   **application of the lens and what I was trying**   03:46:51  
15                   **to accomplish.**                   03:46:53  
16                   Q.       What about if you were trying to   03:46:53  
17                   accomplish the lens that's described in this   03:46:55  
18                   patent?                               03:46:57  
19                   MR. MURRAY: Objection to form.           03:47:01  
20                   THE WITNESS: I believe -- I believe   03:47:02  
21                   the '990 patent -- yes, here it is --   03:47:11  
22                   discusses the application field and gives   03:47:14



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1	us some wavelengths.	03:47:16
2	Column 1, paragraph 3, round about	03:47:20
3	35. This is discussing the prior art, but	03:47:24
4	it shows up later as well.	03:47:27
5	BY MR. BREGMAN:	03:47:29
6	Q. Uh-huh.	03:47:29
7	A. "This digital panoramic image is	03:47:29
8	delivered by Camera 1 in the form of a computer	03:47:31
9	file containing image points coded RGBA	03:47:34
10	arranged in a two-dimensional table, R being	03:47:38
11	the red pixel; image point G, the green pixel;	03:47:41
12	B, the blue pixel; and A, the alpha parameter	03:47:47
13	for transparency."	03:47:49
14	So that gives us the -- that tells	03:47:50
15	us that this is a visible application.	03:47:51
16	So I would -- I would -- if I were	03:47:53
17	going to be working in the '990 trying to	03:47:55
18	create a lens that I thought best reflected	03:48:00
19	this application, I'd start with red, green,	03:48:03
20	and blue. Probably a photopic curve like I	03:48:05
21	showed in my report.	03:48:09
22	Q. This says the computer file contains	03:48:10

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1 RGB pixels. I could have an infrared camera 03:48:12  
2 that is not in the visible spectrum, and I 03:48:18  
3 could output a computer program with RGB 03:48:21  
4 values. In fact, it would, so I could see it. 03:48:24  
5 This is talking about the computer 03:48:27  
6 file that's generated from the camera, right? 03:48:28  
7 MR. MURRAY: Objection. 03:48:30  
8 THE WITNESS: It says, "The digital 03:48:31  
9 panoramic image is delivered by the 03:48:32  
10 Camera 1 in the form of a computer file 03:48:35  
11 containing image points coded RGBA." 03:48:37  
12 BY MR. BREGMAN: 03:48:40  
13 Q. All right. So it's the image file 03:48:40  
14 that has image points coded RGBA? That says 03:48:42  
15 nothing about what the sensor is, right? 03:48:48  
16 **A. RGBA is a sensor format.** 03:48:50  
17 Q. That's also an output for 03:48:55  
18 television, or any image for that matter, 03:48:56  
19 right? 03:49:01  
20 **A. A visual image, yes.** 03:49:01  
21 Q. So that -- that paragraph does not 03:49:03  
22 seem to be helpful in telling us what 03:49:06

1 wavelength you would use in a calculation if 03:49:09  
2 you are trying to figure out -- as you said 03:49:13  
3 earlier, if you were trying to design -- design 03:49:16  
4 the lens that you mentioned earlier? 03:49:18  
5 MR. MURRAY: Objection to form. 03:49:21  
6 THE WITNESS: Is that your opinion? 03:49:21  
7 MR. MURRAY: Objection. Form. 03:49:23  
8 BY MR. BREGMAN: 03:49:24  
9 Q. I'm asking you. I asked you about 03:49:24  
10 wavelength and you pointed to a computer file 03:49:28  
11 and having RGBA values. 03:49:30  
12 I'm asking you, are you sticking -- 03:49:32  
13 are you sticking with your testimony that 03:49:34  
14 because the computer file has RGB values, 03:49:36  
15 pixels in an image, that those would be the 03:49:41  
16 same wavelengths of light that you would use in 03:49:43  
17 performing your calculations of the lens? 03:49:47  
18 MR. MURRAY: Objection to form. 03:49:51  
19 THE WITNESS: You were asking me 03:49:51  
20 what wavelengths I would use? 03:49:54  
21 BY MR. BREGMAN: 03:49:54  
22 Q. Yes. 03:49:56



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1 centroid. 03:51:04

2 And I do that for a few reasons, the 03:51:05

3 chief most of which is that I can validate 03:51:11

4 centroids and I can't validate chief rays. 03:51:14

5 Chief rays are fictitious. They're 03:51:16

6 just -- they're a construct, if you will, where 03:51:18

7 a centroid is a real, measurable thing. 03:51:20

8 Q. In a physical lens, right? 03:51:22

9 A. In a physical lens, yes. 03:51:25

10 Q. But these lenses that we're talking 03:51:26

11 about are not physical lenses. This is just 03:51:27

12 lenses that are described in patents. These 03:51:31

13 are not physical lenses. 03:51:33

14 You would agree with that, right? 03:51:35

15 MR. MURRAY: Objection to form. 03:51:37

16 THE WITNESS: When I'm doing lens 03:51:37

17 design, I try to be very careful to do the 03:51:39

18 kinds of analysis that actually can be 03:51:43

19 validated in the laboratory so that 03:51:45

20 assuming the lens get built, we can 03:51:48

21 actually test and verify that we built the 03:51:50

22 lens that we had intended to build. 03:51:53

1 BY MR. BREGMAN: 03:51:55

2 Q. Do you always build a lens if you -- 03:52:00

3 if you model something in software? 03:52:02

4 MR. MURRAY: Objection to form. 03:52:08

5 THE WITNESS: As I mentioned 03:52:10

6 earlier, I use Zemax to do a lot of 03:52:12

7 different things. The chief purpose of my 03:52:15

8 starting up a lens file is to design a lens 03:52:17

9 that will hopefully get built. 03:52:19

10 But occasionally I'll use it to 03:52:22

11 teach my class so I can teach an optical 03:52:24

12 designer how to, you know, split a doublet 03:52:28

13 or design an eyepiece or whatever. And 03:52:30

14 those lenses are classroom examples. 03:52:33

15 They're never going to get built. 03:52:35

16 But when I'm being paid as a 03:52:37

17 consultant, which is what I do for a 03:52:39

18 living, to design lenses for people, it 03:52:41

19 is -- it is rare, if ever, that someone 03:52:45

20 has -- does not have the intention to build 03:52:50

21 the lens. Why would they pay me to design 03:52:52

22 it if they didn't plan to build it? 03:52:54

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1 BY MR. BREGMAN: 03:52:54

2 Q. What about patents? Are all lenses 03:52:56

3 that are described in patents built? 03:52:59

4 MR. MURRAY: Objection to form. 03:53:07

5 THE WITNESS: Well, I -- I really 03:53:11

6 don't know to what extent in patents the -- 03:53:13

7 the various optical design patents have 03:53:19

8 been constructed and which ones haven't. I 03:53:23

9 mean, I guess I'm not an expert in patent 03:53:26

10 law, so I don't know what the rules are 03:53:27

11 exactly. 03:53:29

12 BY MR. BREGMAN: 03:53:30

13 Q. So you're not aware of any rule that 03:53:32

14 you have to build a model, a prototype of what 03:53:34

15 you describe in your patent? 03:53:37

16 MR. MURRAY: Objection to form. 03:53:40

17 THE WITNESS: I'm -- like I said, 03:53:41

18 I'm not a legal expert. I rely on 03:53:45

19 attorneys to do all of my patent 03:53:47

20 applications. I do the initial invention 03:53:49

21 disclosure, and then they turn it into a 03:53:51

22 patent. 03:53:53

1 BY MR. BREGMAN: 03:53:54

2 Q. Right. Why don't we go back to your 03:53:57

3 declaration, and let's turn to paragraph 108. 03:53:59

4 **A. Just a second.** 03:54:27

5 **Yes, I'm there.** 03:54:28

6 Q. Just give me a second to get there. 03:54:29

7 You said, "In a well-corrected lens, 03:54:30

8 there is very little difference between an 03:54:33

9 image point defined by the centroid and the 03:54:35

10 location of the chief ray." 03:54:37

11 Do you see that? 03:54:39

12 **A. Yes.** 03:54:40

13 Q. Why would a person of skill in the 03:54:41

14 art perform a centroid analysis rather than a 03:54:44

15 chief ray height analysis to determine if the 03:54:46

16 lens meets the claimed 10 percent maximum 03:54:49

17 divergence of the '990 patent if there is 03:54:53

18 typically little difference? 03:54:56

19 **A. Well, as I said, I prefer to run 03:55:02**

20 **analysis on parameters that can be physically 03:55:03**

21 **realized so that we can validate that the 03:55:07**

22 **design was constructed correctly.** 03:55:09



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1 I might do a chief ray analysis to 03:55:11  
2 get started just so I can get something on 03:55:13  
3 paper. But ultimately a chief ray analysis and 03:55:16  
4 a centroid analysis are going to be very 03:55:21  
5 similar, but not exactly the same for a 03:55:23  
6 well-corrected lens. 03:55:26

7 Moreover, as the field of view 03:55:27  
8 becomes larger, like it is in all of these 03:55:29  
9 cases, that difference can become extreme. And 03:55:31  
10 we saw -- we see that with -- with the case of 03:55:34  
11 Dr. Chipman's lens that he describes in his 03:55:39  
12 declaration. 03:55:43

13 Q. Which -- which of a centroid 03:55:44  
14 analysis or a chief ray analysis is simpler? 03:55:47

15 A. I'm sorry? 03:55:50

16 Q. Which of a centroid analysis or a 03:55:52  
17 chief ray analysis is simpler? 03:55:54

18 A. These days, they're both -- they're 03:55:58  
19 both pretty straightforward. You could -- you 03:56:02  
20 can -- you can do either one relatively simply. 03:56:06

21 The difference is that you've got to 03:56:11  
22 be a little closer to having a corrected lens, 03:56:13

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1 that is to say you have to have lens apertures. 03:56:17

