UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS INC.
Petitioner

v.

IMMERVISION, INC.
Patent owner

IPR2020-00179

IPR2020-00195

Patent No. 6,844,990

REMOTE EXAMINATION of DAVID AIKENS

TAKEN ON

THURSDAY, OCTOBER 1, 2020

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

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.

A P P E A R A N C E S

(all appearing remotely)

ON BEHALF OF THE PETITIONER:

MORGAN LEWIS & BOCKIUS LLP
BY: DION M. BREGMAN, ESQ.
1400 Page Mill Road
Palo Alto, California 94304-1124
PHONE: 650-843-7519
EMAIL: Dion.bregman@morganlewis.com

-and-

MORGAN LEWIS & BOCKIUS LLP
BY: BRADFORD A. CANGRO, ESQ.
1111 Pennsylvania Avenue NW
Washington, D.C. 20004-2541
PHONE: 202-739-5088
EMAIL: Bradford.cangro@morganlewis.com

APPEARANCES CONTINUED:

ON BEHALF OF THE PATENT OWNER:

PANITCH SCHWARZE BELISARIO & NADEL LLP
BY: STEPHEN E. MURRAY, ESQ.
2001 Market Street, Suite 2800
Philadelphia, Pennsylvania
19103-7044
PHONE: 215-965-1307
EMAIL: SMurray@panitchlaw.com

-and-

PANITCH SCHWARZE BELISARIO & NADEL LLP
BY: JOHN D. SIMMONS ESQ., ESQ.
2200 Concord Pike, Suite 201
Wilmington, Delaware 19803
PHONE: 302-394-6021
EMAIL: Jsimmons@panitchlaw.com

A L S O P R E S E N T

RUSSELL A. CHIPMAN, Expert for Petitioner

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INDEX TO EXAMINATION

WITNESS: DAVID AIKENS

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INFORMATION REQUESTED

None

WITNESS INSTRUCTED NOT TO ANSWER

None

INDEX TO PREVIOUSLY MARKED EXHIBITS

WITNESS: DAVID AIKENS

Thursday, October 1, 2020

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

** No exhibits were included in the transcript **

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PROCEEDINGS

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

New York, New York

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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. We just met. So we are going to go through just a couple of introductory questions related to depositions. 11:04:42 11:04:45 11:04:49 11:04:51

So have you ever had your deposition taken before? 11:04:51 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 I've been deposed three times, so this will be my fourth. 11:04:57 11:05:04 11:05:06

Q. What was the most recent one? 11:05:07
A. July -- I want to say 20th, on that order. 11:05:09 11:05:16
Q. Are these all patent cases? 11:05:17
A. No. Some are patents, some are contract law. 11:05:19 11:05:21
Q. And the most recent one was a patent case? 11:05:23 11:05:26
A. The most recent one is a civil case. 11:05:27
Q. And the one in July, that was also via videoconference? 11:05:29 11:05:34
A. That was videoconference, yes. 11:05:37
Q. So we'll go through some sort of basic ground rules which I'm sure you've heard a million times before, and then we'll talk about a remote deposition. That's a little bit different. 11:05:39 11:05:41 11:05:44 11:05:47 11:05:49
All your answers need to be verbal responses, of course. It's particularly important now because we're not all sitting together, and Jessica, our court reporter, needs to hear your response, not a nod of the 11:05:49 11:05:51 11:05:54 11:05:57 11:05:59

head, for example. 11:06:01
Is that okay with you? 11:06:02
A. Yes. 11:06:05
Q. If you don't understand a question 11:06:06
and you need clarification, just feel free to 11:06:08
ask me to rephrase the question. 11:06:11
We're going to be taking a break 11:06:13
about every hour. Of course, if you need a 11:06:15
break at any other time, just let me know, and 11:06:17
we can take a break. I just ask that you 11:06:21
finish answering the line of questions that we 11:06:23
are busy dealing with at the time. 11:06:25
Do you understand that you are under 11:06:29
oath as if testifying in a court of law? 11:06:31
A. Yes, I do. 11:06:35
Q. Is there any reason why you can't 11:06:37
answer my questions fully and truthfully today? 11:06:39
A. No, there is not. 11:06:41
Q. Are you taking medication that would 11:06:43
affect your testimony? 11:06:45
A. No, I'm not. 11:06:47
Q. All right. Since we're not in 11:06:49

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

computer other than the documents that we are discussing; is that okay? 11:07:47 11:07:50

A. I understand. 11:07:51

Q. And you'll let me know if you're looking at any of the other documents in front of you other than the ones I've directed your attention to, right? 11:07:52 11:07:54 11:07:56 11:08:00

A. Yes. 11:08:02

Q. I also ask that you refrain from using chat or instant messaging features on your computer or phone while I'm -- until I'm finished asking my questions today; is that okay? 11:08:02 11:08:04 11:08:07 11:08:12 11:08:14

A. Yes. 11:08:15

Q. Thanks. 11:08:15

Finally, just like a regular deposition, you're forbidden from discussing your testimony with your counsel until I'm done asking you questions. 11:08:19 11:08:21 11:08:23 11:08:26

Do you understand that? 11:08:26

A. Yes. 11:08:28

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

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

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

Q. Okay. 11:08:50

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

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

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

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

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

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

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

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

Is that okay? 11:09:23

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

Q. Why don't we look at Exhibit 1001. And that's U.S. Patent 6,844,990.

A. I have it.

Q. And is this the patent that you've provided your opinions on?

A. Yes, it is.

Q. And has the patent been --

(Audio technical difficulties; stenographer asks for clarification.)

BY MR. BREGMAN:

Q. And it is the patent that is being challenged in the IPRs, right?

A. Yes.

Q. And I'm going to refer to it as either "the '990 patent" or "the patent."

Is that okay?

A. Yes.

Q. And you recognize this Exhibit 1001? You've seen it before?

A. I do.

Q. Why don't you briefly tell me what

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

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

Is that all right? 11:10:46

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

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

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

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

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

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

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

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

the IPRs? 11:11:42
A. That's correct. 11:11:45
Q. Okay. Sorry. I cut you off. Why don't you continue telling me about the inventions. 11:11:46 11:11:50 11:11:52
A. Well, as you can see from my Section 6, I go through the patent and the claim summary. I'm not exactly sure what you specifically want to know. 11:11:55 11:11:59 11:12:02 11:12:05
Q. I just want to know sort of in a nutshell what you believe the invention of the patent, the '990 patent is all about. 11:12:06 11:12:08 11:12:12
A. Well, it is about panoramic imaging and display. 11:12:17 11:12:22
Q. Panoramic imaging and display, of course, is -- 11:12:23 11:12:26
A. I'm sorry. Could you repeat that? You're breaking up a little. 11:12:27 11:12:28
Q. Panoramic imaging and display, in and of itself is not new, right? 11:12:29 11:12:34
A. Panoramic imaging dates back to roughly to the 1840s. 11:12:36 11:12:41

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

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

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

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

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

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

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

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

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

and tell me what -- what the invention is. 11:13:44
A. **Well, actually, first we should look at Figure 5.** 11:13:47 11:13:50
Q. Okay. 11:13:51
A. **Figure 5 puts the context -- puts the invention in a little better context. This is the prior art.** 11:13:52 11:13:55 11:13:58
Q. Uh-huh. 11:14:01
A. **So this figure describes a series of angles in object space and a series of heights in image space. And it shows a linear relationship between the angle and the height on the detector.** 11:14:03 11:14:05 11:14:09 11:14:12 11:14:15
In the patent, it specifically describes the Angle A2 as being half of A1. In this particular figure, A1 is drawn incorrectly. It should extend from line A all the way to the optical axis. 11:14:16 11:14:19 11:14:25 11:14:28 11:14:30
So A2 is half of A1. And similarly, the image of those -- the image point related to those object points are A prime and B prime at the image plane, and they would have heights 11:14:33 11:14:36 11:14:38 11:14:41

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

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

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

Q. Okay. So I think I got that. 11:15:28

So if we go back to Figure 4A and 4B, how does that apply to what we just discussed with respect to Figure 5? 11:15:29 11:15:32 11:15:34

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

degrees, 20 degrees, 30 degrees and so on. 11:15:51
In this particular case, the lens in 11:15:54
question is imaging over plus or minus 90 11:15:58
degrees diameter. So there is the -- the 11:16:00
circles relating to the field angles are C10, 11:16:05
C20 and so on up to C90. 11:16:09
Q. Uh-huh. And lenses are always round 11:16:12
or circular, as you said? 11:16:16
A. I'm just describing this figure. 11:16:17
Q. Okay. And my question just 11:16:20
generally, are lenses always circular? 11:16:22
A. That's -- that's a very broad 11:16:24
question. In what context? In this patent? 11:16:27
Q. In this patent. 11:16:31
A. In this patent. 11:16:32
Q. Are lenses circular? 11:16:33
A. No, I believe not. We'll have to 11:16:36
look at a different figure. Should we leave 11:16:39
this line for the moment? 11:16:42
Q. Why don't we look at that figure. 11:16:42
We'll come back in a second. 11:16:44
A. In this patent, there is Figure 18, 11:16:45

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

Q. I see. 11:17:03

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

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

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

Q. Uh-huh. 11:17:25

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

Q. Yep. 11:17:30

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

Q. I see. What shape would that normally have? 11:17:40 11:17:42

A. Like I said, it could be elliptical, it could be square, it could be rectangular. 11:17:43 11:17:47

Q. Sticking with Figure 18, what is No. 43? 11:17:50 11:17:52

A. I'm not sure. I'll have to take a look at the specification, if that's all right. 11:17:53 11:17:57

Q. Sure. 11:17:59

A. The beam is deflected by the mirror, M2 is sent onto an Image Sensor 43. So Item 43 in Figure 18 is the image sensor. 11:18:00 11:18:17 11:18:22

Q. Are imaging sensors -- what shape are image sensors normally? 11:18:24 11:18:26

A. In this particular case, I don't believe the specification says what the shape of the image sensor is. The sensors, again, come in lots of different shapes and sizes. 11:18:28 11:18:31 11:18:33 11:18:36

Q. You can get a circular image sensors? 11:18:38 11:18:39

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

THE WITNESS: Speaking in the 11:18:49

context of, like -- like a camera or in the context of a satellite? What... 11:18:51 11:18:55

BY MR. BREGMAN: 11:19:00

Q. I'm not sure what's the difference between a satellite and a camera. 11:19:00 11:19:01

A. Well, I guess the simplest answer is sensors come in lots of different shapes. 11:19:05 11:19:07

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

A. Well, so first of all, there's -- there is a difference between an image sensor and a camera. 11:19:12 11:19:23 11:19:25

So, I mean, that's why the question is so vague, it's very difficult for me to approach it. But if you consider Item 43, which is an image sensor, you can certainly get round image sensors. They do exist. 11:19:25 11:19:27 11:19:30 11:19:32 11:19:35

Q. You say there's a difference between a camera and an image sensor. What's the difference? 11:19:39 11:19:41 11:19:43

A. An image sensor is -- it can mean a lot of different things, including a camera. 11:19:43 11:19:47

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

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

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

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

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

So camera, some people would call a camera just an imagine sensor. Other people would call a camera the image sensor and its processing electronics. Others would call it the entire encapsulated system like in my phone where it has a lens and an image sensor and electronics that's behind it. Some might even include the software in the definition of the camera. 11:20:45 11:20:49 11:20:51 11:20:55 11:20:58 11:21:01 11:21:04 11:21:06 11:21:07

Q. And you might even have cameras that don't have an image sensor -- right? -- just analog camera? 11:21:08 11:21:10 11:21:12

A. I think -- I'm not sure that that's possible. I'd have to think about it. I'm not -- so you can have an image sensor that is not a camera. I'm not sure you can have a camera that doesn't have an image sensor involved somewhere. 11:21:13 11:21:22 11:21:26 11:21:29 11:21:31 11:21:33

Q. I mean, once upon a time we had analog cameras. People called them cameras, and they didn't have an image sensor, right? 11:21:34 11:21:37 11:21:40

A. Oh, sure. Yes. For example, Thomas 11:21:43

Sutton, when he invented the panoramic camera, he included a -- I think it was a silver nitrate plate that was on a curved plane, and that was his image sensor. 11:21:44 11:21:47 11:21:49 11:21:52

Q. Uh-huh. 11:21:53

A. In the sense -- in a very broad sense of image sensor. It's not an electronic sensor. It's a -- it's a chemical plate that can record images. 11:21:53 11:21:55 11:21:57 11:22:02

Q. So it's your belief that a chemical plate or a chemical phone, a photographic phone, is a form of an image sensor? 11:22:04 11:22:07 11:22:11

MR. MURRAY: Objection to form. 11:22:14

THE WITNESS: I was just describing the case where Thomas Sutton invented the panoramic camera, and that's pretty indisputable that it is a camera and that it had a way of recording the image. And that recording device was what we would now call film, but it was a glass plate. 11:22:15 11:22:20 11:22:23 11:22:25 11:22:28 11:22:31 11:22:34

BY MR. BREGMAN: 11:22:37

Q. So you're saying that glass plates 11:22:38

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

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

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

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

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

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

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

Q. Sure. 11:23:37

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

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

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

(Pause in testimony.) 11:24:36

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

By the way, is Figure 4A and 4B also the prior art? 11:26:21 11:26:24
A. Yes, that's prior art. 11:26:25
Q. Okay. So can you tell me what the relationship is between Figure 5 prior art and Figures 4A and 4B prior art. 11:26:26 11:26:29 11:26:33
A. Well, I believe I explained Figure 4A. Would you like me to go through it again or should we move on to 4B? 11:26:35 11:26:38 11:26:40
Q. No, I understand Figure 4A, thanks. 11:26:42
A. Uh-huh. 11:26:44
So Figure 4B is a different way of representing the information associated with the spacing between each of those circles in Figure 4A. In this figure, the X axis is the angle in degrees, and the Y axis is the relative height at the image plane. 11:26:45 11:26:48 11:26:50 11:26:54 11:26:58 11:27:03
And there is a line, a linear relationship which is indicated as FDC, which shows the height of the image for a given field angle. And as you can see, it's a straight line, and it is a linear relationship so that 11:27:07 11:27:09 11:27:13 11:27:20 11:27:22

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

just so I -- 11:28:38
Q. So the lens that's represented schematically in Figure 4A will have the characteristics of whatever is shown in Figure 4B irrespective of where the chart in Figure 4B was plotted or not, right? 11:28:39 11:28:41 11:28:43 11:28:46 11:28:50
MR. MURRAY: Objection to form. 11:28:53
THE WITNESS: Once again, Figure 4A is not a lens. Figure 4A is a distribution of concentric rings which is shown schematically in a 2D pattern, and then it is shown in a 1D pattern in the relationship in Figure 4B. So these are two figures representing the same information. 11:28:54 11:28:57 11:29:01 11:29:03 11:29:07 11:29:10 11:29:12 11:29:14
BY MR. BREGMAN: 11:29:14
Q. Why don't we just skip Figure 4A altogether. 11:29:15 11:29:17
A. All right. 11:29:20
Q. 5A is a schematic of a lens, right? 11:29:21
A. It is a -- yeah, called a cartoon, but, yeah. It is a -- it is a representation 11:29:25 11:29:28

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

Q. Okay. And why -- sorry. Why do you call it a cartoon? 11:29:32 11:29:34

A. Well, it's -- it's not -- it's not, for example, what we see in Figure 15 or Figure 16, which would be more of a schematic of a lens, which actually shows surfaces and information about the lens. 11:29:35 11:29:41 11:29:46 11:29:50 11:29:56

Here the lens is just represented kind of generically with Item 15. It's -- and the figure is intended to show the relationship between the field angles and the image heights. 11:29:57 11:30:02 11:30:05 11:30:07

Q. Uh-huh. 11:30:10

A. So calling it a schematic is being far too generous. I'd call it a cartoon that shows the relationship between object space and image space. 11:30:10 11:30:13 11:30:16 11:30:20

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

A. Well, when I say the term "a lens schematic," I'm meaning something that's more like Figure 15, Figure 16, Figure 18, something which shows the relative positions of 11:30:23 11:30:28 11:30:31 11:30:36

individual elements. 11:30:38

May also include showing rays and stops and other mechanical features that may be important to the image. That's what I would refer to as a schematic. 11:30:40 11:30:44 11:30:47 11:30:50

Q. I just looked up the word schematic as we were talking, and I want to know if you agree with this definition. 11:30:51 11:30:53 11:30:56

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

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

THE WITNESS: Well, I don't see what you're looking at exactly, but could you repeat that again? How would you like to define schematic for the purposes of this discussion? 11:31:07 11:31:08 11:31:10 11:31:12 11:31:14

BY MR. BREGMAN: 11:31:14

Q. I want to know if you agree with this. Is a schematic "a symbolic and simplified diagnose or other representation"? 11:31:16 11:31:18 11:31:20

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

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

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

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

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

A. Indeed. 11:33:35

Q. Okay. 11:33:37

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

Q. I see. 11:33:51

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

A. In this case, I would refer to Figure 5 and Figure 6 as cartoons, because 11:34:02 11:34:06

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

location relative to one another? 11:35:03
A. **For example, sure.** 11:35:04
Q. What else does it show? 11:35:08
A. **It depends on what's being represented schematically, right? In the case of 5A and 5B, what the author was trying to schematically represent was a relationship between angles and space.** 11:35:10 11:35:13 11:35:17 11:35:22 11:35:24
In the case of Figure 16, the author is schematically representing the individual elements that, when combined, form an imager. So this is a lens schematic in that it has lenses labeled L1, L2, L3, L4, L5, L6, and L7. 11:35:25 11:35:30 11:35:34 11:35:37 11:35:41
Q. Okay. 11:35:47
A. **It has an apodizer labeled D1, and it shows their relative spacing as well.** 11:35:47 11:35:50
Q. And this was drawn to scale? 11:35:53
MR. MURRAY: Objection to form. 11:36:06
THE WITNESS: Well, I can't say I took a ruler to it. It certainly looks reasonable. So is it drawn to scale? Well, it is not drawn to -- to specifically 11:36:09 11:36:11 11:36:14 11:36:17

emphasize some feature or other which would mean it would not be drawn to scale. 11:36:21 11:36:24
So I think the answer is I don't know. 11:36:26 11:36:29
BY MR. BREGMAN: 11:36:29
Q. And what would -- what would allow you to know whether it's drawn to scale? 11:36:30 11:36:32
A. Well, if I had an optical model of that lens, for example. 11:36:34 11:36:36
Q. Are patent figures normally drawn to scale? 11:36:39 11:36:42
A. In all of the patents that I have done where I've been the author, when I include lens schematics, I output them directly from the optical design program. So although they may not be perfectly scaled in X and Y, they're relatively well scaled. 11:36:42 11:36:47 11:36:51 11:36:54 11:36:57 11:37:00
Q. But what do you mean not perfectly scaled in X and Y? 11:37:02 11:37:04
A. Yes. Well, you can have printing errors which contract the length of the -- of one axis with respect to the other. It's 11:37:05 11:37:07 11:37:09

called anamorphism. So it might be slightly anamorphic because of printing errors.

But ultimately it is intended to be a proper representation of the relative heights and positions of the lenses.

Q. But you wouldn't give this figure, for example, Figure 16 from the '990 patent, to someone to build a lens system, right?

MR. MURRAY: Objection to form. Also I'm not sure it's in the scope of the declaration.

BY MR. BREGMAN:

Q. You can answer.

A. Could you repeat the question, please?

Q. Would you feel comfortable giving Figure 16 from the '990 patent to a lens manufacturer to build this lens?

MR. MURRAY: Same objections.

THE WITNESS: Is there something in my declaration that you -- that you're discussing --

BY MR. BREGMAN: 11:38:13
Q. I'm asking -- I'm asking you a question about the Figure 16. Would you -- 11:38:14 11:38:15
A. Are you asking me that in general or in the specific context of this patent? 11:38:17 11:38:20
Q. Would you feel comfortable giving a figure like this, Figure 16, to a lens manufacturer to build a lens? 11:38:23 11:38:24 11:38:27
MR. MURRAY: Same objections. 11:38:30
THE WITNESS: When I design optical systems, and I have them manufactured, I often include a schematic that looks like this in the information packet that's given to the manufacturer. 11:38:32 11:38:38 11:38:41 11:38:43 11:38:45
BY MR. BREGMAN: 11:38:52
Q. So I'm not asking if you'd give it in a packet that includes other things. 11:38:52 11:38:54
My question is: Would you take Figure 16 and feel comfortable using that to build a lens? That's your roadmap, that's your blueprint. Figure 16, a figure from a patent, would you be comfortable manufacturing a lens 11:38:56 11:38:58 11:39:03 11:39:08 11:39:10

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

A. No. 11:39:17

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

THE WITNESS: To change -- to change 11:39:19
the perspective a little bit, you could say 11:39:21
could you take Figure 16 and make a lens 11:39:28
which could make a proper image with no 11:39:31
other information than that shown in 11:39:34
Figure 16 and making no assumptions? And 11:39:36
the answer is no. 11:39:40

But you could reasonably start from 11:39:42
Figure 16 and create a lens that could make 11:39:45
a perfectly good image. 11:39:48

BY MR. BREGMAN: 11:39:50

Q. Now, you said the X and Y dimensions 11:39:50
may not be correct, there may be printing 11:39:52
errors. 11:39:56

A. Sure. 11:39:56

Q. How -- how could you be sure there 11:39:57
are not printing errors when using this 11:40:01
Figure 16 from the '990 patent to build a lens, 11:40:03
an actual lens? 11:40:08

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

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

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

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

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

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

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

right? 11:42:11
A. When I'm referring to a model, I'm describing a specific kind of model which is a computer representation of a lens. 11:42:11 11:42:14 11:42:17
Q. And it's a theoretical lens, right? 11:42:20
A. That's correct. It's a computer simulation. It could be used to manufacture a lens. It could be a model based on actual measurements of lenses, or it could be just a -- a model that's being used to figure out a particular problem that I'm trying to solve. 11:42:23 11:42:30 11:42:33 11:42:37 11:42:42 11:42:46
Q. So you -- there are instances where you would not take a theoretical lens from a model and actually build the lens? 11:42:48 11:42:50 11:42:54
A. I didn't understand that question. 11:43:00
Q. Do you always -- 11:43:01
A. Can you repeat it? 11:43:02
Q. Do you always have to take your model and build the lens in the real world, or do you often work with models that are theoretical? 11:43:03 11:43:06 11:43:08 11:43:10
A. Well, in my work -- 11:43:11

MR. MURRAY: Objection. 11:43:18
THE WITNESS: -- I am almost always 11:43:19
designing lenses that I intend to build. 11:43:23
There are occasionally times when I will 11:43:26
build a model to understand how an optical 11:43:28
aberration performs over angles or in some 11:43:31
specific configuration. 11:43:34
In my class, my tutorial class, for 11:43:36
example, we frequently build models we 11:43:39
never intend to build. 11:43:41
BY MR. BREGMAN: 11:43:43
Q. So I could build a model 11:43:44
theoretically that has characteristics that may 11:43:46
not even exist in the real world? For example, 11:43:50
I may -- I may invent, I may think that I've 11:43:54
got a new material, for example, and run that 11:43:59
through a simulation or model to see how that 11:44:03
theoretical lens would operate, right? 11:44:08
MR. MURRAY: Objection to form. 11:44:13
THE WITNESS: I don't think I've 11:44:14
ever done that. 11:44:24
///

BY MR. BREGMAN: 11:44:25
Q. I'm not asking whether you've done 11:44:25
it. I'm asking: Is that a possibility? 11:44:26
MR. MURRAY: Objection to form. 11:44:31
THE WITNESS: So you're asking in 11:44:31
the general, hypothetical context, could 11:44:35
someone build a Zemax or Code V model of a 11:44:37
lens which was based on some fiction? 11:44:43
BY MR. BREGMAN: 11:44:43
Q. Correct. 11:44:46
A. Is that the question? 11:44:46
Q. Yeah. 11:44:47
A. I suppose that's always possible. 11:44:54
Q. So returning to Figure 16, just so 11:44:55
I'm clear on this before we move on. You 11:44:57
believe that although patent figures are 11:45:02
generally not drawn to scale, you would be 11:45:06
comfortable taking dimensions off of figures, 11:45:09
such as Figure 16, and using that as an 11:45:12
accurate representation of the lens depicted in 11:45:15
that figure; is that right? 11:45:21
MR. MURRAY: Objection to form. 11:45:22

THE WITNESS: In the case of the 11:45:24
'990 patent, I would have no reason to do 11:45:26
that. 11:45:28
In other cases, though, when I've 11:45:30
been attempting to reverse engineer someone 11:45:33
else's patent, this may be all I have to 11:45:35
start from, just a schematic. 11:45:38
And I'll do the best I can to 11:45:41
recreate that and then start varying things 11:45:44
that I know could be variable and try to 11:45:46
design a lens that is what I'll call in the 11:45:49
family of the design that was described in 11:45:51
the patent. 11:45:55
That doesn't mean I've recreated a 11:45:56
specific lens. I've created a member of an 11:45:59
ensemble of possible solutions. 11:46:02
Is that more clear? 11:46:06
BY MR. BREGMAN: 11:46:06
Q. Yeah. So figure -- just to be 11:46:08
clear, Figures 15, 16, and 17 for that matter, 11:46:10
are not lenses that are covered by the claims 11:46:13
that we are discussing today -- right? -- 11:46:17

Claims 5 and 21 of the '990 patent? 11:46:20
MR. MURRAY: Objection to form. 11:46:24
Outside the scope of the declaration. 11:46:26
BY MR. BREGMAN: 11:46:28
Q. Let me back up a little bit. 11:46:28
So you've given opinions with regard to the patentability of certain claims in this patent; is that right? 11:46:30 11:46:32 11:46:36
A. I'm sorry. Could you repeat the question? I was thinking about your other question. 11:46:37 11:46:41 11:46:43
Q. No problem. 11:46:44
You provided opinions regarding the patentability of certain claims in the '990 patent; is that right? 11:46:45 11:46:47 11:46:51
A. I've provided a declaration analyzing the arguments made by Dr. Chipman that certain claims in the patent were obvious or anticipated. 11:46:51 11:46:56 11:47:02 11:47:04
Q. And it's your belief that those claims are neither obvious nor anticipated, right? 11:47:08 11:47:10 11:47:14

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

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

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

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

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

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

BY MR. BREGMAN: 11:47:47

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

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

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

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BY MR. BREGMAN: 11:48:01
Q. And if you gave me a straight answer, we could move on to the next question. 11:48:01 11:48:03
MR. MURRAY: Objection. 11:48:05
BY MR. BREGMAN: 11:48:06
Q. Do you have an opinion on whether the claims are obvious or anticipated? 11:48:07 11:48:08
MR. MURRAY: Same objections. 11:48:10
THE WITNESS: I don't recall if I wrote in my declaration a specific opinion on the -- on the claims themselves. I only recall writing a document that was refuting the arguments that had been made by Dr. Chipman. 11:48:11 11:48:16 11:48:20 11:48:25 11:48:29 11:48:32
BY MR. BREGMAN: 11:48:33
Q. So as you sit here today, you don't recall whether or not you have an opinion on whether the claims are obvious or anticipated; is that correct? 11:48:33 11:48:35 11:48:37 11:48:41
MR. MURRAY: Object to form. 11:48:41
Please give me a chance to object, Dr. Aikens. 11:48:42 11:48:47

THE WITNESS: I'm sorry. 11:48:47
MR. MURRAY: No problem. 11:48:48
THE WITNESS: Well, here. Let me take a quick look. I've gotten all flustered and my pages are all shuffled together. I'm sorry. 11:48:49 11:48:50 11:49:01 11:49:04
BY MR. BREGMAN: 11:49:04
Q. No problem. Take your time. 11:49:04
A. I've actually mixed it in with the patent at this point. Okay. So let's see. 11:49:06 11:49:08
(Pause in testimony.) 11:49:17
As I'm looking through my declaration, I do not see a stated opinion regarding the general obviousness or patentability of those claims. 11:50:07 11:50:08 11:50:10 11:50:17
I have to point out that I'm expert. I'm not a lawyer. So something like patentability or validity or any of that, that would be a -- that's a legal issue that really is out of my purview. 11:50:21 11:50:25 11:50:27 11:50:33 11:50:35
What I do is I -- I'm an expert in optical design, and I can talk to the technical 11:50:37 11:50:40

information that's -- that's been provided to me and that I've found on my own.

Q. That's -- I'm not -- Mr. Aikens, I'm not accusing you of anything. I'm just asking you whether you have an opinion on whether the Claims 5 and 21 of the '990 patent are nonobvious, not anticipated. That's all. If you don't have an opinion on that, that's fine.

A. I think the answer is I do not have an opinion on that at this time.

Q. Okay. So which -- which claims of the patent -- is it fair to say that the claims that Dr. Chipman has provided an opinion on are Claims 5 and 21 of the '990 patent?