2 I described this all in my report. 03:56:20

3 You need to have the sizes of the lenses so you 03:56:21

4 can calculate the vignetting. Again, 03:56:25

5 especially in these very wide field cases. 03:56:27

6 In a typical lens where you've got a 03:56:30

7 5-degree field of view, it mostly doesn't 03:56:32

8 matter. Lens is well corrected, the chief ray 03:56:36

9 and the centroid are the same. 03:56:39

10 But there's an optical aberration 03:56:40

11 called coma which displaces the chief ray and 03:56:42

12 the centroid. And if you have a lot of coma, 03:56:45

13 those two analyses get different answers. And 03:56:49

14 they can be different by quite a bit for very 03:56:51

15 large fields. 03:56:53

16 One of these wide field lens 03:56:54

17 designs, you're fighting coma constantly. Not 03:56:56

18 just third order coma, but fifth order coma, 03:57:01

19 elliptical coma. It's a -- it's a difficult 03:57:03

20 problem to design these -- these wider and 03:57:05

21 wider fields. 03:57:09

22 Q. Is there anything in the '990 patent 03:57:10

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1 that would instruct a person of skill in the 03:57:12  
2 art to perform a centroid analysis to determine 03:57:15  
3 the image point distribution function? 03:57:17

4 A. I don't recall seeing anything in 03:57:23  
5 the '990 patent that specifically defined how 03:57:27  
6 the image point was to be calculated. It 03:57:31  
7 merely starts at the image point distribution 03:57:34  
8 function. 03:57:37

9 So as far as I recall, there is no 03:57:38  
10 language saying either centroid or chief ray in 03:57:42  
11 the '990 patent. 03:57:45

12 Q. Does the -- 03:57:47

13 A. It could be there, but I don't 03:57:48  
14 recall seeing it. 03:57:50

15 Q. Does the '990 patent, for example, 03:57:50  
16 Figure 6, show chief rays? 03:57:54

17 A. No. 03:57:59

18 Q. What are those rays that are being 03:57:59  
19 shown in Figure 6? 03:58:03

20 A. Well, as I mentioned earlier, 03:58:07  
21 Figure 6 is just a -- well, we'll use the 03:58:09  
22 patent's term, schematic, but it's just a 03:58:11

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1 cartoon to show the relative orientation of the 03:58:13  
2 object angles on the left-hand side and the 03:58:16  
3 image field heights on the right-hand side. 03:58:19

4 But those are -- those are not chief 03:58:21  
5 rays. And that's not a real lens. It's just 03:58:25  
6 a -- a notion of a lens that's been put in the 03:58:28  
7 figure. 03:58:30

8 Q. Go to the lens that you created, for 03:58:33  
9 example. Why don't we look at page 65 of 94 in 03:58:52  
10 your declaration. 03:58:55

11 A. I have it. 03:59:01

12 Q. Are there any chief rays shown 03:59:01  
13 there? 03:59:03

14 A. I don't believe the chief rays are 03:59:04  
15 shown here. 03:59:11

16 Q. So what rays are these? 03:59:13

17 A. These are just the center and edge 03:59:15  
18 rays. The issue is that it's vignetted. So 03:59:20  
19 this is -- this is the version that I did in 03:59:23  
20 order to do the centroid analysis. And when 03:59:25  
21 you've vignetted it, then the pupil position 03:59:27  
22 shifts depending on the field angle. So -- 03:59:30

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1 Q. Where is the pupil position here? 03:59:32

2 A. **It's the black line.** 03:59:34

3 Q. Black line? 03:59:39

4 A. **Uh-huh.** 03:59:41

5 Q. Where -- 03:59:42

6 A. **I believe --** 03:59:42

7 Q. Where is the black line? I mean, I 03:59:43

8 see -- oh, the black line at the right -- the 03:59:45

9 focal plane? 03:59:50

10 A. **Let me -- hold on. Let me just** 03:59:51

11 **verify this real quickly from Tada. I don't** 03:59:53

12 **remember off the top of my head.** 03:59:56

13 **But I use a specific convention to** 03:59:57

14 **mark where the chief ray -- or the -- where the** 03:59:59

15 **aperture stop usually is, but let's see. We're** 04:00:04

16 **talking about Figure 11, right?** 04:00:07

17 **Yeah, that's the location. So** 04:00:09

18 **that's the place where -- the black line** 04:00:11

19 **between the third lens and the fourth lens.** 04:00:13

20 **You see that?** 04:00:18

21 Q. Uh-huh. 04:00:18

22 A. **That is Tada nominally placed his** 04:00:20

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1 diaphragm. And you can see that the rays 04:00:25  
2 cluster on axis just after that. At the top 04:00:31  
3 far to the right of it, and at the bottom a 04:00:35  
4 little bit to the left of it. 04:00:41  
5 So you can see from that that we're 04:00:43  
6 vignetting these rays, and it's plotting the 04:00:44  
7 center of those bundles based on the -- based 04:00:47  
8 on the rays. So those are not -- in short, 04:00:50  
9 those are not chief rays. 04:00:54  
10 Q. So the rays do not pass, they don't 04:00:55  
11 bundle at the focal plane? Or the focal point? 04:00:59  
12 A. Oh, I'm sorry. Yeah. So there are 04:01:03  
13 two conjugate planes in an optical design that 04:01:05  
14 are important. The one that we all think about 04:01:08  
15 is the focal plane. That's where all the rays 04:01:10  
16 from any given object point should come to a 04:01:12  
17 focus. They should all come -- they should 04:01:15  
18 bunch together, right? 04:01:17  
19 Q. Uh-huh. 04:01:19  
20 A. And you can see that's the far right 04:01:19  
21 line where the three rays traced from each of 04:01:21  
22 the field points come together. 04:01:23

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1 Q. Uh-huh. 04:01:26

2 A. The second plane that's critically 04:01:26

3 important in an optical design is the -- is the 04:01:29

4 pupil plane. And the pupil plane is the place 04:01:31

5 which limits the amount of light that can get 04:01:36

6 through the lens. 04:01:39

7 In a nominal starting design, or in 04:01:39

8 most conventional designs, that stop is the 04:01:43

9 place where all the chief rays go through the 04:01:48

10 center of the stop, and they're all the rays 04:01:50

11 that go through that stop go all the way 04:01:53

12 through the lens. 04:01:55

13 Q. Uh-huh. 04:01:56

14 A. So it would be an un-vignetted lens. 04:01:56

15 That's not the case with this lens. 04:01:59

16 This lens is significantly vignetted at the top 04:02:01

17 and bottom. And that's in order to provide 04:02:05

18 better image correction across the field. 04:02:08

19 Q. But the rays should all pass through 04:02:10

20 the center of the pupil, right? 04:02:12

21 A. In a -- in a simple lens design 04:02:13

22 where apertures are infinite, then, yes, all 04:02:17

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1 the rays that go through the pupil go to the 04:02:21  
2 field. And all of the rays that are the chief 04:02:26  
3 rays go through the center of the pupil. 04:02:30  
4 Q. Uh-huh. 04:02:33  
5 A. But that's not the case with these 04:02:34  
6 complex wide angle lenses. I do quite a few of 04:02:35  
7 these wide angle lenses in my work, and I 04:02:40  
8 always use vignetting to clean up the field. 04:02:43  
9 Q. So the diaphragm doesn't just have a 04:02:46  
10 hole in the middle of the background? What 04:02:48  
11 is -- physically, what is the diaphragm? 04:02:51  
12 A. No. You're thinking of it right. 04:02:53  
13 It's a -- it's typically an iris. In this 04:02:55  
14 case, I mean Tada, I don't remember he gave -- 04:02:57  
15 I don't think Tada gave much of a description. 04:03:00  
16 But in a typical camera lens, the 04:03:02  
17 diaphragm would be like a literal diaphragm, 04:03:06  
18 like an opening and closing iris. And so that 04:03:08  
19 would be used to stop down the energy if it was 04:03:11  
20 in a really bright environment, or to open it 04:03:14  
21 up in a -- in a -- in a really dark 04:03:16  
22 environment, right? 04:03:20





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1 to pass through? 04:04:12

2 A. That's correct. As the diaphragm 04:04:13

3 gets stopped down, you're clipping more and 04:04:17

4 more of the light. 04:04:19

5 Q. But if you put the diaphragm where 04:04:20

6 they cross, most of that light can still get 04:04:22

7 through? 04:04:25

8 A. Well, you still get less and less 04:04:25

9 light. I mean, as you stop the lens down, you 04:04:27

10 trim out more and more light. What you're 04:04:32

11 seeing is kind of an optical illusion. It's 04:04:34

12 created by the very highest field point -- 04:04:37

13 Q. Uh-huh. 04:04:40

14 A. -- which is the innermost rays which 04:04:40

15 is the most vignetted. 04:04:43

16 So if you imagine as you stop it 04:04:45

17 down, you're not losing any of the light at the 04:04:48

18 edge of field, which is good because you don't 04:04:51

19 have much to begin with. You're trimming out 04:04:54

20 more of the center of the field of view 04:04:57

21 aperture, and that's okay because you got 04:04:59

22 plenty of light there. 04:05:02

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1                   So but to answer your question, if I 04:05:03  
2           were designing this lens and it were a wide 04:05:06  
3           angle lens, I would probably move the stop 04:05:10  
4           back. 04:05:13

5           Q.       Uh-huh. 04:05:14

6           A.       Just because I think it would be 04:05:14  
7           more symmetric. I think it would be more 04:05:16  
8           pleasing to see the field of view dim more 04:05:19  
9           uniformly. And I think you would get that with 04:05:22  
10          the stop a little further back than it's shown. 04:05:25

11          Q.       When you said the field of view 04:05:27  
12          dimming more uniformly, how would it dim 04:05:29  
13          non-uniformly? What would it look like, you 04:05:32  
14          know, if my eye was where the image sensor 04:05:35  
15          would be? 04:05:41