A. That's correct.

Q. And is it fair to say that your rebuttal of Dr. Chipman's opinions relate to those same claims?

A. Yes.

Q. Are there any other claims that you provided any opinions on?

A. Just a moment. I just want to give

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

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

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

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

BY MR. BREGMAN: 11:53:50

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

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

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

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

BY MR. BREGMAN: 11:54:26

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

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

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

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

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

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

BY MR. BREGMAN: 11:55:03

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

MR. MURRAY: Same objections. 11:55:06
THE WITNESS: I don't know how to answer it except to say that these -- Figures 15 and 16 are meant to be cross section and exploded cross section of the first embodiment of the invention. 11:55:07 11:55:09 11:55:12 11:55:17 11:55:19
BY MR. BREGMAN: 11:55:22
Q. Okay. Is it -- 11:55:23
A. The claims are -- the claims are related to the embodiment through the specification. 11:55:23 11:55:25 11:55:28
Q. And which of the figures in the patent relate to the first embodiment of the invention? 11:55:28 11:55:30 11:55:33
MR. MURRAY: Objection. Form. And outside the scope. 11:55:36 11:55:38
THE WITNESS: Reading the descriptions of the figures, Figures 5 and 6 relate to the image points and object angles information. 7A and 7B show a first example of the nonlinearity of a panoramic objective lens. 11:55:39 11:55:47 11:55:56 11:56:03 11:56:12 11:56:16

BY MR. BREGMAN: 11:56:17
Q. When you say "first example," that's 11:56:17
the first embodiment? 11:56:20
A. It's described as the first example 11:56:21
in the specification. 11:56:24
Q. Okay. 11:56:25
A. Figure 8 shows a second example of 11:56:29
nonlinearity. 11:56:31
Figure 9 shows a third example of 11:56:32
the nonlinearity. 11:56:35
Figure 10 shows a system for 11:56:36
displaying the panoramic image. 11:56:38
Figure 11 schematically shows the 11:56:40
first embodiment of the correction method. 11:56:42
Figure 12 is a flowchart. 11:56:45
Figure 13 schematically shows a 11:56:48
second embodiment of the correction method. 11:56:50
Figure 14 shows a flowchart. 11:56:53
Figure 15 is a cross section of a 11:56:55
first embodiment of a nonlinear panoramic 11:56:58
objective lens according to the present 11:57:02
invention. 11:57:05

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

BY MR. BREGMAN: 11:58:09
Q. And which figure shows what's being -- what's being claimed in Claims 5 and Claim 21? 11:58:10 11:58:12 11:58:17
MR. MURRAY: Same objections. 11:58:18
BY MR. BREGMAN: 11:58:21
Q. Let's take them one at a time. 11:58:21
Does Figure 4B, is that -- is that covered by -- does that show a representation of what's in Claims 5 and 21? 11:58:23 11:58:26 11:58:30
MR. MURRAY: Same objections. 11:58:33
THE WITNESS: It is a figure that helps illustrate the concept of the linearity of field relationships. 11:58:34 11:58:37 11:58:39
BY MR. BREGMAN: 11:58:40
Q. Okay. Do the claims cover a linear diagram as shown in Figure 4B? 11:58:41 11:58:48
A. I don't understand what you mean by "cover." Are you trying to get -- 11:58:50 11:58:52
Q. Figure 4B is the prior art. So if you are you saying that the prior art is the claims, is a depiction of what's being claimed, 11:58:53 11:58:55 11:58:59

well, then you guys have got a problem. So I'm trying to understand which figures cover the embodiment that's being claimed. 11:59:03 11:59:05 11:59:09

MR. MURRAY: Objection to form. 11:59:12
Outside the scope. 11:59:14

BY MR. BREGMAN: 11:59:18

Q. You tell me Figure 4B, that's it, that's what's being claimed, then that's fine. I just want to know which figure best represents what is being shown in the claims -- 11:59:18 11:59:21 11:59:23 11:59:27

MR. MURRAY: Same objections. 11:59:29

BY MR. BREGMAN: 11:59:30

Q. -- what is being claimed in Claims 5 and 21 of the '990 patent, Exhibit 1001. 11:59:30 11:59:34

MR. MURRAY: Same objections. 11:59:38

THE WITNESS: Are you asking me to interpret these claims? 11:59:39 11:59:50

BY MR. BREGMAN: 11:59:50

Q. Yes, I'm asking you to interpret the claims. 11:59:54 11:59:55

A. I don't believe I included that anywhere in my report. 11:59:57 11:59:58

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

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

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

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

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

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

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

the claim -- the embodiment is meant to be a -- as I said before, a member of the ensemble. It is a representative example showing the invention. 12:02:02 12:02:04 12:02:07 12:02:12

BY MR. BREGMAN: 12:02:14

Q. Could I pick up this document, if I was a person of skill in the art, read Claim 5, read Claim 21, and build a lens per the description in this patent? 12:02:14 12:02:16 12:02:20 12:02:26

MR. MURRAY: Objection to form. Outside the scope of the declaration. 12:02:28 12:02:29

THE WITNESS: Could you repeat the question again, please? 12:02:33 12:02:38

BY MR. BREGMAN: 12:02:38

Q. Could I pick up this document if I was a person of skill in the art at the relevant time period, read Claim 5, read Claim 21, and build a lens per the description in this patent? 12:02:39 12:02:41 12:02:46 12:02:49 12:02:51

MR. MURRAY: Same objections. 12:02:52

THE WITNESS: Well, to be more specific, I do believe that a person of 12:02:53 12:02:54

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

And can the witness -- can you please leave the room for a few minutes, Mr. Aiken [as spoken]? 12:03:40 12:03:42 12:03:51

THE WITNESS: Sure. 12:03:51

MR. BREGMAN: Just give us five minutes. 12:03:51 12:03:53

(Pause in testimony.) 12:03:54

(Mr. Aikens leaves the room.) 12:04:01

(Whereupon, discussion held off the record.) 12:14:09 12:14:40

(Whereupon, a break for lunch was taken from 12:14 p.m. to 12:58 p.m.) 12:14:40 12:46:00

BY MR. BREGMAN: 12:58:41

Q. So, Mr. Aiken, why don't we turn to Exhibit 2009. That's your declaration we were talking about a little bit earlier. 12:58:43 12:58:49 12:58:51

A. Yes, yes. 12:58:53

Q. Can you turn to page -- why don't, just for convenience, we'll talk about the page number being 7 of 94 instead of the actual document number. 12:58:54 12:59:01 12:59:03 12:59:06

A. Okay. 12:59:08

Q. So page 7 of 94. 12:59:08
A. Yes. 12:59:13
Q. Paragraph 11, you say, "In forming my opinions expressed in this declaration, I've considered and relied upon my education, background, and experience. In addition, I have reviewed and in some cases relied upon the following list of materials in preparation of this declaration." 12:59:13 12:59:17 12:59:19 12:59:22 12:59:25 12:59:27 12:59:29
Do you see that? 12:59:30
A. Yes. 12:59:30
Q. And what follows is a list of all of the documents that you've considered in reaching your conclusions in your declaration; is that correct? 12:59:31 12:59:35 12:59:38 12:59:41
A. Yes. 12:59:41
Q. And is this list complete? 12:59:42
A. I believe so, yes. 12:59:45
Q. Exhibit 1013, can I presume that's a typo, "Dave from Code V analysis"? 12:59:53 12:59:57
A. Yeah. That should be "data." 01:00:03
Q. Let's go to page 12 of 94. This is 01:00:07

under a heading that says level of skill in the art.

Do you see that?

A. I do.

Q. So paragraph 24, one, two, three, four -- fifth -- sixth line down says, "While I do not necessarily agree with Dr. Chipman's opinion."

Which opinion are you talking about? His definition of a person of ordinary skill in the art?

A. Yes.

Q. All right. And what is it that you don't agree with about his opinion?

A. As I said in the report, it doesn't materially affect the analysis. So for the purposes of the document, I used Dr. Chipman's definition of a POSA.

Q. Okay. But I would like to know why -- what it is that you don't necessarily agree with.

A. I haven't thought about it in

careful enough detail to give you a specific reason why I would or would not like his definition. 01:01:12 01:01:14 01:01:17

I just don't necessarily agree with it. I didn't consider for myself, in studying the documents, what I would recommend as a POSA. I simply used Dr. Chipman's recommendation. 01:01:17 01:01:20 01:01:24 01:01:27 01:01:29

Q. I see. So you didn't -- 01:01:30

(Audio technical difficulties; stenographer asks for clarification.) 01:01:39 01:01:39 01:01:39

BY MR. BREGMAN: 01:01:39

Q. So it's not that you disagree with Dr. Chipman's opinion; it's just that you haven't formed your own position on it; is that right? 01:01:40 01:01:42 01:01:46 01:01:49

A. It is just that I do not necessarily agree. 01:01:49 01:01:51

Q. And why don't you necessarily agree? 01:01:51

A. Because I have not come to a conclusion of what kind of a POSA I would like 01:01:53 01:01:58

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

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

Do you see that? 01:02:24

A. Yes. 01:02:25

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

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

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

Do you see that? 01:03:10

A. Yes. 01:03:11

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

distribution function? 01:03:14
A. The image point distribution function is the distribution of image points with respect to field angle such as that shown in Figure 4B just above it. 01:03:47 01:03:49 01:03:51 01:03:54
Q. So the line shown in Figure 4B with a reference numeral attached it, FDC, that linear line is an image point distribution function? 01:03:57 01:04:04 01:04:08 01:04:10
A. That's correct. 01:04:12
Q. And the phrase "image point distribution function" is something that the inventors of the '990 patent conceived of? 01:04:15 01:04:21 01:04:26
MR. MURRAY: Objection to form. 01:04:29
THE WITNESS: Could you repeat the question? 01:04:30 01:04:31
BY MR. BREGMAN: 01:04:31
Q. The phrase "image point distribution function," is that a phrase that the inventors of the '990 patent conceived of? 01:04:32 01:04:36 01:04:43
MR. MURRAY: Objection to form. 01:04:48
THE WITNESS: "Image point 01:04:49

distribution function" is not a standard term in the art. 01:04:50 01:04:51

BY MR. BREGMAN: 01:04:53

Q. Was it a term that you were familiar with prior to the '990 patent? 01:04:55 01:04:57

A. I don't believe so, no. 01:05:00

Q. And is it a common term that's used in optics today? 01:05:06 01:05:11

A. Again, it is not a term used in the art. 01:05:14 01:05:17

Q. So is it your belief that the inventors of the '990 patent coined the phrase? 01:05:18 01:05:22

A. I don't know that that's the case. 01:05:28

Q. But you had never heard of it before the patent? 01:05:30 01:05:34

A. I don't believe so, no. 01:05:34

Q. Have you heard of it absent the '990 patent in the work you've done related to it? Have you heard that term being used at any point in your career? 01:05:36 01:05:39 01:05:42 01:05:45

A. I may have, but I don't recall. 01:05:58

Q. What is a "maximum divergence"? 01:06:00

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

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

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

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

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

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

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

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

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

Q. Sure. 01:08:25

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

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

A. Sure. 01:08:34

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

Exhibit 1001. 01:08:36
So I see an equation on line 2 01:08:44
around about line 40? 01:08:47
A. No. That's a linear distribution. 01:08:53
Q. Hold on. So I'm -- let's come back 01:09:01
to this in a second. But you told me when we 01:09:03
were looking at it a moment ago in your 01:09:06
declaration that -- that the Figure 4B was a 01:09:08
linear distribution function -- sorry -- was 01:09:17
a -- was a -- was an image point distribution 01:09:20
function. 01:09:24
Is that incorrect? Figure 4B is 01:09:26
actually a linear distribution function? 01:09:29
A. Figure 4B is an image point 01:09:33
distribution function which is linear. 01:09:37
Q. Okay. And that figure has the 01:09:40
equation which was -- I just referred to in 01:09:44
Column 2, line 40, right? 01:09:48
A. The equation you're referring to is 01:09:52
DR equals FDC alpha equals K alpha. That's 01:09:54
just describing a line. And that line is the 01:09:59
line in Figure 4. 01:10:04

Q. Okay. And that's -- that's an image point distribution function? 01:10:05 01:10:07
A. Which is linear. 01:10:09
Q. Which is linear. 01:10:10
So that is the equation for image point distribution function? 01:10:12 01:10:14
A. No. That's not correct. 01:10:16
MR. MURRAY: Objection. 01:10:18
THE WITNESS: That is an equation of a line. 01:10:18 01:10:19
Perhaps the easiest way to find it would be to refer to Dr. Chipman's declaration, because I know where it is in that. Would that be all right with you? 01:10:25 01:10:27 01:10:28 01:10:30
BY MR. BREGMAN: 01:10:32
Q. I would like to stick with the patent seeing that's what we're talking about. So let's try and find it in the patent looking through it as well. 01:10:33 01:10:34 01:10:35 01:10:41
Is this maybe Column 8, line 56? 01:10:41
A. Yes, that's it. 01:10:51
Q. That starts with -- 01:10:53

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

image and the edges of the image and expands the intermediate zone of the image located between the center and the edges of the image." 01:12:04 01:12:06 01:12:08

Q. And Claim 5 includes Claim 1? 01:12:13

A. That's correct. 01:12:16

Q. Is that correct? 01:12:17

I'm going to go back to Claim 1. This is in Exhibit 1001, Column 19. 01:12:20 01:12:26

If you look just before where it says plus or minus 10 percent, it says, "The distribution function having a maximum divergence of at least plus or minus 10 percent." 01:12:31 01:12:32 01:12:34 01:12:37 01:12:39

Do you see that? 01:12:39

A. Yes, I do. 01:12:40

Q. So where the claim is talking about the maximum divergence, we should basically substitute the equation from the stand of what the maximum divergence is into this claim? 01:12:41 01:12:43 01:12:47 01:12:52

A. I used the equation that was shown that we were just discussing to calculate my maximum divergence in considering Dr. Chipman's 01:12:58 01:13:01 01:13:04

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

Q. And that's because the inventors of the patent defined what the maximum divergence is with an equation in the patent, right? 01:13:12 01:13:16 01:13:18

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

THE WITNESS: I just followed Dr. Chipman's lead. He used that equation. I used the same equation. It seemed logical. 01:13:22 01:13:27 01:13:29 01:13:31

BY MR. BREGMAN: 01:13:31

Q. So you do not dispute the fact that Dr. Chipman's position that the maximum divergence as mentioned in the claim is -- is taken from the equation in the patent for maximum divergence, right? 01:13:31 01:13:37 01:13:41 01:13:45 01:13:48

A. I just followed Dr. Chipman's lead. He used the same equation. 01:13:53 01:13:58

Q. Okay. So you have no opinion on whether -- whether the equation in the patent provides a definition of maximum deviation in the claims? 01:14:00 01:14:01 01:14:06 01:14:12

MR. MURRAY: Objection. 01:14:13

THE WITNESS: I was not -- I was not asked to do claim construction. 01:14:14 01:14:15

BY MR. BREGMAN: 01:14:17

Q. But you adopted claim construction, right? Your declaration says you adopted claim construction. So you're applying a claim construction. 01:14:17 01:14:19 01:14:22 01:14:24

MR. MURRAY: Objection to form. 01:14:25

BY MR. BREGMAN: 01:14:25

Q. Is that correct? 01:14:26

A. Could you show me where that is in my dec? 01:14:27 01:14:28

Q. Sure can. It's on page 10. I'm not sure what -- it's regular page 10. 01:14:29 01:14:48

A. Regular page 10. 01:14:50

Q. Yeah. So this is on page 13 of 94. 01:14:55

A. Uh-huh. 01:15:00

Q. Patent claim summary. And then if go down, sorry, page 16 of 94, it's got claim construction. 01:15:00 01:15:05 01:15:09

A. Yeah. My paragraph 32 says, "I understand that the petitioner proposed 01:15:16 01:15:19

constructions for a number of the terms in Claims 5 and 21. While I do not agree with the interpretation set forth by the petitioner, it does not materially affect my analysis. 01:15:20 01:15:22 01:15:25 01:15:28

"Accordingly, for the purposes of my declaration, I have adopted the petitioner's claim construction." 01:15:31 01:15:34 01:15:36

Q. So you say you do not agree with the interpretation set forth by the petitioner. 01:15:38 01:15:42

What are your -- what don't you agree with? 01:15:45 01:15:46

A. I was not asked to construct these claims. I simply work from the assumptions that the petitioner had provided. 01:15:46 01:15:48 01:15:51

Q. But you say you don't agree to it. So in your declaration, you don't say I wasn't asked and I just applied those constructions; you said you do not agree with the interpretations. 01:15:53 01:15:55 01:15:58 01:16:01 01:16:03

It's your position. I would like to know why you do not agree with the interpretations set forth by the petitioner. 01:16:04 01:16:05 01:16:06

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

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

I haven't analyzed these claims. 01:18:49

Q. So you can't tell from looking at Figure 8 where the center of the lens is compressed, the edges compressed, and the zone between the center and the edge is expanded? You can't tell that from Figure 8? 01:18:51 01:18:54 01:18:57 01:19:01 01:19:04

MR. MURRAY: Objection to form. 01:19:05

THE WITNESS: Removing -- sorry, Steve. 01:19:06 01:19:08

MR. MURRAY: Objection to form. 01:19:09

THE WITNESS: I'm sorry. Go ahead. 01:19:10

MR. MURRAY: No, I made an objection. Go ahead. 01:19:11 01:19:12

THE WITNESS: Okay. 01:19:13

Removing the reference to the '990 patent and simply looking at that image distribution function, just irrespective of claims, that image point distribution function does not show a compressed area at the edge. 01:19:15 01:19:18 01:19:20 01:19:22 01:19:24 01:19:27

BY MR. BREGMAN: 01:19:27

Q. Okay. So you would agree that 01:19:27

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

BY MR. BREGMAN: 01:20:28

Q. Can you give me a little bit more understanding of what you're talking about there? 01:20:29 01:20:30 01:20:32

A. The image point distribution function is a representation of where the field, the object field points map onto the sensor. 01:20:34 01:20:38 01:20:41 01:20:44

If the image point distribution function is a line, then it would be shown as FDC, for example, where as you move linearly in field angle, you move linearly on the sensor. 01:20:46 01:20:49 01:20:54 01:20:59

In each area of the sensor, the pixels are equally distributed. So if that line is -- if the line has a lower slope, then it means that there is more pixels covering that same -- I'm sorry -- there is less pixels covering that angular range from zero to 70 degrees, for example. The expanded zone is the one which covers the greater number of pixels. 01:21:04 01:21:06 01:21:10 01:21:15 01:21:20 01:21:23 01:21:26 01:21:32

Q. So you're taking the same light that's reflected from some surface, it comes, 01:21:36 01:21:39

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

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

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

Q. Uh-huh. 01:22:32

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

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

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

A. Uh-huh. 01:23:08

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

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

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

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

back in the 1860s. 01:23:55

It's a fairly common term in the art to represent the distortion of the image with respect to what the user would expect to see, which is F times the tangent of the angle, not F times the angle. 01:23:56 01:23:59 01:24:01 01:24:05 01:24:08

If you see a fish-eye lens image, for example -- 01:24:10 01:24:16

Q. Uh-huh. 01:24:16

A. -- you would see something that looks almost like a ball. And that's because the edges of the field have been compressed in order to fit them onto the sensor. 01:24:16 01:24:18 01:24:21 01:24:27

So that -- although it looks compressed to us, it is a linear distribution with respect to the angle. It's just that we see trigonometrically, not radially, so we're not used to viewing fields like that. 01:24:30 01:24:33 01:24:35 01:24:38 01:24:42

Q. So does that mean that the distortion on a linear distribution, that the distortion is the same across the entire lens? 01:24:46 01:24:47 01:24:53

A. It's actually kind of neat. When we 01:24:56

discuss an F-theta lens like the image 01:25:00
distribution function shown in Figure 4B -- 01:25:04
Q. Uh-huh. 01:25:06
A. -- the optical designer has added 01:25:06
enough distortion of the type, the barrel 01:25:10
distortion, in order to move from an F10 theta 01:25:12
function, which is trigonometrically correct, 01:25:16
to a linear distribution function, which is not 01:25:19
trigonometrically correct. If you think about 01:25:23
it, angles should be related by the tangent, 01:25:27
not by -- not by the angle itself. 01:25:31
So we refer to that as an F-theta 01:25:33
lens. F-theta lenses are used in a couple of 01:25:35
applications. One of them is wide angle 01:25:37
viewings, which is panoramic imaging. Another 01:25:39
one, though, is laser scanning systems for 01:25:42
welding where you want to keep that weld plane 01:25:45
flat. 01:25:47
Q. What -- what difference does that 01:25:48
constant that you put in front of it make, like 01:25:51
the slope of that linear function? 01:25:54
A. The slope of the function in these 01:25:58

curves that we're looking at, the -- the Y axis is actually a relative distribution, which means it always goes to 1 at the top. 01:26:02 01:26:06 01:26:08

Q. Uh-huh. 01:26:11

A. So that's -- so the constant that's involved is where -- where 1 is for that particular imager. 01:26:11 01:26:14 01:26:18

Q. Uh-huh. 01:26:20

A. And that determines the slope of that line plotted against angle. 01:26:22 01:26:23

Q. So the linear distribution, if you've got a lens that, as much of the image you can see is 90 degrees, it will -- the linear distribution slope won't change. It will always go from 00 to 91; is that right? 01:26:26 01:26:28 01:26:33 01:26:36 01:26:40

A. For linear distribution, that's correct. 01:26:43 01:26:46

Q. Okay. Okay. And why back in Figure 8 where you get some expansion and compression, why does it always at the end go back to that linear line again? Or does it not necessarily need to go back to the linear line 01:26:46 01:26:52 01:26:54 01:26:58 01:27:04

again? 01:27:06
A. It's a normalized term, so the edge of the sensor must always necessarily be 1. 01:27:07 01:27:11
Q. Uh-huh. So is it sort of like a zero sum game? If I add some compression, I need to also add some expansion, ultimately, because it's sort of a zero sum game and the lines have to come back to 1 and whatever the field is? 01:27:16 01:27:19 01:27:22 01:27:29 01:27:32 01:27:35
MR. MURRAY: Objection to form. 01:27:38
THE WITNESS: The plot that the -- the plot that's shown in Figure 8 and elsewhere in -- throughout my declaration, and that of Dr. Chipman's, we have used the convention of always having the upper right corner be consistent with the linear distribution function. 01:27:41 01:27:42 01:27:45 01:27:47 01:27:51 01:27:54 01:27:55
BY MR. BREGMAN: 01:27:56
Q. Uh-huh. To me, at least, that seems logical, because that's the -- that's the biggest field of angle you've got, and that's a normalized distance on the left. So it will 01:27:59 01:28:00 01:28:04 01:28:06

always come back to 1 and whatever the maximum field angle is, right? 01:28:10 01:28:13

A. That's correct. 01:28:15

Q. Okay. Let me go down to just above paragraph 31, the reproduced Figure 9 from the patent. 01:28:15 01:28:30 01:28:34

Do you see that? 01:28:34

A. I do. 01:28:35

Q. And can you tell me what's going on in this -- in this figure? 01:28:37 01:28:39

A. This figure shows a -- an image point distribution function which is compressing from zero to 30 degrees, and expanding from 30 to 70 degrees, and then compressing again from 70 to 90 degrees. 01:28:41 01:28:46 01:28:48 01:28:52 01:28:55

Q. So this would meet -- if we go up a little bit to paragraph 30, this would meet the limitation of the claim that you have in paragraph 30 where it says, "The lens compresses the center of the image and the edges of the image and expands an intermediate zone"; is that correct? 01:29:00 01:29:04 01:29:06 01:29:09 01:29:11 01:29:13 01:29:17

A. The language of Claims 5 and 21 is right there in paragraph 30, yes. 01:29:18 01:29:20

Q. And that's Figure 9 shows an example of that, right? 01:29:22 01:29:28

A. Yes. 01:29:29

Q. And so up to zero to 30 we've got compression. From 30 degrees to 70 degrees, we've got expansion. And then from 70 degrees to 90 degrees, we've got compression again, right? 01:29:29 01:29:34 01:29:38 01:29:41 01:29:48

A. Yes, that's correct. 01:29:48

Q. And, again, as we discussed before -- of course, if you have some compression, some expansion, you have to have some more compression. 01:29:49 01:29:53 01:29:56 01:29:59

Whatever you do, you have to -- the linear -- sorry -- the image point distribution function always starts at 00 and always will end at 1 and whatever the field angle is, right? 01:30:01 01:30:04 01:30:08 01:30:12 01:30:17

MR. MURRAY: Objection to form. 01:30:17

THE WITNESS: I suppose you could 01:30:18

draw all sorts of different kinds of image point distribution functions. But for the purposes of this report, yes, all of the image point distribution functions go from 00 to 1 max field angle, whatever that may be, 90 degrees. In some cases, 58.5 degrees. 01:30:21 01:30:24 01:30:25 01:30:27 01:30:29 01:30:33 01:30:37

BY MR. BREGMAN: 01:30:38

Q. But it would always be the case if you've got a normalized distance on the Y axis, that you would have to come back to 1 and whatever the field angle is of the lens ultimately at the end, correct? 01:30:38 01:30:40 01:30:44 01:30:47 01:30:49

A. I'm not sure that's correct. I can imagine having a sensor which didn't actually -- an image that didn't cover the whole sensor or something like that, or some even 2D distribution. 01:30:52 01:30:56 01:30:59 01:31:01 01:31:03

For the purposes of this report, though, we can always say that the image point distribution function starts at 00 and ends at 1 maximum field angle. 01:31:06 01:31:08 01:31:10 01:31:14

Q. When you say the purpose of this report, you mean the purposes of the '990 patent, correct?

A. No. I mean for the purposes of my declaration.

Q. Okay. And for the purposes of the '990 patent, if you've got a normalized Y axis, by definition, the linear -- I'm sorry -- the image point distribution function must end at 1 because it's normalized. You'd agree with that?

A. Are you discussing something specific in the '990 patent?

Q. I'm looking at Figure 9.

A. Looking at Figure 9.

Q. Still looking at Figure 9 and trying to figure out, you said it's possible that you never reach -- that the -- that the image point distribution function does not always start at 00 and end at 1 and the field angle.

And I'm trying to figure out how that's even possible if the whole point of normalizing the Y axis requires that you end at whatever the distance is. That's a normalized distance. 01:32:15 01:32:21 01:32:25

A. I think you're probably right. I think it -- but this is a -- and so right and wrong. 01:32:26 01:32:29 01:32:34

For all of these radial image point distribution functions, I -- I can't imagine a case where I would want to not go to 1 at the edge. 01:32:34 01:32:36 01:32:41 01:32:44

But I could image a two-dimensional image point distribution function, for example. And there, if I plotted the horizontal and vertical image point distribution functions, they would not go to 1 because 1 would be the radial case going to the corner. 01:32:45 01:32:49 01:32:50 01:32:53 01:32:55 01:32:58

Q. What do you mean by the -- I don't understand what you mean by two-dimensional system. 01:32:59 01:33:01 01:33:04

A. Well, for example, let's say I had a -- an HD sensor, so it's 16 by 9 aspect ratio. 01:33:05 01:33:11 01:33:16

Q. Yes. Okay. Carry on. 01:33:17

A. Are you following me? 01:33:19

Q. Yes. Claim 9 is not the sensor, has nothing to do with the sensor, right? This is only the lens is my understanding. 01:33:21 01:33:23 01:33:26

A. You mean Figure 9? 01:33:28

Q. Figure 9, sorry. Figure 9. 01:33:29

A. Well, you were trying to generalize in terms of image point distribution functions always doing something or never doing something. 01:33:30 01:33:33 01:33:34 01:33:36

I'm trying to explain how there is a clear case that I could give you where I could draw an image point distribution function which did not go to 1. 01:33:36 01:33:38 01:33:41 01:33:42

Q. For a lens or for a sensor? 01:33:44

A. For the image point distribution function. You'd want to map it in two dimensions, for example. I might even want to add anamorphic power to my lens so that I get different image point distribution functions than X and Y. 01:33:46 01:33:46 01:33:54 01:33:56 01:33:59 01:34:01

That would be a much more complicated image point distribution function. And a linear graph of that might not go to 1. 01:34:02 01:34:03 01:34:06

Q. So is there any description in the '990 patent of any of these systems that you just described where the linear point distribution function does not return to -- I'm sorry, the image point distribution function doesn't return back to 1 and the field angle? 01:34:11 01:34:14 01:34:17 01:34:20 01:34:25 01:34:27

A. All of the plots that are in the '990 patent look like this. They all go to the edge. 01:34:33 01:34:37 01:34:40

Q. Something that sort of I am struggling to understand, maybe you can help me with. So if you've got an expanded area, doesn't that mean that the same light that would have normally hit the sensor in that area is now spread out amongst more pixels so, therefore, less light will be hitting the sensor from an expanded zone? 01:34:42 01:34:52 01:34:54 01:34:57 01:35:01 01:35:02 01:35:07 01:35:09

A. Not necessarily. Depends on the design of the lens. Assuming that there's no 01:35:15 01:35:17

vignetting across the lens and the pupil is perfectly centered and has no -- no anamorphic distortion, like, it's a typical round pupil. 01:35:19 01:35:23 01:35:30

Q. Uh-huh. 01:35:33

A. You would actually still see a falloff in signal across the aperture just because of the cosign to the fourth effect. So you would not get uniform illumination necessarily. 01:35:33 01:35:35 01:35:38 01:35:41 01:35:44

Q. Uh-huh. 01:35:45

A. But I think what you're really asking is, in an expanded zone, do you need to be careful about not having as much light. And the answer is yes, you have to be careful of that. 01:35:45 01:35:48 01:35:50 01:35:54 01:35:56

Q. Uh-huh. I guess conversely, if you've got a compressed zone, you will probably get more light? 01:35:56 01:35:58 01:36:01

A. All things being equal, yes. If you have a uniform illuminated field, for example, then it would tend to be brighter in compressed zones. 01:36:03 01:36:05 01:36:08 01:36:12

Q. Uh-huh. 01:36:12
A. But there are other physics effects going on like I said. The -- the angle of the pupil with respect to the field angle decreases by the cosign of that angle. So that decreases the amount of light that can necessarily get to the image plane. 01:36:13 01:36:15 01:36:19 01:36:25 01:36:27 01:36:29
Q. So in paragraph 31, the last part of your sentence -- or the last sentence says, "The result is a high definition intermediate zone which lends itself well to digital enlargements because it occupies more pixels." 01:36:31 01:36:33 01:36:36 01:36:40 01:36:43
What do you mean by that? 01:36:46
A. Just what it says. Because in the expanded zone you have more pixels per degree, you have more definition in the angular spectrum. So that would give you more information content. So if you're going to digitally display that, you don't have to interpolate as much. 01:36:48 01:36:53 01:36:56 01:37:01 01:37:04 01:37:06 01:37:09
Q. When you say "enlargements," you mean sort of zooming in on the image? What do 01:37:10 01:37:12

you mean by "enlargements"? 01:37:14
A. In this case, yes, that's what I'm referring to. 01:37:16 01:37:20
Q. Let's go to paragraph 33. 01:37:21
A. Uh-huh. Yes. 01:37:28
Q. So here you mention two programs, Code V and Zemex, which are optical design software programs; is that right? 01:37:30 01:37:36 01:37:40
A. Colloquially it's referred to as "Code 5," even though it is written Code V for the court reporter. 01:37:42 01:37:45 01:37:49
Q. I see. 01:37:50
So Code V and Zemax are optical design software programs? 01:37:51 01:37:53
A. That's correct. 01:37:54
Q. And what -- what does a person of ordinary skill in the art do with these programs? 01:37:55 01:38:01 01:38:02
A. These are really quite complex modeling codes. They are very specific to the optical industry, specifically the optical design industry, in fact. 01:38:02 01:38:05 01:38:07 01:38:10