16          A.       Okay. So imagine your eye is where 04:05:41  
17          the image sensor is, and you can see on axis 04:05:44  
18          you've got a lot of rays. See how big that 04:05:47  
19          angle is? You're collecting a lot of light 04:05:49  
20          there. 04:05:51

21                   And all of that light goes through 04:05:52  
22          the edges of the aperture stop, right? And it 04:05:53

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1 comes out of -- it comes to the lens from 04:05:56  
2 the -- from the center of the -- along the 04:05:59  
3 optical axis, goes through the pupil, and then 04:06:02  
4 gets focused onto the axis. Lots of rays 04:06:05  
5 there, lots of light. 04:06:08  
6 Look at the edge ray, and you've got 04:06:09  
7 a much smaller cone of light getting to the 04:06:11  
8 focal plane. And that smaller bundle of light 04:06:13  
9 is trimmed at lenses 3 and 4 by vignetting. 04:06:18  
10 And that's done on purpose. That's 04:06:22  
11 not an accident. That's right. Because 04:06:25  
12 although we lose light, we gain image fidelity. 04:06:27  
13 It's cleaner that way. 04:06:31  
14 So what would happen is when you use 04:06:32  
15 this camera, it would be non-uniformly 04:06:34  
16 illuminated with the center having more light 04:06:37  
17 than the edges. When the camera is in a bright 04:06:39  
18 field condition, that's fine. I'm going to 04:06:46  
19 stop down that iris. And even in the position 04:06:49  
20 where it's at, it would still look perfectly 04:06:51  
21 fine. 04:06:53  
22 But if I left the iris where it is 04:06:54

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1 and I started stopping down the image, what I 04:06:56  
2 would see is the intense -- if I measured the 04:06:59  
3 intensity across the focal plane, the intensity 04:07:01  
4 at the center of the field would start dropping 04:07:04  
5 before the edge of the field. 04:07:07

6 Q. Uh-huh. 04:07:08

7 A. So it would get dimmer in the 04:07:10  
8 middle, bringing the whole field to a more 04:07:12  
9 uniform brightness. 04:07:14

10 Q. Uh-huh. You mentioned a few times 04:07:17  
11 "vignetting." Can you explain what that is? 04:07:19

12 A. Yes. Vignetting is the -- it is the 04:07:22  
13 phenomenon when -- the best way to think about 04:07:27  
14 it is the stop is poorly defined. But it's 04:07:31  
15 done on purpose, so don't read too much into 04:07:37  
16 that. 04:07:39

17 And that's the case here. So what 04:07:39  
18 I'm doing is for the on-axis rays, the stop is 04:07:41  
19 the stop, right? The stop is that diaphragm. 04:07:45

20 Q. Uh-huh. 04:07:49

21 A. But as I get further and further up 04:07:49  
22 in field of view, then some of the rays get 04:07:52

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1 trimmed off. They don't actually get all the 04:07:56  
2 way through the lens. Or to think about it 04:07:58  
3 differently, the lens doesn't see with as wide 04:08:01  
4 an angular spectrum. 04:08:04  
5 So that trimming is occurring on 04:08:05  
6 lens 3, and you can also see it sort of 04:08:07  
7 occurring on lenses 4 and 5. So that's that 04:08:10  
8 trimming effect. That's -- that's what's 04:08:16  
9 called vignetting. 04:08:18  
10 So if you looked at -- if you were 04:08:19  
11 at the detector looking out, you would see a 04:08:21  
12 diaphragm in the center. And then in the -- 04:08:24  
13 towards the edge it would become more of an 04:08:27  
14 ellipse as the rays became vignetted. 04:08:30  
15 Does that make more sense? 04:08:34  
16 Q. It would become more of an ellipse 04:08:35  
17 where? Towards the edge, right? 04:08:38  
18 A. Towards the edge, yes. 04:08:39  
19 Q. Uh-huh, uh-huh. 04:08:41  
20 A. Towards the corner. 04:08:42  
21 Q. And vignetting -- so firstly I see 04:08:43  
22 you've got a scale on this figure of 5 mms, 04:08:47

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1 right? 04:08:51

2 **A. Yes.** 04:08:51

3 Q. Is that common to put on a lens 04:08:52

4 schematic when you're building something to 04:08:57

5 scale? 04:09:00

6 **A. I always include a scale. I think** 04:09:00

7 **it's helpful.** 04:09:02

8 Q. Does Zemax do that automatically? 04:09:03

9 **A. You can turn it on or off. I always** 04:09:07

10 **leave it on.** 04:09:10

11 Q. And in order to do vignetting, you 04:09:11

12 need diameters of the lenses, right? 04:09:15

13 **A. In order to recreate the amount of** 04:09:18

14 **vignetting in Tada, I had to make assumptions** 04:09:24

15 **about the lens diameters. Because unlike the** 04:09:28

16 **way I document my lenses, Tada did not include** 04:09:31

17 **the outer aperture information in his tables,** 04:09:33

18 **which is unfortunate. Because we know from** 04:09:36

19 **Chipman's model, and my own, that the F 1.3** 04:09:38

20 **beam that's going through this lens cannot** 04:09:44

21 **possibly get through these lenses.** 04:09:46

22 Q. So you got the diameters off 04:09:47

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1 Figure 11? No. Off which -- where did you get 04:09:52  
2 the diameters from? 04:09:56

3 A. So a few of them you could actually 04:09:57  
4 get from the specification. The diameter of 04:09:59  
5 lens 2 is actually pretty clear. You get -- 04:10:03  
6 you have a description of the asphere, and the 04:10:08  
7 asphere description stops at the edge of the 04:10:13  
8 sag table. 04:10:16

9 So one great place to start is go to 04:10:16  
10 the sag table and look at the most extreme lens 04:10:19  
11 height. That tells you the aperture of both 04:10:22  
12 surfaces on lens 2 in Tada. 04:10:25

13 Q. Uh-huh. 04:10:28

14 A. I didn't need to trim lens 1 at all. 04:10:29  
15 The only other lenses that looked wrong, and 04:10:33  
16 you can see this from my report 64 out of 94, 04:10:36  
17 the right-hand picture is the one that Chipman 04:10:41  
18 showed in his report. 04:10:43

19 And you can see these lenses don't 04:10:45  
20 look the same. Just qualitatively, that 04:10:47  
21 doesn't look right. And that's because Tada 04:10:50  
22 has not told us about his -- his choice of 04:10:55



1 vignetting. 04:10:58

2 The next thing you can do is you've 04:10:59

3 got that stop, you see that? The aperture stop 04:11:00

4 on the left-hand side of the Tada snippet. 04:11:03

5 Q. Uh-huh. 04:11:07

6 A. That, we know exactly what that is 04:11:07

7 as well, because we have the F number on axis 04:11:09

8 as 1.3. So I could calculate the diameter of 04:11:12

9 that, and I could use really any number between 04:11:18

10 that aperture diameter and maybe a 10th of a 04:11:24

11 millimeter larger and get the figure that you 04:11:27

12 see on the next page of my report where now the 04:11:29

13 lenses really do look much more like Tada's 04:11:32

14 Figure 11. 04:11:35

15 Q. So -- 04:11:36

16 A. And I can't say that I've exactly 04:11:37

17 recreated his vignetting. I can't do that, 04:11:39

18 because he didn't provide the diameters. But 04:11:42

19 I've certainly gotten a lot closer. 04:11:45

20 Q. So I'm not understanding how you 04:11:47

21 went about doing this. 04:11:49

22 Did you measure off Figure 11 or did 04:11:50

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1 you estimate size as a relative dimension from 04:11:53  
2 Figure 11 and then play with that size in Zemax 04:11:58  
3 until you got something that looked similar? 04:12:02  
4 **A. As I said, you can get the exact 04:12:03**  
5 **numbers on lens 2. But you're talking about 04:12:05**  
6 **how did I pick the diameters of lenses 3, 4, 5, 04:12:08**  
7 **6, and 7, right? 04:12:11**  
8 **Q. Right. 04:12:13**  
9 **A. Yeah. So the way I did that is I 04:12:13**  
10 **literally had a copy of the figure sitting in 04:12:16**  
11 **front of me. This is the Figure 11 from Tada. 04:12:19**  
12 **Q. Yeah. 04:12:22**  
13 **A. And then I just started reducing the 04:12:23**  
14 **aperture until I got something that looked like 04:12:25**  
15 **Figure 11. Just visually. 04:12:27**  
16 **Q. For each of them? 04:12:29**  
17 **A. I wasn't scaling or measuring 04:12:30**  
18 **anything. Yeah, I was just getting the same 04:12:32**  
19 **picture, getting that image right. 04:12:34**  
20 **Q. And if a different person of skill 04:12:36**  
21 **in the art did this, they might get a slightly 04:12:41**  
22 **different analysis, right? That seems pretty 04:12:44**

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1 subjective that you were playing with it until 04:12:47  
2 you got something that you thought looked -- 04:12:49  
3 looked like the Figure 11. 04:12:51  
4 MR. MURRAY: Objection to form. 04:12:53  
5 THE WITNESS: I think -- I think 04:12:53  
6 they came out really nice. I actually was 04:12:57  
7 very happy with how close I could get those 04:12:59  
8 figures to match. 04:13:02  
9 And I was making adjustments of a 04:13:03  
10 10th of a millimeter if I remember right. 04:13:05  
11 BY MR. BREGMAN: 04:13:08  
12 Q. Uh-huh. 04:13:08  
13 A. **And plus or minus a 10th of a** 04:13:08  
14 **millimeter in these lenses looks very** 04:13:10  
15 **different. So I'm pretty sure I got it to** 04:13:13  
16 **within about a 10th of a millimeter.** 04:13:15  
17 Q. If I took 10 optical engineers, gave 04:13:17  
18 them Tada, told them, you know, we want it to 04:13:19  
19 look similar to the figures, they would get the 04:13:24  
20 exact same values as you? 04:13:26  
21 MR. MURRAY: Objection to form. 04:13:29  
22 THE WITNESS: I think it would 04:13:31