The best way to explain it to someone who doesn't use them is it's sort of like SOLIDWORKS is for the mechanical engineers, or SPICE is for the electrical engineers. It's the way they model lenses for -- for optical design purposes and optical analysis. 01:38:12 01:38:13 01:38:16 01:38:19 01:38:22 01:38:26 01:38:29

Q. So does sort of all sorts of finite element analysis type calculations? 01:38:30 01:38:34

A. The optical version of that, yeah. 01:38:36

Q. I see. 01:38:37

A. Not finite element, per se. That's a -- that's a mechanical thing. 01:38:38 01:38:40

Q. Yeah, yeah. 01:38:42

A. But, like, OPD maps and ray maps and wave front maps and other things that are sort of the optical analogy. 01:38:43 01:38:47 01:38:49

Q. Now, both you and Dr. Chipman used, should I say, modern versions of the code; is that correct? 01:38:56 01:39:05 01:39:08

A. I don't recall what Dr. Chipman said, but I certainly used the latest edition 01:39:08 01:39:10

of Zemax, yes. 01:39:12

Q. And is it your understanding that circa May 2000- -- I think it's 2001 -- the same capabilities were available in Zemax? 01:39:14 01:39:19 01:39:26

A. The capabilities that I used in this analysis were available in the 2001 version, and you can look at the 2001 user's guide for comparison. 01:39:30 01:39:34 01:39:37 01:39:40

Q. Uh-huh. 01:39:40

A. I believe the same thing's true of Dr. Chipman and his Code V analysis. 01:39:40 01:39:43

Q. And what has changed from 2001 to 2020 in the software? 01:39:47 01:39:50

A. Oh, heavens. They do three or four releases a year. They're constantly adding new functionality, new features, new analysis routines, different kinds of surface types that can be modeled. 01:39:52 01:39:55 01:39:58 01:40:01 01:40:05

They just recently -- the latest announcement was that Zemax now has a faster optimization method, which is kind of exciting. They're changing constantly. Both codes 01:40:07 01:40:09 01:40:13 01:40:16

continue to change. 01:40:19
Q. But at least for the purposes that you use Zemax, the same functionality was available in 2001? 01:40:20 01:40:22 01:40:27
A. As far as I could tell, yes. 01:40:30
Q. Were you using Zemax in 2001? 01:40:31
A. I know I used it for the first time in 2000, so -- but whether I was using it in 2001, I don't recall exactly. I've used both Code V and Zemax over my career. 01:40:35 01:40:40 01:40:45 01:40:48
Q. In paragraph 35, you refer to excerpts of the Zemax user guide. I don't see any citations. 01:40:50 01:40:54 01:40:58
Are those -- were those documents -- documents listed at the front of your declaration in the table of materials considered? 01:40:59 01:41:03 01:41:08 01:41:09
MR. MURRAY: Did we lose the witness? 01:41:26 01:41:35
THE STENOGRAPHER: Yes, we lost the witness. 01:41:36 01:41:38
///

(Pause in testimony while witness 01:41:47
reconnects to meeting.) 01:41:48
BY MR. BREGMAN: 01:43:02
Q. We're talking about some excerpts 01:43:02
from the Zemax manual. I went back to the 01:43:05
materials considered, which is on page 8 of 94, 01:43:08
and I see something there, Exhibit 2011, 01:43:10
excerpts from Zemax optimal design program; is 01:43:13
that correct? 01:43:17
A. It must be mislabeled -- 01:43:17
Q. I'm sorry. Say that again? 01:43:19
A. Sorry. Yes, that's correct. 01:43:20
It's -- I was reading paragraph 35 and seeing 01:43:23
Exhibit 2010, but that's actually my analysis. 01:43:27
The Zemax manual was Exhibit 2011. 01:43:30
Q. Okay. Why don't we go to 01:43:34
paragraph 36. 01:43:42
A. Yes. 01:43:42
MR. BREGMAN: And, Jessica, sorry. 01:43:47
If you can tell us roughly when we're at 01:43:48
two hours. I know we were on for about an 01:43:50
hour before. 01:43:53

BY MR. BREGMAN: 01:43:54
Q. Okay. So in paragraph 36, you say, 01:43:54
"Tada addresses a retrofocus type of lens with 01:44:00
a front group with negative power and a rear 01:44:04
lens group of positive power." 01:44:08
You lost me at "retrofocus" there. 01:44:09
If you could maybe just give me a little bit of 01:44:17
an explanation of what you meant? 01:44:18
A. Yeah. A retrofocus lens is -- 01:44:19
retrofocus is a class of lens. When we do lens 01:44:21
design, we frequently try to group them into 01:44:24
families or classes or types. 01:44:27
So it's just a label for a type of 01:44:29
design we do. It's called a retrofocus. It's 01:44:31
also called a reverse telephoto by some people. 01:44:35
But it is characterized by a front negative 01:44:39
group and a rear positive group. 01:44:42
Q. And a negative group means what and 01:44:45
a positive group means what? 01:44:47
A. A negative lenses. So lenses with 01:44:48
negative power -- 01:44:51
Q. Uh-huh. 01:44:52

A. -- imaging lenses. And positive group has positive power and, therefore, is a converging lens. 01:44:53 01:44:55 01:44:57

Q. And you would agree that Tada is a wide angle lens, discusses a wide angle lens like the '990 patent? 01:44:59 01:45:09 01:45:13

A. Tada discusses a retrofocus type wide angle lens. I think Tada refers to it as a -- something else, a super wide or an ultra wide or something. 01:45:16 01:45:20 01:45:23 01:45:26

Q. Okay. 01:45:27

A. It is a wide angle lens. It is actually more -- more accurately, it is a retrofocus lens. All of his solutions are retrofocus. 01:45:27 01:45:29 01:45:31 01:45:33

Q. Uh-huh. The last sentence of this paragraph says, "The first lens element is typically a negative meniscus lens" -- 01:45:34 01:45:36 01:45:38

(Stenographer asks for clarification.) 01:45:48 01:45:49

BY MR. BREGMAN: 01:45:49

Q. "The first lens element is typically 01:45:49

a negative meniscus lens because it can 01:45:50
advantageously reduce due to the shape thereof 01:45:53
a stigmatism and distortion of a bundle of 01:45:58
light chiefly at a large angle of view." 01:46:02
Do you see that? 01:46:04
A. Yes. 01:46:05
Q. And how is it reducing distortion? 01:46:07
A. I'm just quoting from Tada. But a meniscus lens tends to introduce less of that Seidel aberration distortion that I was talking about earlier. 01:46:09 01:46:16 01:46:19 01:46:22
Q. That's reducing distortion at large angles? 01:46:26 01:46:30
A. Compared to a plano concave lens, yeah. When you -- so we think of it as bending the lens. 01:46:31 01:46:34 01:46:37
If you have a plano concave lens of some power, let's say it's a negative 5 mm focal length, and I then bend that lens so that it still has exactly the same focal length, the bent version, which is meniscus, a convex on the outside and concave on the inside, has less 01:46:37 01:46:40 01:46:46 01:46:49 01:46:52 01:46:56

of the optical aberration distortion and astigmatism than the plano concave version of exactly the same focal length. 01:46:58 01:47:02 01:47:06

Q. If you -- we've been talking a little bit about compression and expansion. Those are also forms of distortion, I assume, right? 01:47:08 01:47:10 01:47:12 01:47:17

A. Everything about this case is related to distortion. The optical distortion of a typical rectilinear lens, which is what Tada was describing in his patent, is analyzed differently than the kinds of distortion from -- deviating from an F-theta line. 01:47:17 01:47:21 01:47:26 01:47:29 01:47:34 01:47:37

So we use the term distortion to mean something that's different, but we also use it in a very specific technical way optically. 01:47:42 01:47:44 01:47:47 01:47:49

So it is -- could you say that the expansion and compression are distortions from an F-theta line? And the answer is yes, colloquially you could say that. 01:47:51 01:47:54 01:47:58 01:48:03

But from an optical design, optical 01:48:04

engineering point of view, you would not say that has more or less distortion. 01:48:06 01:48:09

Q. Is that because the compression and expansion is a desired feature when you're designing it? That's the other distortion that you have is undesired -- undesirable? 01:48:12 01:48:15 01:48:20 01:48:22

A. No. We really just don't think of it this way. It's just not the way we think. The optical design codes don't report an image point distribution function, for example. So we don't do this analysis. We do an analysis where we map the image field height against the field angle. 01:48:25 01:48:28 01:48:32 01:48:35 01:48:37 01:48:41 01:48:46

Q. Uh-huh. 01:48:48

A. And then we see how far that bends. And we got to try to keep that to less than 4 percent for something that someone's going to visually use, or 10 percent in some binocular cases. But it's the deviation from the equation H equals F10 theta, and we try to minimize that. 01:48:48 01:48:50 01:48:53 01:48:55 01:48:59 01:49:01 01:49:06

So in Tada's plots of his 01:49:07

distortion, he actually shows it versus the F10 theta line. So that is classical Seidel distortion. 01:49:11 01:49:13 01:49:17

But all the optical design codes allow you to instead look at the distortion with respect to an F-theta line, so you choose a different calibration for your distortion term. 01:49:18 01:49:20 01:49:23 01:49:27 01:49:30

But we would still refer to it as what is the maximum point deviating from this -- this target plane. So we're almost always looking at the very edge. 01:49:30 01:49:32 01:49:35 01:49:39

Q. If you had a lens that was poorly built and you got some compression where you didn't want it, you would still say that there's distortion in that zone, right? 01:49:41 01:49:44 01:49:46 01:49:48

A. So, first of all, distortion doesn't change much with tolerances. It mostly is driven by the first order surface properties. 01:49:52 01:49:56 01:49:59

So -- but I'll take your question to mean if you designed a lens that had some distortion in it, and it had -- it had a 01:50:03 01:50:05 01:50:08

compressed area somewhere in that distortion, I might view that as a good thing. I might view it as a bad thing. 01:50:11 01:50:14 01:50:16

Most of the time, any deviation from F10 theta or F-theta is considered a bad thing. 01:50:18 01:50:21

Q. Uh-huh. 01:50:25

A. In conventional optical design, we are always trying to reduce distortion, but it's confusing because we reduce it with respect to a target distribution, and there are two choices for target distribution. 01:50:26 01:50:28 01:50:30 01:50:32 01:50:35

Q. I think I heard you say you do not typically get any expansion or compression from manufacturing; is that correct? 01:50:37 01:50:42 01:50:45

A. I said you don't get much change in distortion with tolerance. So if you buy 50 -- 50 Cannon lenses, for example -- 01:50:48 01:50:50 01:50:55

Q. Yeah. 01:50:55

A. -- and you measure their distortion, they'll all be about the same. They're not going to change much. 01:50:58 01:50:59 01:51:01

Whereas they might have very 01:51:02

different wave front quality, or they could even have variations in focal length. But the distortion tends -- it just generally tends not to be as affected by manufacturing tolerances. That's -- that's not always the case, but that's often the case. 01:51:04 01:51:06 01:51:09 01:51:11 01:51:15 01:51:17

Q. I see. 01:51:18

But, I mean, there could be a lens that -- I'm not saying between lenses is there a change in distortion. 01:51:19 01:51:21 01:51:23

I'm saying if a lens was badly designed or there was something in the manufacturing process that all lenses that were made all had some compression or expansion maybe where I didn't want it to be, would an optics engineer say that those areas where there's expansion and compression that I didn't want it introduces distortion into the lens? 01:51:24 01:51:26 01:51:30 01:51:32 01:51:35 01:51:38 01:51:42 01:51:45

A. No, I don't think so. Again, optical designers think of the term "distortion" to mean a very specific technical term. 01:51:49 01:51:51 01:51:52 01:51:55

Q. Uh-huh. Why don't we go to paragraph 42. 01:51:56 01:52:31
A. Yes. 01:52:34
Q. "Each embodiment is described by 'prescription' in the form of a table including the focal length F (set to 1 in all cases), a half field of view W, a radius -- sorry -- a radius of curvatures R for all surfaces in the distance to the next surface, index of refraction and dispersion at the helium D line (which I will explain further below) for each element," et cetera. 01:52:35 01:52:37 01:52:40 01:52:47 01:52:53 01:52:57 01:53:00 01:53:04 01:53:08
What do you mean by "prescription" in quotes? 01:53:12 01:53:16
A. "Prescription" is another one of those ambiguous terms. It can mean a lot of different things. In optics, we usually use the term "prescription" to mean the way we are describing the design information of the lens. 01:53:16 01:53:17 01:53:21 01:53:25 01:53:28
Q. And how much of a prescription is enough when designing a lens? 01:53:33 01:53:36
A. Different tasks actually require 01:53:40

different prescriptions. So, for example, I have a function on Zemax -- I don't know if this exists in Code V -- where it's called prescription. 01:53:45 01:53:48 01:53:49 01:53:53

And I can select that function, and it generates a text file with the prescription of the length. But there's about 20 features that I can turn on and off for that prescription depending upon the application. 01:53:53 01:53:56 01:53:58 01:54:01 01:54:04

I might DNDT information. I might need partial dispersion. I might need a whole bunch of other things, TCEs and -- and specific weight. I mean, I have to print out the centers of gravity for some of my satellite optical systems I did. 01:54:06 01:54:09 01:54:11 01:54:15 01:54:18 01:54:20

Q. Uh-huh. 01:54:22

A. So the prescription can be quite complex, and quite long, or it can be fairly simple for simple applications. 01:54:22 01:54:24 01:54:29

Q. And somewhere in the middle of that sentence, we -- you mention something called a helium D line. Can you tell me what that 01:54:31 01:54:33 01:54:35

means. 01:54:38

A. Sure. French physicist named Fraunhofer originally started mapping the spectrum of the sun a long time ago. I think it was in the 1800s. 01:54:39 01:54:43 01:54:46 01:54:48

And he identified a bunch of lines associated with specific elements. And we still use these references to this day in most physics publications. 01:54:50 01:54:53 01:54:55 01:54:59

And he assigned letters to the different lines for a given atom. So, for example, the helium D line is Fraunhofer's fourth line that he measured. 01:55:01 01:55:04 01:55:09 01:55:14

I think it goes from -- I don't remember if it goes from left to right or right to left. But it was the fourth one in Fraunhofer's description of the heat -- the atom helium, the atomic spectrum of the atom helium. 01:55:17 01:55:19 01:55:20 01:55:23 01:55:25 01:55:31

Q. When you say "line," do you mean wavelength? 01:55:31 01:55:33

A. Yeah. Helium D line is a specific 01:55:34

wavelength. 01:55:38
Q. How is that related to helium? 01:55:38
A. It is -- if you take a container of helium and heat it up into a plasma, it emits light. Imagine making like a helium neon or a -- like a neon light. 01:55:45 01:55:49 01:55:52 01:55:57
You have a discharge lamp or something. Fill it with compact helium, you light it up, and then you analyze that spectra and see what wavelengths are being emitted by the helium. 01:55:58 01:56:00 01:56:04 01:56:06 01:56:10
And those lines are very, very thin. They're specific to the specific atoms that are involved in the emission spectrum. 01:56:11 01:56:17 01:56:19
Q. And there's only one wavelength of light that's emitted from the plasma helium? 01:56:20 01:56:22
A. No. There are a bunch of lines. The helium D line is one of the peaks of the emission spectrum. 01:56:26 01:56:28 01:56:32
Q. All right. The next sentence says, "The shape of object surface of the second lens element for each embodiment is also given in 01:56:33 01:56:39 01:56:43

the form of 'sag' tables." 01:56:45
Do you see that? 01:56:51
A. Yes. 01:56:55
Q. What are these -- what are these sag tables? 01:56:55 01:56:58
A. Sag tables are a listing of the -- the sagittal deviation, the distance from a plane or any -- actually from any surface. The sag table could be -- well, okay, I'm getting off track. 01:56:59 01:57:05 01:57:12 01:57:15 01:57:18
The sag table is a listing of the -- think of it as the height of the material of the lens with a respect to displacement from the optical axis. 01:57:19 01:57:21 01:57:23 01:57:27
Q. Why don't we jump to paragraph 108. I'll give you a page number in a minute. Actually not. Let's not do that. Hold on one second. 01:57:29 01:57:41 01:57:49 01:57:52
MR. BREGMAN: Why don't we take a break now for a few minutes. 01:58:01 01:58:02
(Whereupon, a recess was taken at 1:58 p.m.) 01:58:05 02:02:29

BY MR. BREGMAN: 02:02:29
Q. Why don't we turn to page 24 of 94 02:02:29
of your declaration, paragraph 50. Let me know 02:02:32
when you're there. 02:02:39
A. Yes, I'm there. 02:02:41
Q. So you say, "Like Nagaoka" -- that's 02:02:42
N-a-g-a-o-k-a -- "Baker," B-a-k-e-r, "laments 02:02:45
that, 'The valuable content from the peripheral 02:02:53
areas lacks in potential image quality 02:02:57
(resolution) mapping because the imaging device 02:03:02
and system does not differentiate between these 02:03:08
areas in the central areas of less valuable 02:03:11
detail,'" period, close quotes. 02:03:15
Do you see that? 02:03:20
A. Yes, I do. 02:03:20
Q. What do you mean by the valuable 02:03:21
content? Or what do you think Baker means by 02:03:23
the valuable content? 02:03:25
MR. MURRAY: Objection to form. 02:03:27
THE WITNESS: We can look at the 02:03:27
patent to see what the -- what the exact 02:03:32
information is in Baker. 02:03:35

In general, Nagaoka and Baker both do not like the compression of the data at the edge of the field, so they -- they are referring -- so Baker is very much concerned about trying to improve the data density at the periphery. And he's doing that at the expense of the inner part of the field of view. 02:03:41 02:03:43 02:03:45 02:03:48 02:03:52 02:03:56 02:03:58 02:04:01

BY MR. BREGMAN: 02:04:02

Q. If I recall, Baker is like a videoconferencing system, and it has a lens sort of pointing up at the ceiling, and then people would be sitting around a boardroom table or something. 02:04:02 02:04:05 02:04:12 02:04:16 02:04:19

And my assumption is that the valuable content is trying to see the people sitting around the boardroom table; is that accurate? 02:04:19 02:04:21 02:04:23 02:04:26

A. That sounds like a reasonable summary, yes. 02:04:27 02:04:29

Q. So you would really want to see -- I guess you wouldn't be that interested in seeing 02:04:30 02:04:34

the table surface. You want to see sort of -- 02:04:35
the most valuable part is shoulders and head of 02:04:38
individuals, right? 02:04:41

A. Well, that's interesting. I thought 02:04:42
it was pointing up. So it would be, like, the 02:04:44
ceiling would be in the middle and then around 02:04:47
the edges would be all the people. But I might 02:04:48
be envisioning that wrong. That's what I had 02:04:51
in mind. 02:04:53

Q. I think we're on the same page. 02:04:54
Ceiling is the middle and then horizon is the 02:04:57
edges. 02:05:01
Is that what you're saying? 02:05:02

A. That's how I'm seeing it in my head. 02:05:03

Q. I think we're seeing it correctly. 02:05:05
And when it -- wants more detail or 02:05:07
the valuable content, it's really the people's 02:05:10
heads that are sitting slightly above the 02:05:13
horizon, right? 02:05:16

A. I believe throughout Baker he's 02:05:18
talking about the -- the information in the 02:05:20
periphery. I think in the next line, I have 02:05:22

another quote from him. 02:05:25
"The image content of the periphery of a conventional fish-eye lens is so degraded in comparison with the central area that the lens allows for only minimal area of the periphery to be recorded by the film or electronic imager." 02:05:27 02:05:28 02:05:32 02:05:35 02:05:38 02:05:40
So that's that compression we're talking about. 02:05:41 02:05:43
Q. So it's really not that interested with the center, which is the ceiling. It cares about the people at the periphery. 02:05:44 02:05:46 02:05:49
Am I reading that correctly? 02:05:51
A. Baker is primarily focused on that compression at the edge, yes. 02:05:57 02:06:00
Q. So Baker discusses expanding a lens at the zone where the valuable content is located, right? 02:06:01 02:06:05 02:06:07
A. He discusses specifically trying to change the distortion so that he has more pixels at the periphery. 02:06:08 02:06:12 02:06:14
Q. But he's trying to capture the 02:06:21

valuable content? That's what he cares about; is that correct? 02:06:23 02:06:24

A. In his case, that's all at the periphery, yes. 02:06:24 02:06:25

Q. And a person of skill in the art would know from Baker how to do that? 02:06:27 02:06:31

A. Know how to do what? 02:06:33

Q. How to build a lens that expands the lens at wherever the valuable content is. 02:06:34 02:06:40

A. I don't recall. I don't -- I didn't -- I didn't analyze Baker to decide if a POSA would or would not be able to properly recreate his invention. 02:06:43 02:06:48 02:06:51 02:06:54

I was focused more on what was the point of Baker and how was that teaching the patent by Tada, specifically Russ Chipman's declaration. 02:06:58 02:07:01 02:07:04 02:07:11

Q. If we go to your paragraph 51, you again quote Baker in that first sentence. I'm just going to read the second part of the sentence starting with line 3. Actually the end of line 2. 02:07:11 02:07:15 02:07:17 02:07:18 02:07:21

"And thus provide greater resolution with existing imaging devices for the relevant visual information in the scene." 02:07:22 02:07:24 02:07:28

Do you see that? 02:07:32

A. Uh-huh. Yes. 02:07:33

Q. What do you mean -- what do you think Baker means by that? 02:07:33 02:07:36

A. Well, as it says in the next line, "If the conventional wide angle lens 'focuses the lowest 15 degrees up from the horizon on 10 percent of the imager,'" Baker is trying to focus that same 15 degrees on, say, 50 percent of the imager. That would give a fivefold improvement in the resolution of the periphery at the expense of the center. 02:07:38 02:07:42 02:07:45 02:07:48 02:07:50 02:07:53 02:07:58 02:08:00

Q. I see. 02:08:02

So at the expense of the center, it expands 15 degrees so that it gets greater resolution of what it calls the relevant visual information in the scene; is that correct? 02:08:03 02:08:05 02:08:09 02:08:12

A. Yes, that's right. 02:08:14

MR. MURRAY: Object to form. 02:08:17

BY MR. BREGMAN: 02:08:19

Q. Okay. 02:08:22

A. I'm sorry. What was the question again? Can you repeat it? 02:08:22 02:08:23

Q. So at the expense of the center, Baker expands 15 degrees so that it gets greater resolution of what it calls the relevant information in the scene; is that correct? 02:08:26 02:08:38 02:08:42 02:08:44 02:08:46

A. Yes. It focuses the lowest 15 degrees up from the horizon on more of the sensor. In Baker's words, 50 percent of the imager is used? 02:08:46 02:08:54 02:08:56 02:08:59

Could you hold on for just a moment? I need to close my door. 02:09:00 02:09:03

(Pause in testimony.) 02:09:05

Q. Let's go to paragraph 54. 02:09:21

A. Just a moment. Yes, I'm there. 02:09:31

Q. And you say, "I agree that, as Dr. Chipman says, 'the disclosure of Tada includes schematic views of the lens arrangements, diagrams of the aberrations," et 02:09:35 02:09:37 02:09:41 02:09:45

cetera. 02:09:51
"And tables of measurements of the lens that allow one of ordinary skill in the art to reconstruct the exact lens system described in Tada," closed quote. 02:09:51 02:09:53 02:09:55 02:09:58
Do you see that? 02:10:02
A. Yes. 02:10:02
Q. So, again, you're talking about Tada including schematic views. Is that the same -- are those the same type of views, the same schematics that we discussed earlier with respect to the '990 patent, or is the term "schematic" being used here any different? 02:10:02 02:10:09 02:10:11 02:10:14 02:10:15 02:10:20
A. I'm using this term in the -- in the colloquial optical design sense as a lens schematic. 02:10:22 02:10:24 02:10:28
Q. I see. 02:10:28
Bottom of page 28 of 94. 02:10:44
A. I'm sorry. What was that again? 02:10:48
Q. 28 of 94. 02:10:50
A. 28 of 94, yes, I'm there. 02:10:52
Q. You say, "His, quote, 'recreation,' 02:10:54

closed quote, is just a creation of a lens that was never intended to be exemplary in Tada's invention." 02:11:00 02:11:03 02:11:06

Do you see that? 02:11:06

A. Yes, I do. 02:11:08

Q. First of all, have you ever spoken to Mr. Tada? 02:11:09 02:11:14

A. No. 02:11:16

Q. And how do you know what his intention is? 02:11:17 02:11:20

A. We can presume that the inventor intended to make a lens that would work. 02:11:21 02:11:27

Q. And the lens with respect to Table 5 is incapable of working? 02:11:29 02:11:33

A. As I show in my report, it can't make a decent image. 02:11:35 02:11:41

Q. But it can make an image, right? 02:11:42

A. Not per se, no. 02:11:45

Q. It cannot -- it cannot make an image? 02:11:46 02:11:49

A. It would make this blurry mess with some parts of the field of view being able to 02:11:49 02:11:52

be resolved and most of the field of view being unusable. 02:11:54 02:11:58

Q. So it's just not a -- it's not a great lens is what you're saying? 02:12:00 02:12:01

A. It's not what Tada would have intended since Tada was trying to describe working lenses that actually had meaningful fields of view and good image quality. And he specifically balances things like astigmatism and distortion versus the manufacturing costs. 02:12:03 02:12:05 02:12:08 02:12:10 02:12:13 02:12:16

So, yeah, it's -- it's quite clear that the lens shown in my picture under paragraph 57, that's -- that is not a useful lens. 02:12:20 02:12:22 02:12:28 02:12:31

Q. Are there physical lenses in a patent, or are they just words on a piece of paper? 02:12:33 02:12:36 02:12:38

A. I'm sorry. It is not -- it is not a schematic of a useful lens. 02:12:39 02:12:42

Q. Okay. So can you point me to where in Mr. Tada's invention, in his -- in his patent he says that? 02:12:44 02:12:50 02:12:56

A. **He says what, that the lens should work?** 02:13:00 02:13:02
Q. That he says that the lens of Figure 5 is not a useful lens. 02:13:03 02:13:05
A. **The lens -- the lens -- the lens that he intended as his embodiment No. 3 is a perfectly useful lens, but there was a typographical error in his American patent. Thankfully it wasn't also in the Japanese priority patent. So we were able to reconstruct Embodiment 3.** 02:13:08 02:13:12 02:13:14 02:13:17 02:13:20 02:13:25 02:13:28
My point here is just that that's not what Dr. Chipman was doing. Dr. Chipman made his own lens because of a typographical error that had nothing to do with the embodiment of Tada. 02:13:29 02:13:30 02:13:32 02:13:34 02:13:36
Q. So Mr. Tada never says that he has -- that his lens described in Table 5 is an unsuitable lens, does he? 02:13:37 02:13:43 02:13:47
A. **Again, Table 5 has a typographical error. Tada would not have intended a typographical error, don't you think?** 02:13:49 02:13:53 02:13:55

Q. I don't know. I've never spoken to Mr. Tada. 02:13:58 02:13:59
Your thought is that -- your opinion is that Tada would not have created the lens in Table 5; is that correct? 02:14:01 02:14:04 02:14:08
A. I don't think anyone deliberately puts in typographical errors, no. 02:14:11 02:14:13
Q. And how did you discover this purported typographical error? 02:14:15 02:14:21
A. Well, I describe my methodology in great detail in my report. I took a series of steps. 02:14:23 02:14:25 02:14:30
First, my first effort was simply to recreate Dr. Chipman's work but do it in Zemax, because that's the program that I use. So I didn't have his Code V model to convert, so I basically had to follow his methodology and recreate it. 02:14:30 02:14:33 02:14:37 02:14:38 02:14:42 02:14:44
And so I did what he said. I did exactly what he described in his report and took the information in Table 5 and typed it all in and got the lens that's shown on page 29 02:14:45 02:14:47 02:14:50 02:14:53

of 94. 02:15:00

Q. Uh-huh. 02:15:03

A. And I could see right away that it didn't look right. And the easiest way to see that it didn't look right is I could zoom into the area near the sensor and see that it wasn't making a proper image. It couldn't be right. 02:15:03 02:15:05 02:15:08 02:15:11 02:15:15

Q. Because you zoomed in on your model or on the diagram in the patent? 02:15:20 02:15:23

A. No. The model that I had created based on Table 5 following Dr. Chipman. Assuming I did exactly what Dr. Chipman did, which he was fairly explicit about what he did. 02:15:26 02:15:28 02:15:32 02:15:35

So I just followed him exactly, and what I got was a lens that couldn't have worked. And so it could not have been the intent of Tada. 02:15:37 02:15:40 02:15:42 02:15:46

Q. I'm not understanding what you're saying, what you mean by "couldn't have worked"? Light couldn't pass through the lens? 02:15:47 02:15:48 02:15:50

A. It couldn't make an image. That's the primary job of a lens, right? 02:15:52 02:15:53

Q. It couldn't make any image? 02:15:56
A. Like I said, it couldn't make a usable image. It would have some -- I don't actually know. I haven't built the lens. I didn't analyze it in detail. 02:15:57 02:15:59 02:16:01 02:16:03
But it was so clearly wrong, there was no point in spending more time on it. I wanted to understand how this lens could be so wrong and be in the patent. It just didn't make sense to me. 02:16:05 02:16:07 02:16:09 02:16:13 02:16:15
Q. And how long did it take you to figure that out? 02:16:16 02:16:18
A. It took me a few hours. 02:16:19
Q. Like, five hours? 02:16:21
A. Probably three, I would say. 02:16:22
Q. And then that was the end of your analysis? 02:16:25 02:16:27
A. No, not at all. So the first thing I did is I recognized that there had to be something wrong with the aspheric coefficients. This is almost always where problems occur. 02:16:28 02:16:32 02:16:37 02:16:40
It is possible that I had made a -- 02:16:44

an incorrect lens, like, maybe I typed in an index wrong or I typed in a radius wrong, but almost always it's the aspheric coefficients that you get wrong. 02:16:48 02:16:52 02:16:55 02:16:58