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1 depend on which 10. But the short answer 04:13:33  
2 is: There might be differences of a 10th 04:13:35  
3 of a millimeter, but not much more than 04:13:38  
4 that. 04:13:40

5 BY MR. BREGMAN: 04:13:41

6 Q. And where did you get -- sorry. 04:13:42  
7 Where did you get the millimeter scale from in 04:13:43  
8 the first place? 04:13:45

9 A. So it is arbitrary, right? I 04:13:46  
10 chose -- so Tada doesn't tell us what his focal 04:13:50  
11 length is. He merely has scaled it to 1. So I 04:13:52  
12 could use one foot, one meter. I just -- I let 04:13:56  
13 the Zemax default as 1 millimeter, so I set the 04:13:59  
14 focal length to 1 millimeter. 04:14:03

15 In a vignette, you can't do -- 04:14:07

16 Q. There was a foot. You said 04:14:07  
17 one-tenth of a millimeter difference, but if 04:14:09  
18 you add a foot, now it becomes pretty material. 04:14:11  
19 Or if it was a meter, or 10-meter wide lens, a 04:14:13  
20 difference of a 10th of that is not 04:14:18  
21 insignificant? 04:14:21

22 MR. MURRAY: Objection to form. 04:14:23

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1                   THE WITNESS: Yeah, you're sort of       04:14:24  
2                   going the right way. The real -- I mean,       04:14:26  
3                   we have to choose a scale factor. So a       04:14:28  
4                   better way to think about it is I was       04:14:30  
5                   making adjustments of a 10th of a       04:14:32  
6                   millimeter because my focal length was a       04:14:34  
7                   millimeter.                                       04:14:37  
8                   A better way to think about it is I       04:14:38  
9                   was making adjustments in the diameter of       04:14:40  
10                  order of 10th of a focal length. And       04:14:42  
11                  that's a small number on a wide angle lens.   04:14:45  
12                  BY MR. BREGMAN:                               04:14:48  
13                  Q.       So you don't take any measurements       04:14:49  
14                  of the figures?                               04:14:50  
15                  A.       No, I didn't.                           04:14:51  
16                  Q.       You sort of eyeballed it?               04:14:51  
17                  A.       Yeah. I thought it came out okay.       04:14:54  
18                  I did what any optical designer would do. When   04:15:01  
19                  you're -- when you've got a heavily vignetted   04:15:03  
20                  wide field lens and you don't know what the   04:15:07  
21                  vignetting is, you've got to kind of dial it   04:15:09  
22                  in.                                       04:15:12

1 Q. Did you include the diameters in 04:15:13  
2 your declaration, any of these diameters? 04:15:20

3 A. I don't recall if we provided the 04:15:25  
4 prescription. I'm not -- I don't think I did, 04:15:31  
5 no. 04:15:35

6 Q. Is your complaint with Tada that its 04:15:35  
7 description doesn't provide enough information 04:15:49  
8 for you to -- to perform -- to perform a 04:15:51  
9 centroid analysis properly? 04:15:57

10 MR. MURRAY: Objection to form. 04:16:00

11 THE WITNESS: I had a lot of 04:16:03  
12 problems with Tada. I really do not like 04:16:04  
13 this patent. 04:16:08

14 BY MR. BREGMAN: 04:16:10

15 Q. Why? 04:16:10

16 A. But nevertheless, it was the one 04:16:10  
17 that we had to work from. 04:16:12

18 So is your -- if your question is: 04:16:14  
19 Should I have provided my lens diameters? I'd 04:16:17  
20 say I suppose if the objective was to have 04:16:23  
21 someone check my work. 04:16:26

22 Q. Right. And do you think Dr. Chipman 04:16:31

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1 would have liked to have checked your work? 04:16:34

2 **A. I think frankly he can do the same** 04:16:36

3 **thing I did and get the same answer. And he** 04:16:38

4 **should be able to look at my centroids and -- I** 04:16:41

5 **don't -- I don't think they would be materially** 04:16:44

6 **different.** 04:16:46

7 **This eyeballing strategy is -- is** 04:16:48

8 **pretty common. I would -- I would have all the** 04:16:51

9 **confidence that Dr. Chipman could recreate my** 04:16:56

10 **work from what's been provided.** 04:16:58

11 **Q. Does the '990 patent specify any of** 04:17:03

12 **the diameters of its lenses?** 04:17:15

13 **A. I don't recall.** 04:17:16

14 **Q. Why don't we look at Column 17,** 04:17:17

15 **lines 30 to 33.** 04:17:30

16 **A. Oh, the '990?** 04:17:40

17 **Q. Yes.** 04:17:40

18 **It says, "The determination of the** 04:17:40

19 **parameters defining the spherical sides** 04:17:41

20 **mentioned above, the formula of the** 04:17:44

21 **diffraction" -- sorry -- "of the diffraction** 04:17:46

22 **grading of the lens L6, the calculation of the** 04:17:52

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1 diameters of the lenses, and the other 04:17:54  
2 distances between the lenses are well within my 04:17:56  
3 understanding of those skilled in the art using 04:17:58  
4 classical computer-aided lens design tools." 04:18:01

5 Do you agree with that? 04:18:04

6 A. I think that's very similar to what 04:18:05  
7 I was saying earlier, that the -- that you 04:18:12  
8 can -- you can use ordinary skill in the art 04:18:17  
9 to -- once you know what the rough length 04:18:20  
10 shapes are and where the aspheres are, you can 04:18:22  
11 design that lens to achieve some kind of a 04:18:25  
12 merit function. 04:18:29

13 The trick is figuring out what merit 04:18:30  
14 function to use, and that's what the -- that's 04:18:32  
15 what this specification helps with, as well as 04:18:34  
16 the people with skill in the art. 04:18:36

17 Q. And it says -- it says a classical 04:18:38  
18 computer-aided lens designs tools, are we 04:18:42  
19 talking about Code V and Zemax? 04:18:45

20 A. That's correct. Well, I don't know, 04:18:47  
21 right? I don't know what was in their head, 04:18:52  
22 but I would presume based upon reading that 04:18:54



1       **paragraph, that's probably what they meant.**       04:18:57

2           Q.       Code V and Zemax are the two most       04:18:59

3       common types of classical computer-aided lens       04:19:01

4       designs tools?       04:19:05

5           **A.       I'm not sure. OpTaliX is pretty big**       04:19:06

6       **in Europe. There are probably a dozen codes**       04:19:10

7       **that are in use worldwide. Certainly in North**       04:19:15

8       **America, Code V -- and Japan, North America and**       04:19:17

9       **Japan, Code V and Zemax dominate the market.**       04:19:20

10          Q.       Sorry. Turning back to the figure       04:19:25

11       we were discussing in the determination between       04:20:03

12       paragraphs --       04:20:06

13                   (Audio technical difficulties;       04:20:06

14                   stenographer asks for       04:20:06

15                   clarification.)       04:20:06

16                   THE WITNESS: Yes.       04:20:06

17       BY MR. BREGMAN:       04:20:12

18          Q.       Turning back to the figure between       04:20:12

19       your paragraphs 111 and 112 in your       04:20:14

20       declaration, we were looking at a figure. This       04:20:17

21       figure is modeled using the Table 5 data in       04:20:23

22       Tada; is that correct?       04:20:26

1           **A.**     **As I explain in my declaration,**           04:20:30  
2           **that -- that model actually came about from**       04:20:32  
3           **starting with Table 5 and then going through**       04:20:36  
4           **this torturous debugging process to figure out**       04:20:38  
5           **what the aspherical coefficient should be, and**       04:20:42  
6           **then ultimately finding them in the Japanese**       04:20:44  
7           **patent and just typing them in correctly.**           04:20:46  
8                    **And then after doing that, then I**       04:20:49  
9           **chose wavelengths that seemed appropriate, and**   04:20:51  
10          **I trimmed the lenses to get them to look more**    04:20:54  
11          **like Figure 11. And I think that's all I did.**       04:20:57  
12                    **Oh. And I used the sag table to**       04:21:03  
13          **verify, of course.**                                   04:21:05  
14            **Q.**     **And the title of this is just**           04:21:06  
15          **underneath the diagram on the left. It says,**       04:21:09  
16          **"Tada Embodiment 3 fixed."**                       04:21:13  
17                    **Do you see that?**                       04:21:15  
18            **A.**     **Correct.**                                   04:21:17  
19            **Q.**     **And "fixed" is what you just said,**       04:21:17  
20          **it's all the changes that you made?**               04:21:20  
21            **A.**     **"Tada Embodiment 3 fixed" was the**       04:21:22  
22          **name of the file where I had fixed the**           04:21:26



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1           A.     "Operand" is a term in the art.           04:22:33

2           It's the same term in Zemax and Code V, I           04:22:36

3           think, which is a thing which is to be           04:22:40

4           achieved. So that is an operand.           04:22:45

5                     There are two things about           04:22:47

6           optimization. One is operand, which is what           04:22:49

7           I'm targeting, and the other is variable, the           04:22:51

8           thing I'm allowing the computer to change.           04:22:54

9                     So in this case I created a merit           04:23:00

10          function which consisted of 100 CENY targets,           04:23:02

11          and that 100 centroid heights exactly matched           04:23:12

12          the hundred field points that I had done for my           04:23:16

13          chief ray analysis so I could get them to match           04:23:20

14          exactly.           04:23:22

15          Q.     And where --           04:23:23

16          A.     So we had 100 field points is a           04:23:24

17          better way to think of that.           04:23:26

18          Q.     And where -- where in Tada did you           04:23:27

19          get the hundred field points from?           04:23:30

20          A.     It's just 58.5 divided by 100. Like           04:23:32

21          Chipman, I had to figure out how to parse the           04:23:37

22          field in order to get some kind of image point           04:23:40



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1 thousands of points. 04:24:59