So I carefully checked and made sure that I had typed in the values that were in Table 5. I verified all the radiuses, all the spacings. 02:16:59 02:17:01 02:17:03 02:17:06

So the first thing I did was assume I had made a mistake and checked my work carefully. And once I proved to myself that I had typed everything in correctly, I noticed that the shape of the aspheric lens in my schematic did not look like Tada's. 02:17:07 02:17:09 02:17:11 02:17:14 02:17:17 02:17:23

Q. Uh-huh. 02:17:26

A. I show that in my figures on page 30 of 94. So I -- so let me back up. 02:17:26 02:17:29

So the first thing I did is I zoomed in on the backend and saw that it wasn't making an image. I then ran some typical optical design analysis, OPDs, field curvature distortion, just to -- just a general suite of 02:17:34 02:17:36 02:17:38 02:17:42 02:17:47

standard operations that we do when we're 02:17:51
designing a lens. 02:17:52

Q. Uh-huh. 02:17:53

A. And it was -- it was terrible. It 02:17:54
was just not working very well. So -- so then 02:17:56
I tried to debug what I had done wrong. First 02:17:59
I thought maybe I typed something in wrong. 02:18:02
Then I noticed that this aspheric shape was 02:18:04
different. 02:18:08

And so I thought, okay, well, maybe 02:18:08
there's a typo on the -- on the aspherics, or 02:18:11
maybe Tada is not very good. So the next thing 02:18:16
I actually did was I actually went back and 02:18:19
modeled Embodiment 1 and Embodiment 2, and they 02:18:21
worked fine. 02:18:24

Then I noticed that when I was 02:18:25
typing in Embodiment 2 from Table 3, the 02:18:27
aspheric coefficients were exactly the same as 02:18:30
in Table 5, and that's never true. That could 02:18:33
not be right. So then I knew that the aspheric 02:18:36
shape had to be wrong. 02:18:41

And fortunately we had some things 02:18:43

to use here. One is there's a sag table in Table 6. So I could verify that the shape of the surface was not what Tada intended as an Embodiment 3. That's shown in paragraph 62. 02:18:44 02:18:48 02:18:51 02:18:54

And you can see the dots represent the points on the sag table. And the line indicates the shape of the actual surface based on the aspheric coefficients in Table 5. 02:18:58 02:18:59 02:19:03 02:19:06

And then I remembered that there were all these other equations in Tada. So there were other ways to check on what the aspheric coefficients could be. 02:19:09 02:19:11 02:19:13 02:19:16

Q. Uh-huh. 02:19:18

A. And sure enough, they didn't match the numbers in Table 5. But I -- when I typed in the values that I got from the sag table, when I typed in the values that I got from -- sorry, from Table 9 -- I actually got much closer to the aspheric shape described in the sag table. 02:19:19 02:19:21 02:19:25 02:19:29 02:19:32 02:19:34 02:19:37

Unfortunately, Tada didn't include a constraint on his A10 term, so that I had to 02:19:38 02:19:42

optimize to find. But I just entered the 27 02:19:45
points on the sag table into the optimizer, 02:19:50
theoried the A10 term, and bam, dropped right 02:19:54
in. 02:19:57

Q. And at that point you were convinced 02:19:58
that there was an error in the patent? 02:20:00

A. Well, it was clear there was an 02:20:01
error in the patent as soon as I looked at the 02:20:03
sag table. And then it's confirmed when you 02:20:05
look at Table 9. 02:20:08

Because the focal length is 1, 02:20:09
Table 9 rather conveniently gives you the 02:20:12
aspheric coefficients for each of the four 02:20:15
embodiments, and it matches correctly for 1, 2 02:20:18
and 4 and is totally wrong for 3. 02:20:20

Q. So you could just look at the sag 02:20:22
tables? You don't need to plug those into 02:20:24
Zemax? 02:20:27

A. I actually just looked at the bottom 02:20:27
term in the sag table and then looked at my sag 02:20:29
table, basically compared the sag table from 02:20:34
Zemax to the sag table in Tada and just looked 02:20:37

at the bottom number, and it was so radically off that it was obvious. 02:20:40 02:20:42

Q. And how long did all of this take you? 02:20:43 02:20:46

A. Like I said, a few hours. 02:20:46

Q. So all of this was just three hours? 02:20:48

A. No. I would say -- I had figured out that something was wrong probably within two to three hours. Then modeling the other embodiments, that took time. And then continuing to try to understand how to recreate the surface, that took more time. 02:20:51 02:20:53 02:20:58 02:21:00 02:21:04 02:21:07

Q. Uh-huh. 02:21:09

A. It wasn't until the -- 02:21:10

Q. I'm not -- how much time in total do you think you spent -- 02:21:11 02:21:14

(Audio technical difficulties; stenographer asks for clarification.) 11:10:06 11:10:06 11:10:06

BY MR. BREGMAN: 02:21:25

Q. I said how much time overall did it take you to figure out the purported error? 02:21:25 02:21:27

A. And it was how many hours total did I spend creating the correct Embodiment 3 model? Probably about 10 hours, maybe 12. 02:21:31 02:21:50 02:21:56
Q. And whose idea was it to look at the Japanese priority application? 02:22:00 02:22:05
A. I asked the attorneys to get me the Japanese patent. 02:22:09 02:22:11
Q. And you can read Japanese? 02:22:12
A. I can read numbers. 02:22:14
Q. And you knew which table was which? 02:22:16
A. It's pretty obvious. I have -- I have that printed out here. But you can see the tables themselves are all exactly the same as the tables in the American patent with one very big difference. 02:22:18 02:22:24 02:22:27 02:22:29 02:22:33
Q. And did you have that translated into English? 02:22:34 02:22:36
A. I did not. I think the attorneys did, though. 02:22:37 02:22:38
Q. Did you read the translated copy? 02:22:40
A. I don't remember. I remember looking at the Japanese version, and that's 02:22:42 02:22:44

where I pulled the numbers from. But I don't recall if I -- I think I did read the translated version as well. 02:22:47 02:22:49 02:22:51

Q. Let's look at your -- top of page 30 of 94. You may want to read the entire sentence that starts on the previous page -- 02:22:52 02:23:02 02:23:06

A. Okay. 02:23:09

Q. -- and then I'll ask you my question. 02:23:09 02:23:11

A. Sure. Just give me a moment. 02:23:11

(Pause in testimony.) 02:23:28

A. Yes, I see it. 02:23:28

Q. You say you wanted to confirm that there was no gross difference between the target design and the model, right? 02:23:29 02:23:31 02:23:33

A. Correct. 02:23:35

Q. Why did you have the word "gross" in there? Why were they any different? 02:23:36 02:23:39

A. If the radius of curvature of a lens is, say, 1.011, and what I typed in was 1.101, I might not be able to see that. It's such a subtle difference that I probably wouldn't be 02:23:45 02:23:47 02:23:53 02:23:56

able to see it in the layout or the schematic. 02:23:57

But if the radius were 11 and I typed in 1, that would create a gross error that would be obvious. I should be able to see that in the layout. 02:23:59 02:24:03 02:24:06 02:24:08

So the first thing you do is you look at the 2D layout of the lens and see, you know, does it look right? I think that might be Kingslake's first law, but I don't remember. 02:24:09 02:24:11 02:24:14 02:24:19

Q. And by how much did you have to blow up these figures to see the purported differences in shape? 02:24:21 02:24:26 02:24:30

A. Well, the Zemax allows you to just zoom in arbitrarily. So I just zoomed into the -- starting at the detector where I could see the massive error. And then moving my cursor back across the screen in kind of a pan, looking at the top edge of the lenses. 02:24:31 02:24:33 02:24:36 02:24:38 02:24:41 02:24:47

Q. I'm sorry. I'm looking at the figures above paragraph 59. 02:24:49 02:24:50

A. Yeah. 02:24:52

Q. Neither of those are Zemax, right? 02:24:52

A. **No.** 02:24:55
Q. One is a lens, and the other is Figure 11 from the patent. So how much -- how much did you need to blow these up so that you could see the purported error? 02:24:55 02:24:57 02:24:59 02:25:02
A. **My apologies. This may be unclear. When I called the left-hand picture Dr. Chipman's lens, I meant that was my model of the Table 5 only embodiment. So I was recreating Dr. Chipman's lens, but that is actually a Zemax picture.** 02:25:04 02:25:07 02:25:10 02:25:12 02:25:18 02:25:20
Q. I see. 02:25:22
So by how much did you need to blow up your reproduction of the lens and Figure 11 from the Tada patent to see the purported error in the shape of the lenses? 02:25:23 02:25:25 02:25:32 02:25:36
A. **You could notice it pretty well just without any magnification at all. But zooming in allowed you to really see the differences.** 02:25:38 02:25:42 02:25:46
Q. And we know that Figure 11 of Tada is a schematic, right? 02:25:48 02:25:52
A. **Well, that is an aspheric shape. So** 02:25:59

the fact that the surface is, in fact, aspheric whereas the others are sort of spherical kind of tells you that they did what I would have done which is to export the figure directly from an optical design program. 02:26:02 02:26:05 02:26:07 02:26:09 02:26:11

Q. So is it your belief that the Figure 11 of Tada is drawn to scale? 02:26:13 02:26:19

A. It doesn't need to be as long as it has reasonable representations of the lenses. And this was not -- this was simply an example. I wanted to explain how I got there, but this would not be convincing to me if I didn't do further analysis. 02:26:25 02:26:28 02:26:31 02:26:34 02:26:38 02:26:40

Q. Okay. Paragraph 59, second sentence says, "Surface 2 of the lens too is also different, but is less obviously wrong," period. 02:26:42 02:26:47 02:26:51 02:26:55

Do you see that? 02:26:56

A. Uh-huh. That's correct. 02:26:56

Q. Okay. Can you tell me where you describe what is wrong with surface 2 of lens 2? 02:26:58 02:26:59 02:27:06

A. Yeah. You can actually see from this image. I tried to scale them exactly the same, and you can see that the radius of curvature of Surface 2 is too steep compared to Tada's Figure 11. 02:27:07 02:27:08 02:27:11 02:27:13 02:27:17

Q. Is that described in your declaration? 02:27:18 02:27:20

A. I -- I think only in that one line where it's -- I think it's -- it would be obvious to someone skilled in the art that it was also wrong. But it's less obvious. The front asphere is really quite distinct, because we have the first lens and the second lens coming so close together. 02:27:20 02:27:27 02:27:30 02:27:32 02:27:34 02:27:38 02:27:40

I have to correct myself. When I say Dr. Chipman's lens in this figure, it is, in fact, Dr. Chipman's schematic. That is not my recreation. But they look exactly the same. 02:27:46 02:27:48 02:27:52 02:27:54

Q. Hold on a minute. So you're comparing Dr. Chipman's schematic with -- 02:27:58 02:28:01

(Simultaneous unreportable cross-talk occurs among parties.) 02:28:11 02:28:11

(Stenographer requests one speaker at a time.) 02:28:11

BY MR. BREGMAN: 02:28:11

Q. So I said you were actually comparing Dr. Chipman's schematic with Figure 11 from Tada; is that correct? 02:28:11 02:28:13 02:28:17

A. That is correct. I misspoke earlier. 02:28:19 02:28:21

Q. Where is the lens that you created or tried to reproduce of Dr. Chipman's lens? Do you have that anywhere in here? 02:28:22 02:28:28 02:28:33

A. Not zoomed in like that, but it is, in fact, the previous page. And you can see it right there. To one skilled in the art, that's obvious. 02:28:34 02:28:37 02:28:45 02:28:48

I mean, I'm looking at the two figures side by side right now, Figure 11 and my version of Chipman's lens, and you can -- you can see clearly that aspheric surface is wrong. Has to be. 02:28:51 02:28:53 02:28:56 02:28:59 02:29:03

Q. Let's go to paragraph 60 on page 31 of 94. It's one, two, three, four, five, six, 02:29:05 02:29:13

seven -- eight lines from the bottom. Just to find it easy, you'll see 19 in the very left-hand -- 02:29:19 02:29:22 02:29:24
A. Yes. I have it. 02:29:25
Q. -- and just the sentence after that. It says, "In addition, the sign of each term is important and is easy to get incorrect." 02:29:26 02:29:29 02:29:34
Do you see that? 02:29:38
A. Yes, I do. 02:29:38
Q. Did Dr. Chipman get the sign incorrect in any of his calculations? 02:29:39 02:29:43
A. No. He simply typed in the wrong number. 02:29:45 02:29:47
Q. He typed in the number from the -- from Tada? 02:29:47 02:29:50
A. He typed in the incorrect typo, yes. 02:29:51
Q. He used the numbers in Tada, right? 02:29:54
A. The reason I mention this was this is the explanation for why we always look at the sag table. It is -- it is really easy to get a sign error in the aspheric coefficients. It's easy to get typos in the aspheric 02:29:57 02:29:59 02:30:02 02:30:06 02:30:10

coefficients. 02:30:10
But sign errors are common because 02:30:14
it turns out there are different conventions 02:30:16
for how you assign the sine of the aspheric 02:30:17
coefficients whether the asphere is on the 02:30:20
left-hand surface or the right-hand surface. 02:30:22
So you always -- you always provide a sag 02:30:24
table. You always check it. 02:30:26
Q. You always provide a sag table? 02:30:28
A. For aspheres, yes, absolutely. 02:30:31
Q. Every single time you build a lens 02:30:32
system, you are going to have to build a sag 02:30:36
table? 02:30:38
A. When it has aspheres, yes, of 02:30:38
course. 02:30:41
Q. Otherwise a person of skill in the 02:30:41
art would have no idea how to make the 02:30:43
invention; is that correct? 02:30:45
A. No. The sag table, as I said here, 02:30:46
allows the person who's recreating or 02:30:48
manufacturing that lens, or maybe documenting 02:30:50
it or making drawings or using it in their 02:30:53

mechanical model or whatever, people who are using that information need to be able to check to make sure the aspheric coefficients are correct. So you always provide a sag table with an asphere. 02:30:55 02:30:58 02:31:01 02:31:04 02:31:06

Q. And if you didn't provide a sag table, it wouldn't be a reliable way of making -- or understanding a lens -- right? -- to make sure the lens is correct? 02:31:07 02:31:09 02:31:13 02:31:16

MR. MURRAY: Objection to form. 02:31:18

THE WITNESS: I should never say things like -- sorry, Steve. Go ahead. 02:31:18 02:31:19

MR. MURRAY: Go ahead. Just slow down -- mostly for Jessica's benefit, but also so I can make an objection. 02:31:22 02:31:24 02:31:26

THE WITNESS: My apologies. I get so excited about the optical design stuff. 02:31:29 02:31:31

So, okay. So what was the question again? I think it was always -- 02:31:34 02:31:36