2 But in order to stay consistent with 04:25:01

3 my earlier analysis, I just used the same 04:25:04

4 number of field points as we had for the chief 04:25:06

5 ray based analysis. 04:25:09

6 Q. And reading this, how would a person 04:25:12

7 of skill in the art know where you selected 04:25:18

8 your hundred field points? 04:25:19

9 A. There are a hundred field points 04:25:21

10 equally spaced from zero to 58.5 just as they 04:25:23

11 are in the chief ray analysis. Like Chipman, I 04:25:27

12 just did a whole series of points evenly 04:25:36

13 distributed across the field. 04:25:38

14 Q. Would the value of the centroid 04:25:40

15 change depending on how many field points were 04:25:41

16 chosen, which ones? 04:25:45

17 A. The value of the centroid change 04:25:46

18 depending on which... 04:25:48

19 The image point distribution 04:25:50

20 function should have the same shape. You know, 04:25:52

21 the -- the image point distribution function 04:25:56

22 that I show is on the bottom of page 66 of 94. 04:26:00

1 I mean, this is an example. 04:26:03

2 And you can see that, you know, a 04:26:04

3 hundred points is more than enough to get the 04:26:08

4 general shape of that curve. 04:26:11

5 Q. And if you had more points, you 04:26:16

6 would get a more accurate curve? 04:26:19

7 A. It depends on what I would try to 04:26:21

8 do. If what you're saying is -- I really, 04:26:25

9 really want to know exactly where the DIVmax 04:26:28

10 is. I want to know it to a thousandth of a 04:26:32

11 degree. Well, you can do that. Just add more 04:26:34

12 points. 04:26:37

13 Or you could do like Chipman did, a 04:26:38

14 regression step where you start with some 04:26:40

15 course array, figure out about where the peak 04:26:42

16 is, and then just do a thousand points around 04:26:47

17 where you think the peak is and you'll find the 04:26:50

18 peak. 04:26:52

19 For this analysis, the difference 04:26:53

20 between 24 and 24.001 degrees was immaterial. 04:26:56

21 And for that matter, the difference between 04:27:02

22 minus 7.66 and 7.7 is probably immaterial. It 04:27:04

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1       **was significantly less than minus 10, which is**       04:27:11

2       **what I was looking for.**       04:27:13

3           Q.       Let's go to paragraph 117, the last       04:27:15

4       sentence on page 68 of 94. You say, "For       04:27:21

5       example, if we were using a sensor and 2500       04:27:24

6       pixels across the diagonal."       04:27:28

7                   Do you see that?       04:27:31

8           **A.       Yes.**       04:27:31

9           Q.       Where did you get the sensor with       04:27:32  
10       2,500 pixels from?       04:27:34

11           **A.       Well, it seems to me the COOLPIX**       04:27:37  
12       **came out in, like, '99, so it's kind of an easy**       04:27:40  
13       **camera to just pull. I mean, could have had**       04:27:44  
14       **more. But I knew that the COOLPIX, Nikon**       04:27:45  
15       **COOLPIX was available in 2001.**       04:27:51

16           Q.       Is the Nikon COOLPIX a CCTV camera?       04:27:53

17           **A.       It's just a camera. It's a -- it's**       04:27:57  
18       **a standard combo still video camera like --**       04:28:00  
19       **like a lot of people have. Like everyone has**       04:28:05  
20       **in their phone these days.**       04:28:08

21           Q.       So it's not a CCTV camera that you       04:28:09  
22       would use for monitoring a parking lot, for       04:28:12



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1 example? 04:28:20

2 A. No. This is just the number I 04:28:20

3 happened to pick. I knew the camera -- I 04:28:21

4 wanted to make sure the sensor was available. 04:28:24

5 Because if the sensor is available, someone 04:28:26

6 could make a camera out of it to do practically 04:28:27

7 anything. 04:28:30

8 So Nikon buys those sensors from 04:28:30

9 somebody, probably Sony or Micron or someone. 04:28:33

10 And then Sony or Micron or someone mass 04:28:38

11 produces these chips and other people can put 04:28:40

12 them in different form factors. 04:28:44

13 Q. Are you aware of this chip ever 04:28:46

14 being in a CCTV camera? 04:28:47

15 A. I didn't try to find one. I didn't 04:28:49

16 look. I -- and I was only merely using the 04:28:51

17 2,500 pixels as a -- kind of a benchmark to see 04:28:56

18 where these calculations would get you in terms 04:28:58

19 of number of pixels. 04:29:01

20 It could be 5,000 or 10,000. But I 04:29:04

21 just wasn't sure. But I knew the 2,500 was 04:29:09

22 available, so that's why I picked that one. 04:29:11

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1 Q. What do you mean by "pixels"? 04:29:14

2 A. The -- all of these -- all of these 04:29:16

3 sensors have an array of pixels, usually CMOS, 04:29:22

4 but not always CMOS, and the pixels divide up 04:29:27

5 the chip into -- you know, a thousand across by 04:29:31

6 a thousand down. That would be a mega-pixel 04:29:34

7 camera or a million pixels total. 04:29:38

8 The Apple iPhones have something 04:29:41

9 like 8.4 mega-pixels. So that's 8.4 million 04:29:44

10 pixels distributed across the array. 04:29:48

11 Q. So pixels obviously have different 04:29:49

12 sizes, right? 04:29:52

13 A. For different sensors, yes. 04:29:53

14 Q. So what is the size of the pixel in 04:29:59

15 your calculation here? 04:30:04

16 A. It's unitless. I did the analysis 04:30:05

17 in pixels. 04:30:09

18 Q. So it makes no difference how big 04:30:12

19 the actual sensor is whether or not, you know, 04:30:15

20 how many pixels you're going to -- going to 04:30:20

21 change depending on how the lens behaves? 04:30:22

22 A. That's correct. The lens -- the 04:30:27

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1 lens has some focal length, and it has some 04:30:30  
2 chip size. It has some field of view and some 04:30:34  
3 number of pixels. 04:30:37

4 I felt the most meaningful analysis 04:30:38  
5 to do would not be to take some cell phone chip 04:30:40  
6 that was available in 2001. 04:30:44

7 It would be more meaningful to just 04:30:47  
8 say, okay, we'll just -- we'll just generalize 04:30:48  
9 it and say if you've got 2,500 pixels instead 04:30:51  
10 of, you know, exactly this many pixels with 04:30:55  
11 each pixel being 4 microns or something like 04:30:57  
12 that, it's all sort of immaterial. 04:31:01

13 What matters to the image and the 04:31:03  
14 display function, and whether or not it is 04:31:05  
15 significant for the purposes of this 04:31:07  
16 compression and expansion, the pixel is the 04:31:09  
17 correct quantity. I don't care if it's a 04:31:12  
18 20-micron pixel or a 2-micron pixel. What I 04:31:15  
19 care about is how many more pixels did I get. 04:31:18

20 Q. So, I mean, how big is a pixel 04:31:20  
21 normally? 04:31:23

22 A. It depends completely on the camera. 04:31:23

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1 On some of the satellites that I do, the pixels 04:31:26  
2 are in the 10-micron range. In some of the 04:31:30  
3 spectrometers that I design for laboratory 04:31:33  
4 equipment, they are 15 to 30 microns. 04:31:35

5 Q. Uh-huh. 04:31:38

6 A. In your cell phone camera, there are 04:31:38  
7 probably 2 or 3 microns. 04:31:40

8 Q. So less than a full pixel is a 04:31:42  
9 negligible amount, right? 04:31:46

10 A. Actually not always. And I -- I 04:31:50  
11 wasn't exactly sure how to quantify this, so 04:31:53  
12 that's why I sort of just left it in pixels so 04:31:57  
13 that the reader could decide, you know, how 04:32:00  
14 much is this and is it a lot. 04:32:02

15 A pixel is a kind of -- it's a 04:32:04  
16 quanta, right? It's an easily understood 04:32:07  
17 number. 04:32:09

18 But in some applications that I 04:32:09  
19 do -- like I do reconnaissance mapping cameras. 04:32:11  
20 And those oftentimes -- we're talking about 04:32:14  
21 10th pixel as a significant difference in terms 04:32:18  
22 of distortion, because they're mapping cameras. 04:32:21

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1 It's really very important. 04:32:24

2 But I think that's extreme. I think 04:32:25

3 a pixel is a pretty reasonable number to say if 04:32:29

4 it's less than a pixel, it's probably not that 04:32:32

5 important. And if it's more than a pixel, it 04:32:35

6 probably is, just as a -- just as a number to 04:32:37

7 kind of put it in context. 04:32:40

8 It's hard to -- hard to get your 04:32:41

9 head around what's the difference between -- at 04:32:43

10 least for me. It's hard for me to get my head 04:32:45

11 around what's the difference between 9.88 and 04:32:48

12 7.7, for example. How big a deal is this? So 04:32:52

13 this little analysis helped me kind of get my 04:32:55

14 head around it. 04:32:57

15 Q. Uh-huh. And if the change is less 04:32:58

16 than a pixel, you mean it will have little 04:33:08

17 effect on the performance of the lens? 04:33:14

18 A. It depends on the application, 04:33:16

19 but -- but as a good rule of thumb, if it's 04:33:18

20 less than a pixel, it's -- there are probably 04:33:20

21 bigger issues to confront than that. 04:33:23

22 If it's more than a pixel, then it's 04:33:25

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1       **certainly in play. It's something that -- that** 04:33:28  
2       **it's a -- it's a significant parameter.** 04:33:30  
3       Q.     Let's go to paragraph -- let's go to 04:33:32  
4       paragraph 123. 04:33:58  
5       **A.     That was 123?** 04:34:00  
6       Q.     Yeah, 123. 04:34:02  
7       **A.     I'm there.** 04:34:13  
8       Q.     So about the third line down it 04:34:13  
9       says, "As we can plainly see, Embodiments 1 and 04:34:16  
10      2 have a maximum deviation less than 2 percent, 04:34:20  
11      nowhere close to the at least plus or minus 04:34:23  
12      10 percent described in the '990 patent. And 04:34:27  
13      these embodiments in Tada's view are 04:34:32  
14      substantially the same as Embodiment 3." 04:34:34  
15             Do you see that? 04:34:37  
16      **A.     Yes, I do.** 04:34:37  
17      Q.     Where in Tada does it say that 04:34:39  
18      Embodiment 3 is substantially the same as 04:34:41  
19      Embodiments 1 and 2? 04:34:44  
20      **A.     Oh, did I not indicate that? My** 04:34:45  
21      **apologies. It is -- hang on. I can find it** 04:34:54  
22      **quickly. I know where it is. It's between the** 04:34:59



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1           A.     I think I included that figure just 04:36:05  
2           because I thought somebody would want to know. 04:36:08  
3           Let me see. Where did I put that? Just a 04:36:18  
4           minute. It was before the centroids I 04:36:20  
5           remember. The centroids doesn't make any sense 04:36:22  
6           at 380. 04:36:25  
7                     Here it is. Yes. It's the figure 04:36:26  
8           at the bottom of page 58 of 94. And it's 5.2. 04:36:28  
9           You were exactly right. 04:36:32  
10          Q.     Sorry. 58 of 94? 04:36:34  
11          A.     58 of 94. It shows a max of minus 04:36:37  
12          5.2. 04:36:44  
13          Q.     I see. 5.2, uh-huh. 04:36:45  
14          A.     Uh-huh. 04:36:47  
15          Q.     So even under your corrected 04:37:01  
16          analysis of Embodiment 3, you're getting almost 04:37:03  
17          two to three times the maximum deviation of 04:37:09  
18          Embodiments 1 and 2, right? 04:37:12  
19          A.     I think that's correct. I want to 04:37:15  
20          make sure that that's apples to apples. Please 04:37:20  
21          give me a moment. 04:37:23  
22          Q.     Okay. 04:37:25





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1 5.2 was the UV analysis which I consider 04:38:54  
2 specious. 04:38:57

3 If I were to say for an 04:38:57  
4 apples-to-apples comparison, Embodiment 1 was 04:39:00  
5 minus 1.2, Embodiment 2 was minus 1.1, 04:39:03  
6 Embodiment 3 was minus 4.5. 04:39:06

7 And the question, do I think those 04:39:09  
8 are substantially the same, that's -- that's an 04:39:13  
9 interesting question, because what -- what -- I 04:39:16  
10 wasn't the one who said that they were all 04:39:22  
11 substantially the same. That's Tada. 04:39:24

12 Tada felt these were substantially 04:39:25  
13 the same. And that's telling, right? When 04:39:27  
14 Tada was doing his distortion analysis, he 04:39:30  
15 showed an F10 theta distribution. 04:39:33

16 So, in his mind, the difference 04:39:35  
17 between these three solutions was negligible, 04:39:37  
18 because he didn't care about DIVmax, right? 04:39:42

19 This is -- this is completely a 04:39:46  
20 construct that he did not look at and never 04:39:48  
21 reported and had no interest in. He was 04:39:50  
22 reporting on the peak distortion like we 04:39:53

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1 ordinarily do in optical design. 04:39:56

2 So it was Tada's words that said 04:39:58

3 these are substantially the same which tells us 04:40:00

4 that he didn't care about DIVmax. 04:40:07

5 Q. Do you think they're substantially 04:40:09

6 the same, 1.2 and 5? 04:40:11

7 A. Well, again, 4.6. Please stop using 04:40:12

8 the 5 term, because that's not an 04:40:17

9 apples-to-apples comparison. 04:40:20

10 Q. 4.6 and 1.2. 04:40:21

11 Do you believe the maximum deviation 04:40:24

12 of 1.2 and a maximum deviation of 4.6 are 04:40:25

13 substantially the same? 04:40:29

14 A. No, I do not. I think those are -- 04:40:29

15 Q. Why not? 04:40:31

16 A. -- pretty different. 04:40:32

17 Well, as I explained in my little 04:40:35

18 pixel analysis, the difference -- I think -- if 04:40:37

19 you -- if you start from my arbitrary 2,500 04:40:40

20 pixels, each percentage change from linear 04:40:45

21 moves the image height more than 5 pixels. 04:40:51

22 So to go from 4.6 to 1, that's 3.5 04:40:55

1       percentage points, so that would be 15, 16,       04:41:01  
2       maybe even 20 pixels. That's a big difference.   04:41:05  
3               MR. BREGMAN: Why don't we take a       04:41:10  
4       little break.                                       04:41:11  
5               THE WITNESS: Okay.                       04:41:11  
6               MR. BREGMAN: 15 minutes or so, if       04:41:14  
7       you don't mind.                                   04:41:15  
8               (Whereupon, a recess was taken at       04:41:22  
9       4:41 p.m.)                                       05:00:55  
10       BY MR. BREGMAN:                                 05:00:56  
11               Q.       So getting into the home stretch   05:00:57  
12       here, Mr. Aiken. Why don't we turn to       05:00:59  
13       paragraph 78 of your declaration.             05:01:03  
14               A.       And it's Mr. Aikens, by the way. I   05:01:06  
15       didn't want to correct you before, but it's   05:01:10  
16       showing up on a lot of documents.             05:01:14  
17               What was the page again?               05:01:16  
18               Q.       42 of 94.                       05:01:18  
19               A.       Thank you.                       05:01:21  
20               I'm there.                               05:01:27  
21               Q.       The last sentence on that page says,   05:01:28  
22       "Here I am referring to the RGB telemodel, or   05:01:29

1 the additive color model for human vision 05:01:34

2 perception which dates back to 1931 (CIE 05:01:36

3 1931). " 05:01:40

4 Do you see that? 05:01:40

5 **A. Yes.** 05:01:40

6 Q. And the color model is shown on the 05:01:41

7 following page; is that correct? 05:01:47

8 **A. Yes. That's the -- I think that's 05:01:48**

9 **the figure from Pedrotti, if I remember right? 05:01:51**

10 **Yes.** 05:01:57

11 Q. Why don't we open Pedrotti, which is 05:01:58

12 Exhibit 2012. 05:02:03

13 **A. Yes, I have it. What page? 05:02:14**

14 Q. So if I'm looking at this reference, 05:02:30

15 Exhibit 2012, page 13 of that reference has got 05:02:34

16 a title, "Photometry." 05:02:39

17 Do you see that? 05:02:44

18 **A. Yes, I do.** 05:02:44

19 Q. And the second sentence of that 05:02:45

20 paragraph says, "Photometry, on the other hand, 05:02:47

21 applies only to the visible spectrum portion of 05:02:50

22 the optical spectrum." 05:02:52

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1 Do you see that? 05:02:54

2 **A. Yes.** 05:02:54

3 Q. And carries on saying, "Whereas 05:02:54

4 the" -- 05:03:02

5 (Audio technical difficulties; 05:03:03

6 stenographer asks for 05:03:03

7 clarification.) 05:03:03

8 BY MR. BREGMAN: 05:03:03

9 Q. "Whereas radiometry involves purely 05:03:04

10 physical measurements, photometry takes into 05:03:13

11 account the response of the human eye to 05:03:16

12 radiant energy at various wavelengths and so 05:03:18

13 involves psychophysical measurements." 05:03:21

14 So we're talking about what the 05:03:26

15 human eye sees, right? 05:03:28

16 **A. Yes, photometry is based on human 05:03:30**

17 **vision.** 05:03:38

18 Q. And it says, "The distinction rests 05:03:38

19 on the fact that the human eye, as a detector, 05:03:40

20 does not have a 'flat' spectral response." 05:03:43

21 Do you see that? 05:03:46

22 **A. Yes.** 05:03:46

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1 Q. If we keep going a little bit, I'm 05:03:47  
2 going to skip a bit. It says, "When we use 05:03:54  
3 photometric quantities, then, we are measuring 05:03:57  
4 the properties of visual radiation as they 05:04:00  
5 appear to the normal eye rather than as they 05:04:03  
6 appear to an 'unbiased' detector." 05:04:06  
7 Do you see that? 05:04:08  
8 **A. Yes.** 05:04:08  
9 Q. So when we're talking about 05:04:08  
10 photometry and the chart that you have on the 05:04:12  
11 next page, which we'll get into in a minute on 05:04:14  
12 Figure 2.7, this is all with respect to what a 05:04:17  
13 human eye sees and not as it says here, "rather 05:04:19  
14 than they appear to an 'unbiased' detector," 05:04:23  
15 right? 05:04:27  
16 **A. It's referring to visible light,** 05:04:27  
17 **right? So, yes, that's correct.** 05:04:29  
18 Q. As detected by a human eye? 05:04:31  
19 **A. As detected by a human eye; that's** 05:04:33  
20 **correct.** 05:04:35  
21 Q. And when we're talking about all of 05:04:35  
22 these cameras, the lens directs the light to a 05:04:40

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1 sensor, not into a human's eye, right? 05:04:45

2 **A. Yes, that's correct.** 05:04:49

3 Q. A little bit further, it says, "The 05:04:51

4 relative response or sensation of brightness 05:05:08

5 for the eye is plotted versus wavelength, 05:05:10

6 showing that peak sensitivity occurs at the 05:05:12

7 'yellow-green' wavelength of 555 nm. 05:05:16

8 "Actually the curve shown is the 05:05:18

9 luminous efficiency of the eye for photopic 05:05:21

10 vision, that is, when adapted for day vision. 05:05:25

11 For lower levels of illumination, when adapted 05:05:28

12 for night or scotopic vision, the curve shifts 05:05:31

13 towards the 'green,' peaking at 510 05:05:34

14 nanometers." 05:05:37

15 Do you see that? 05:05:38

16 **A. Yes, I do.** 05:05:39

17 Q. So this curve is just for daylight 05:05:39

18 of what a human eye sees, but as you get in 05:05:44

19 towards dimmer illumination, such as night, the 05:05:47

20 entire curve shifts and is centered about 510, 05:05:52

21 right? 05:05:59

22 **A. That's incorrect.** 05:05:59



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1 Q. So this article is incorrect? 05:06:00

2 A. No, no. It's correct. What you 05:06:02

3 said is incorrect. The entire curve doesn't 05:06:03

4 shift. The peak shifts. But the curve stays 05:06:06

5 roughly the same. 05:06:09

6 Q. The curve stays identical but the 05:06:10

7 peak shifts -- 05:06:12

8 A. No, not identical. No, it shifts. 05:06:12

9 I actually have the scotopic curve. I don't 05:06:16

10 think it's in Pedrotti. 05:06:19

11 But the scotopic curve starts to 05:06:21

12 rise a little faster than the photopic curve 05:06:24

13 around about 450, and it peaks out at about 05:06:27

14 510, 515, somewhere in there. And then it 05:06:31

15 rolls off and continues all the way out to, 05:06:34

16 like, 650. 05:06:37

17 So it -- it kind of -- it skews, but 05:06:38

18 it doesn't just -- it doesn't just shift. The 05:06:41

19 cutoff is still down at the 410, 420 range for 05:06:45

20 both photopic and scotopic. And that's just 05:06:48

21 because of physiology. 05:06:51

22 Q. Of a human eye? 05:06:52



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1 But that's a common scenario. On equipment 05:07:44  
2 that I make, for example, I can -- anything 05:07:46  
3 that is going to get back to a person as the 05:07:50  
4 observer, I would use a photopic reversal 05:07:52  
5 filter. 05:07:56

6 Q. So in a CCTV camera that often you 05:07:56  
7 want to look at things at night, and sometimes 05:07:59  
8 you even have infrared illumination, you are 05:08:04  
9 going to still follow what the -- sorry -- what 05:08:11  
10 the photopic -- photopic curve looks like for a 05:08:13  
11 standard human eye during daylight? 05:08:18

12 A. In the absence of any other 05:08:21  
13 information except red, green, blue or visual 05:08:22  
14 application, yeah, the photopic curve is pretty 05:08:26  
15 standard. 05:08:29

16 Q. And at what level of light is the 05:08:29  
17 lowest that you can start seeing the human -- 05:08:33  
18 that human beings can start seeing? 05:08:36

19 A. Actually that's really interesting. 05:08:38  
20 I remember reading a while ago that at even 100 05:08:40  
21 photons, if the eye is perfectly dark adapted, 05:08:43  
22 it still sense -- can still be sensed by the 05:08:46

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1 human eye. Can't really make out shapes or 05:08:49  
2 resolution or anything at that level, but you 05:08:52  
3 can actually detect it. 05:08:53

4 Q. I'm sorry. At what wavelength? 05:08:55

5 A. At 100 photons. Oh, I'm sorry. I 05:08:56  
6 thought you were talking intensity. You mean 05:09:00  
7 in wavelengths? 05:09:04

8 Q. Yes. 05:09:04

9 A. Well, this curve is fairly accurate. 05:09:05  
10 So the energy content below about 450 05:09:07  
11 nanometers is pretty much zero for any visual 05:09:10  
12 application. There might be a percent of light 05:09:12  
13 down there. 05:09:20

14 Q. So if we turn to your Figure 4, this 05:09:22  
15 PMMA glass, which is just about paragraph 82. 05:09:29

16 A. Yes. 05:09:35

17 Q. And I look directly under the 05:09:35  
18 figure, it says, "At wavelengths above 400 nm, 05:09:37  
19 the transmission is constrained by the Fresnel 05:09:41  
20 losses" -- which amount to two times 05:09:44  
21 3.86 percent, i.e., approximately 8 percent. 05:09:47  
22 "Below 400 nm, the bulk absorption 05:09:50

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1 of Plexiglass becomes dominant." The sample 05:09:54  
2 doesn't transmit any light to 360 nm. 05:09:58  
3 So this is letting in light -- some 05:10:02  
4 lights above 360, no light below 360. And that 05:10:05  
5 includes, you know, below 400 nm. 05:10:10  
6 You'd agree with that? 05:10:14  
7 **A. I think actually in the paper it 05:10:15**  
8 **refers to 405 as the wavelength where the PMMA 05:10:17**  
9 **starts absorbing. So anything below 405. But 05:10:24**  
10 **I said 400 because that's sort of the accepted 05:10:27**  
11 **definition of the top of the UVA range. 05:10:30**  
12 **Q. What do you mean, "starts 05:10:33**  
13 **absorbing"? 05:10:34**  
14 **A. Well, you can see if the curve is 05:10:35**  
15 **flat in this relative transmission plot, it 05:10:39**  
16 **means that the amount of light is invariant 05:10:42**  
17 **with thickness. 05:10:46**  
18 **It's just -- it's losing light 05:10:49**  
19 **simply because of the air/glass and glass/air 05:10:50**  
20 **interface. And here I'm using that term 05:10:54**  
21 **generically because, of course, it's a plastic. 05:10:56**  
22 **Q. Uh-huh. 05:10:58**

1           **A.**     But those two interfaces drop about     05:10:59  
2           8 percent. So you would expect the performance     05:11:02  
3           in a region where the glass or plastic is not     05:11:04  
4           absorbing to be 92 percent or higher.             05:11:08  
5                     And you can see it starts rolling     05:11:11  
6           off right at -- you know, right at about 405.     05:11:13  
7           And then anything below that, the more glass     05:11:18  
8           you put in, or the more plastic in this case,     05:11:21  
9           the more light you're going to lose. And in     05:11:23  
10          this case, by 380 nanometers you've lost more     05:11:26  
11          than half the light for 2 mms of thickness.     05:11:30  
12          **Q.**     So only half of the light will make     05:11:32  
13          it through at 380 nanometers?                   05:11:34  
14          **A.**     That's correct. With 2 mm             05:11:38  
15          thickness, yeah.                                 05:11:41  
16          **Q.**     Why don't we go to Exhibit 1005.     05:11:41  
17          Let me know when you're there.                 05:12:11  
18          **A.**     Is that Baker?                         05:12:12  
19          **Q.**     Yeah.                                     05:12:14  
20          **A.**     I have it open.                         05:12:16  
21          **Q.**     Is that U.S. Patent 5,686,957     05:12:17  
22          referred to as Baker in your declaration?     05:12:22

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1	<b>A. Yes.</b>	05:12:27
2	Q. Let's go to Column 13. Last	05:12:27
3	paragraph of Column 13.	05:12:35
4	Do you see that?	05:12:39
5	<b>A. Not yet. Hang on.</b>	05:12:40
6	<b>Okay. I'm there.</b>	05:12:43
7	Q. So it says, "The panoramic image	05:12:44
8	provided by the Image A is ideally suited for	05:12:47
9	teleconferencing."	05:12:50
10	I think we discussed that earlier;	05:12:52
11	is that correct?	05:12:56
12	<b>A. Yes, I think we did discuss this</b>	05:12:56
13	<b>when we were talking about my overview of Baker</b>	05:12:58
14	<b>perhaps.</b>	05:13:00
15	Q. It says, "For example, with the	05:13:01
16	image lens apparatus mounted in the center of	05:13:02
17	the conference table, from the plane of the	05:13:05
18	table, a hemispheric view is presented."	05:13:07
19	What does that mean?	05:13:10
20	<b>A. It means that if you're using a</b>	05:13:11
21	<b>panoramic image which has a plus and minus</b>	05:13:20
22	<b>90-degree or more field of view and you've</b>	05:13:24

1       imaged that onto the -- onto the sensor using       05:13:26  
2       Baker's method of expanding the outer part       05:13:31  
3       while contracting the inner part, then you       05:13:34  
4       would see on the projected screen, you would       05:13:39  
5       see a circle. And in the center of it would be       05:13:41  
6       the ceiling, and around the edges would be the       05:13:44  
7       people.       05:13:46

8             Q.       So we're trying -- we're trying to       05:13:48  
9       enhance the image by expanding where the people       05:13:50  
10       are, right?       05:13:54

11            **A.       Right.**       05:13:55

12            Q.       And if you can expand some where you       05:13:56  
13       got to compress somewhere else so we are sort       05:13:59  
14       of losing image quality of the ceiling and       05:14:01  
15       we're getting better image quality of the       05:14:05  
16       people, right?       05:14:07

17            **A.       That is what Baker says, yes.**       05:14:09

18            Q.       And then it goes on to say, "If the       05:14:11  
19       participants of the conference are seated       05:14:15  
20       around the table and the microphone array       05:14:16  
21       located conveniently on the table, the       05:14:19  
22       important image information, i.e., the       05:14:21



1 participants, are found with the imager along a 05:14:23  
2 10- to 30-degree or 45-degree segment of the 05:14:26  
3 horizon, by far the bulk of the images of 05:14:32  
4 interest." 05:14:36  
5 Do you see that? 05:14:37  
6 **A. Yes, I do.** 05:14:37  
7 Q. So it's the area of interest that 05:14:38  
8 they're focusing on is along a 10- to 30-degree 05:14:41  
9 or 10- to 45-degree segment of the horizon; is 05:14:44  
10 that correct? 05:14:48  
11 **A. Yeah. Baker is solely about the** 05:14:48  
12 **horizon; that's correct.** 05:14:50  
13 Q. Okay. And then it goes on to say, 05:14:51  
14 "Therefore, using the present invention with 05:14:56  
15 audio detection to determine the direction of 05:14:58  
16 the current speaker, the desired image segments 05:15:01  
17 can be electronically manipulated," blah, blah, 05:15:04  
18 blah, blah, blah, blah. 05:15:04  
19 I think really what we -- I am 05:15:08  
20 trying to get at here is once Baker knows where 05:15:11  
21 the people are, it will expand the image where 05:15:15  
22 the people are and otherwise compress the image 05:15:21

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1 elsewhere; is that correct? 05:15:23

2 **A. No. Baker is always talking about 05:15:25**

3 **the periphery. So we know where his people 05:15:27**

4 **are. The people are always around the 05:15:29**

5 **periphery. 05:15:31**

6 **Q. Around the periphery of the lens, I 05:15:32**

7 **get that. 05:15:34**

8 **A. The view, yeah, the -- around -- 05:15:35**

9 **Q. From the horizon down, starting at 05:15:36**

10 **the horizon is the border -- is the conference 05:15:39**

11 **room table, right? 05:15:41**

12 **A. At the -- no. Well -- I'm not sure. 05:15:42**

13 **But, yeah, the horizon is all the way out at, 05:15:45**

14 **let's say, 90 degrees, just to make it 05:15:47**

15 **convenient, right? 05:15:49**

16 **Q. So if that's the horizon, that's 05:15:50**

17 **90 degrees -- 05:15:58**

18 **A. So that's everybody's -- that would 05:15:58**

19 **be everybody's belly button, say -- 05:15:58**

20 **(Simultaneous unreportable 05:15:58**

21 **cross-talk occurs among parties.) 05:15:59**

22 **///**

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1                   **(Stenographer requests one speaker**     05:15:59  
2                   **at a time.)**   05:16:00  
3       BY MR. BREGMAN:                                     05:16:00  
4           Q.       So we -- 90 degrees -- I guess       05:16:05  
5           that's zero degrees when you're talking about   05:16:09  
6           here, right?                                     05:16:12  
7           **A.       We should stick to 90 degrees just**     05:16:13  
8           **because that's the convention of the other**       05:16:15  
9           **patents, so...**                                     05:16:17  
10          Q.       Okay. But when it's talking about     05:16:18  
11          this 10 degrees or 30 degrees or 45 degrees,    05:16:20  
12          that's measuring from the horizon, right?       05:16:26  
13          **A.       That's correct.**                             05:16:28  
14          Q.       Okay. So just in trying to stick       05:16:29  
15          with what this patent's saying, you would say    05:16:32  
16          that -- that the horizon is at sort of the       05:16:34  
17          person's belly button, right?                     05:16:39  
18          **A.       As I understand it, yeah.**                   05:16:40  
19          Q.       Okay. And then 10 degrees up from     05:16:42  
20          the horizon would be where?                     05:16:44  
21          **A.       Depends on the size of the table and**     05:16:46  
22          **the application and the lens design, but the**       05:16:50

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1 way he's describing it, he's saying -- let's 05:16:52

2 see. What is -- what is his word? 05:16:56

3 The participants are found along the 05:16:59

4 10- to 30-degree or 45-degree segment of the 05:17:01

5 horizon. So he's saying small table, maybe 05:17:04

6 it's 45 degrees; big table, maybe it's, you 05:17:07

7 know, 10 or even -- you know, 10 to 30 degrees 05:17:11

8 depending on how big the table would be. 05:17:14

9 Q. Right. 05:17:16

10 A. So I took that as a -- anywhere from 05:17:16

11 80 degrees to 90 or from all the way to 45 05:17:20

12 degrees to 90. That's the potential range of 05:17:24

13 what Baker is talking about. 05:17:28

14 Q. Well, hold on a second. I mean, it 05:17:31

15 says here found with the image along a 10 to 30 05:17:33

16 degrees or 45 degrees. So that's from 10 to 30 05:17:36

17 or from 10 to 45, right? 05:17:40

18 A. Oh, I see your point. Yeah, yeah. 05:17:42

19 So that would be from 80 to 60 degrees. 05:17:44

20 Q. Okay. 05:17:49

21 A. Yeah. You're right. 80 to 60 05:17:50

22 degrees in the space of these -- these images 05:17:53



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REPORTER CERTIFICATE

I, JESSICA R. WAACK, Certified  
Realtime Reporter, Registered Diplomate  
Reporter, California Certified Realtime  
Reporter, Certified Court Reporter in New  
Jersey, New York Association Certified  
Reporter, New York Realtime Court Reporter and  
Notary Public of the State of New York, County  
of Kings, the officer before whom the  
proceedings were taken, do hereby certify that  
the foregoing transcript is a true and accurate  
record of these proceedings; that said  
proceedings were taken in Stenotype note by me  
on October 1, 2020, commencing at 11:04 a.m.  
and ending at 5:18 p.m.

I further certify that present on  
behalf of LG ELECTRONICS INC., DION M. BREGMAN,  
of MORGAN LEWIS & BOCKIUS LLP, and on behalf of  
IMMERVISION, INC., STEPHEN E. MURRAY, of PANITCH  
SCHWARZE BELISARIO & NADEL LLP.

04:26:00

(Certification continued to next page.)

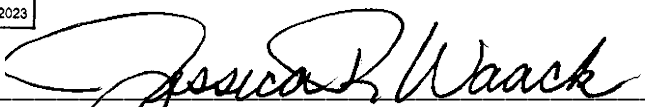
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REPORTER CERTIFICATE CONTINUED

I further certify that I am not related to, nor associated with any of the parties or their attorneys, nor do I have any disqualifying interest, personal or financial in the actions within.

Dated this 4th day of October, 2020, at Kings County, New York.

Jessica Waack  
NOTARY PUBLIC, STATE OF NEW YORK  
Registration No. 01WA6333128  
Qualified in Kings County  
Commission Expires November 31, 2023



JESSICA R. WAACK  
Registered Diplomate Reporter  
Certified Realtime Reporter  
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ACKNOWLEDGMENT OF DEPONENT

I, David Aikens, do hereby  
 acknowledge that I have read and examined the  
 foregoing testimony, and the same is a true, correct  
 and complete transcription of the testimony given by  
 me, and any corrections appear on the attached Errata  
 Sheet signed by me.

10/16/20



(DATE)

(SIGNATURE)

NOTARIZATION (If Required)

State of \_\_\_\_\_

County of \_\_\_\_\_

Subscribed and sworn to (or affirmed) before me on  
 this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by  
 \_\_\_\_\_, proved to me on the  
 basis of satisfactory evidence to be the person who  
 appeared before me.

Signature: \_\_\_\_\_

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Caption: LG Electronics Inc. v. Immervision, Inc.

Deponent: David Aikens

Dep. Date: October 1, 2020

I wish to make the following changes for the following reasons:

Pg.	Ln.	Now Reads	Should Read	Reasons Therefore
24	2	imagine	image	typo
25	11,12	phone	film (2 locations)	typo
28	3, 4	phone	film (2 locations)	typo
42	18	know of their	no other	typo
73	7	creating ratio	creating a ratio	omission
74	20	DR equals FDC alpha	$dr=Fdc(\alpha)$	not clear as written
74	20	equals K alpha	$= K\alpha$	not clear as written
86	12	problem is that	problem is, that	typo
89	6	F10 Theta	f tan (theta)	not clear as written
89	15	viewings	viewers	typo

  
 \_\_\_\_\_  
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this 16<sup>th</sup> day of October, 2020.

ERRATA SHEET FOR THE TRANSCRIPT OF:

Caption: LG Electronics Inc. v. ImmerVision, Inc.  
 Deponent: David Aikens  
 Dep. Date: October 1, 2020

I wish to make the following changes for the following reasons:

Pg.	Ln.	Now Reads	Should Read	Reasons Therefore
94	5	00	0, 0	Transcription error
94	5	1 maxfield angle	1, max field angle	Transcription error
94	6	90 degrees. In some	90 degrees, in some	Transcription error
94	21	00	0, 0	Transcription error
94	22	1 maximum	1, maximum	Transcription error
95	20	00	0, 0	Transcription error
96	11	image	imagine	Typo
97	22	than x and y	in x and y	Transcription error
99	7	cosign	cosine	Transcription error
100	5	cosign	cosine	Transcription error
106	20	A negative lenses	A negative lens	Transcription error

  
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ERRATA SHEET FOR THE TRANSCRIPT OF:

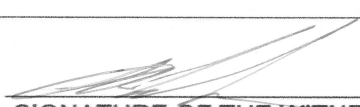
Caption: LG Electronics Inc. v. Immervision, Inc.

Deponent: David Aikens

Dep. Date: October 1, 2020

I wish to make the following changes for the following reasons:

Pg.	Ln.	Now Reads	Should Read	Reasons Therefore
107	1	-imaging	diverging	Transcription error
108	3	a stigmatism	astigmatism	Transcription error
110	20	H equals F10 Theta	$H=f \tan(\Theta)$	not clear as written
111	1-2	F10 Theta line	$f \tan(\Theta)$ line	not clear as written
112	5	F10 Theta	$f \tan(\Theta)$	not clear as written
115	7	length	lens	Transcription error
115	10	I might DNDT	I might need $dn/dt$	Transcription error
116	2	French Physicist	German Physicist	Witness mis-spoke
136	1	to find.	to find it.	omission
136	3	Theoried	varied	Transcription error
146	4	sine	sign	Transcription error

  
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I wish to make the following changes for the following reasons:

Pg.	Ln.	Now Reads	Should Read	Reasons Therefore
150	10	command analysis	command "Analysis/	not clear as written
150	11	surface sag table	surface/sagtable	not clear as written
151	7	sine	sign	Transcription error
151	9	sine	sign	Transcription error
198	4-5	F10 Theta	f tan (Theta)	not clear as written
205	20	get	gets	Transcription error
210	8	Lens is ...	If the lens is	omission
210	16	One of these	In one of these	omission
213	22	That is Tada	That's where Tada	Transcription error
223	19	F 1.3	f/1.3	not clear as written
234	5	coefficient	coefficients	omission

  
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