BY MR. BREGMAN: 02:31:39

Q. If you were to build or reproduce a lens accurately, you would need a sag table, 02:31:41 02:31:45

right? 02:31:48
MR. MURRAY: Objection to form. 02:31:48
THE WITNESS: Well, once again, when I make lenses, lens designs, when I design lenses and I report their characteristics including the surface prescriptions and so forth, I always provide a sag table if there are any aspheres in the design. 02:31:48 02:31:50 02:31:54 02:31:57 02:32:00 02:32:02
Now, it's not actually required, but it's just a really good safety check. 02:32:05 02:32:09
BY MR. BREGMAN: 02:32:13
Q. Okay. So if you didn't have a sag table -- let me rephrase that. 02:32:13 02:32:16
So you -- you're really using the sag table as a safety check? That's the -- that's the purpose of the sag table? 02:32:20 02:32:24 02:32:26
A. Yes. 02:32:28
Q. Did Dr. Chipman incorrectly type in any of the values from Table 5, as far as you can tell, into Code V? 02:32:34 02:32:37 02:32:40
A. As far as I can tell, the only mistake that Dr. Chipman made in terms of the 02:32:42 02:32:46

data entry was using the wrong aspheric coefficients. 02:32:51 02:32:56

Q. So that's not an error in data entry, right? That's an error, you are saying, in the patent. 02:32:57 02:32:59 02:33:01

I'm asking, was there any errors in data entry that Dr. Chipman made with respect to using Table 5 in his analysis? 02:33:02 02:33:05 02:33:07

A. There may have been, but I -- I think I observed all of the places where Dr. Chipman and I did things differently in my declaration. 02:33:14 02:33:17 02:33:19 02:33:23

So I -- I took it at face value that he made reasonable assumptions when he was entering his data. I had no reason to question that. And that I didn't see any other obvious deviations in terms of the schematics. 02:33:23 02:33:26 02:33:29 02:33:31 02:33:35

Unfortunately, Dr. Chipman didn't include his optical analysis, which -- which would have been informative, because as I show in my report, it would have -- it would have clued him in that there was an error. 02:33:39 02:33:40 02:33:44 02:33:48 02:33:52

Q. Let's turn to the table that you include on the top of page 32 of 94. 02:33:54 02:34:04

A. I'm there. 02:34:10

Q. And what is this table? 02:34:11

A. That's a sag table. I just wanted to include it as an example. 02:34:15 02:34:17

Q. This is a sag table that relates to Embodiment 3 of Tada? 02:34:19 02:34:23

A. I don't recall. Standard sag table produced by Zemax through the command analysis surface sag table. It is the sag table of the first surface of lens 2 using the incorrect aspheric coefficients. 02:34:25 02:34:31 02:34:34 02:34:36 02:34:40

Q. So this is a sag table for some of the lenses in Embodiment 3 of Tada? 02:34:44 02:34:47

A. For the very specific lens of surface -- surface 1 of lens 2 of Embodiment 3 with the incorrect aspheric coefficients. 02:34:49 02:34:52 02:34:58

Q. Now, a couple of lines down I see a file name, title, dates, units in millimeters, slope units, et cetera. Then I see algorithm assumes positive Z goes from -- 02:35:01 02:35:11 02:35:16 02:35:18

A. Air to glass.
Q. -- air to glass.
Do you see that?
A. Yes, I do.
Q. So this assumes that the material of the lens is glass?
A. No. That's -- this is the sine convention that I was mentioning earlier. It's so easy to get the aspheric sine convention wrong because there are two of them.
There is the one in which you have the algorithm assuming plus Z goes from air to glass and the other where plus Z goes from left to right.
So this is a statement for Zemax. Zemax is saying the aspheric coefficients have been interpreted assuming plus Z goes from air to glass no matter whether it's on the left surface or the right surface of the lens.
Q. So it's assuming that the lens is made from glass?
A. No. Once again, it is -- that's a

convention. Glass is -- is sort of a generic term in this case for high index to low index material. 02:36:16 02:36:20 02:36:23

So it's going from the air, which is represented in Zemax as a space, to the glass, which in this case may or may not be glass. In fact, it's PMMA, I'm pretty sure, but Tada doesn't say. 02:36:24 02:36:27 02:36:31 02:36:34 02:36:38

And so it is -- a better way to read that is plus Z goes from air to inside the material, but that's cumbersome. So we just use the shorthand term "glass." 02:36:39 02:36:42 02:36:46 02:36:49

Q. And what is the best foot sphere radius? 02:36:52 02:36:59

A. That is the -- it's just what it sounds like. It's the -- it takes this aspheric shape and fits it to a sphere mathematically, gets the best fit shape, and then subtracts that to generate the sag deviations. 02:36:59 02:37:01 02:37:03 02:37:08 02:37:11 02:37:13

Q. And all these numbers in the table are -- these are the mechanical points on a 02:37:14 02:37:19

lens, or mechanical characteristics? 02:37:21
A. **The left-hand column is the Y coordinates, so that's the distance above the optical axis.** 02:37:23 02:37:30 02:37:32
Q. Uh-huh. 02:37:33
A. **In Tada, he doesn't tell us what his actual focal length or scale is. So I've assumed millimeters, so these are all in millimeters, but the lens scales regardless. The focal length is 1, so you can scale it to centimeters or inches or whatever you want to do.** 02:37:33 02:37:38 02:37:41 02:37:44 02:37:47 02:37:50 02:37:51
But in my model, I left the scale as millimeters. So these are in millimeters from the optical axis -- that's the top number -- to the edge of the lens, which is 2.7 mms above the optical axis. 02:37:52 02:37:54 02:37:56 02:37:59 02:38:03
Q. Uh-huh. 02:38:04
A. **The next column is the sag or distance for that surface from a plane which is perpendicular to the optical axis at the vertex.** 02:38:04 02:38:07 02:38:14 02:38:17

And then it does this best fit sphere calculation. The next column is the sag of the best fit sphere. And then deviation is the difference between those two numbers. And the rest probably isn't that important for us. It's just another deviation. 02:38:20 02:38:22 02:38:26 02:38:29 02:38:34 02:38:37

Q. So none of these relate to wavelength? This is all just the shape of the lens? 02:38:38 02:38:40 02:38:43

A. This is all just the shape of the lens; that's right. 02:38:43 02:38:45

MR. BREGMAN: Why don't we take a break now seeing that we got a call in a couple of minutes, and then we will resume. 02:38:46 02:38:47 02:38:50

THE WITNESS: Okay. 02:38:53

(Whereupon, a recess was taken at 2:38 p.m.) 02:38:57 02:38:57

(The following portion of the record is the phone call with the judge. Witness was not present.) 02:38:57 02:38:57 02:47:01

JUDGE DERRICK: This is Judge Derek. With me on the line is Judges Kalan and 02:47:01 02:47:03

McGraw. We are here in a conference call 02:47:06
in cases IPR 2020-00179 and 00195. 02:47:08
Before we get started, I'd ask that 02:47:15
counsel for Petitioner, LG Electronics, 02:47:17
identify themselves. 02:47:20
MR. BREGMAN: Sure. This is Dion 02:47:23
Bregman, Your Honors. I'm not sure if Brad 02:47:25
Cangro and Collin Park are on as well. 02:47:28
MR. PARK: This is Collin Park. I'm 02:47:32
on as well. 02:47:34
MR. CANGRO: And this is Brad. 02:47:35
JUDGE DERRICK: Thank you. Welcome. 02:47:36
And who do we have on the line for 02:47:37
Patent Owner Immervision? 02:47:40
MR. MURRAY: Good afternoon, Your 02:47:42
Honor. Stephen Murray on behalf of 02:47:43
Immervision. And with me is also John 02:47:45
Simmons. 02:47:47
JUDGE DERRICK: Okay. Thank you. 02:47:51
And also I assume we have a court reporter 02:47:53
on the line? 02:47:55
THE STENOGRAPHER: Yes, I am here. 02:47:57

JUDGE DERRICK: Okay. I think I hear someone there. 02:48:01 02:48:03

So we understand the parties have a dispute regarding instructions to a witness during a deposition, in particular, not to answer certain questions. 02:48:04 02:48:07 02:48:09 02:48:11

Mr. Bregman, I believe this regards your deposition. 02:48:17 02:48:19

MR. BREGMAN: Yes, yes. Do you want me to jump in and give you a little bit of the background? 02:48:23 02:48:25 02:48:28

JUDGE DERRICK: Yes. So if you could please describe briefly what the problem is here, and then after that I will want to have counsel for Patent Owner probably -- I guess it's Mr. Murray -- to step in and prescribe -- or set forth their input in this as well. 02:48:28 02:48:31 02:48:32 02:48:34 02:48:37 02:48:39 02:48:42

MR. MURRAY: All right. I'll start. 02:48:45

So we are about -- now about two and a half hours into a deposition of patent owner's expert who has provided a 94-page 02:48:48 02:48:51 02:48:54

declaration on the patent and the prior 02:48:59
art. 02:49:03
I had asked him the following 02:49:03
question: Can you walk me through the 02:49:05
steps of how you would recreate the 02:49:08
invention embodied in Claims 5 and 21? 02:49:11
Those are claims that he's provided 02:49:14
opinions on. And Mr. Murray instructed him 02:49:16
not to answer that question as being beyond 02:49:20
the scope of his declaration. 02:49:24
I, of course, disagree. Mr. Aiken 02:49:25
has discussed at least the types of 02:49:29
information that is required in reproducing 02:49:31
a lens in the prior art, and I think it's 02:49:33
only fair for me to understand what kind of 02:49:35
information is described at that same level 02:49:39
that they are saying is required in the 02:49:42
prior art, what is described in the patent. 02:49:44
And that is as simple as that, Your Honor. 02:49:48
JUDGE DERRICK: Okay. Thank you. 02:49:51
Mr. Murray, could you please explain 02:49:54
why you think that the witness should not 02:49:58

answer this question? 02:50:01
MR. MURRAY: Yes, Your Honor. Thank you. 02:50:02 02:50:05
So this was a sequence of questions which culminated in just prior to the question that Mr. Bregman read for you. He asked, "Could I pick up the patent if I was a person of skill in the art at the relevant time period, read Claim 5, read Claim 21 and build a lens per the description in this patent?" 02:50:05 02:50:09 02:50:11 02:50:15 02:50:18 02:50:21 02:50:23 02:50:25
And then, of course, the follow-up which Mr. Bregman read. 02:50:26 02:50:28
This -- Mr. Aikens, who is our expert, provided a declaration which was rebutting the opinions of Petitioner's expert as to obviousness, and this line of questioning is clearly an attempt to get into an enablement defense being asserted by LG in a parallel district court litigation which is currently stayed pending this IPR. 02:50:29 02:50:33 02:50:35 02:50:39 02:50:43 02:50:45 02:50:48 02:50:51 02:50:54

And because Mr. Aikens' declaration doesn't get into whether or not the claims of this patent are enabled, allowing one of the ordinary skill in the art to build the lenses that were described, we felt it was outside of the scope, and at that point we felt it was more appropriate to have the board's involvement to resolve this issue. 02:50:55 02:51:00 02:51:04 02:51:10 02:51:11 02:51:16 02:51:19 02:51:22

MR. BREGMAN: And, Your Honors, if I could have just a very short rebuttal on that. This has nothing to do with district court. 02:51:26 02:51:28 02:51:30 02:51:32

Their expert has taken the position that the prior art doesn't have enough information in it to, and that information in it is incorrect to allow a person of skill in the art to understand what the patent is talking about, and that there are errors in the prior art. 02:51:32 02:51:34 02:51:35 02:51:39 02:51:41 02:51:42 02:51:45

All I want to know is what sort of information does the patent provide that leads you to the exact same place. Because 02:51:46 02:51:50 02:51:52

the patent doesn't describe even half the amount of information that's in the prior art, and I'd like to juxtapose that. 02:51:55 02:51:58 02:52:00

So I -- I don't see how that's anything but asking questions about the patent which their expert has provided an opinion on, and as such, it's fair game. 02:52:02 02:52:05 02:52:07 02:52:10

MR. MURRAY: If I could just make one brief remark -- 02:52:14 02:52:16

JUDGE DERRICK: Yes. 02:52:17

MR. MURRAY: -- in response to that, Your Honor. 02:52:17 02:52:19

Mr. Aikens has not opined that the prior art reference at issue lacks insufficient information. He has opined that there's an error that would have been obvious to one of ordinary skill in the art, readily apparent to one of ordinary skill in the art. 02:52:19 02:52:24 02:52:28 02:52:29 02:52:31 02:52:34 02:52:36

So what's disclosed in one section of that reference is an erroneous embodiment, and Mr. Aikens has explained 02:52:37 02:52:38 02:52:41

how that could be found and fixed. He has not opined that there's not enough information in Tada to build the lens. 02:52:46 02:52:49 02:52:51

JUDGE DERRICK: So but -- so just to make sure that we understand what the particular fact situation here is. 02:52:56 02:53:00 02:53:04

So he's being asked to opine -- go through and explain the steps that would be necessary to make the invention as set forth in Claims 5 and -- I'm not sure I remember the other claim. 02:53:06 02:53:10 02:53:13 02:53:16 02:53:20

MR. BREGMAN: Claim 21. 02:53:23

JUDGE DERRICK: Okay, 5 and 21? 02:53:24

MR. BREGMAN: Yeah. 02:53:28

JUDGE DERRICK: And the reason we got to this question was because he was pointing to an error in the prior art, and he indicated that what? That would have been apparent or not apparent to one of ordinary skill in the art at the time of the invention, what that error was? 02:53:28 02:53:32 02:53:35 02:53:40 02:53:45 02:53:48 02:53:51

MR. MURRAY: Right. So the claims 02:53:53

require some characteristics of a lens, 02:53:55
which is a lens in like a cell phone 02:53:58
camera, for example. 02:54:01
JUDGE DERRICK: Right. 02:54:01
MR. MURRAY: Or any digital camera. 02:54:01
So there's some inherent characteristics of 02:54:03
the lens. And to get to those inherent 02:54:06
characteristics, both sides have said that 02:54:08
you need some -- some information to get 02:54:10
there. 02:54:13
Prior art teaches some information. 02:54:13
Patent owners have taken the position that 02:54:16
that information is wrong. They said you 02:54:18
got to look at all this other information, 02:54:20
you got to go look at a priority, prior art 02:54:22
Japanese application to try and figure out 02:54:26
where these errors are, and it's not enough 02:54:28
information. 02:54:30
All we're asking is how much 02:54:31
information is described in the patent that 02:54:33
would allow someone to determine these 02:54:35
exact same characteristics. And I'd 02:54:37

like -- I'd like the witness to point out where in the patent that information is. 02:54:39 02:54:41

So I'm just asking questions about the patent. I'm not reading the patent at all. I'm asking about what's in the four corners of the document of the patent. 02:54:44 02:54:45 02:54:48 02:54:51

JUDGE DERRICK: Mr. Murray, do you have anything to add? We're going to take a brief break here, but do you have anything to add before we do that? 02:54:54 02:54:55 02:54:57 02:55:00

MR. MURRAY: So just to clarify the issue, the prior art reference that we're discussing has multiple tables of information, and their expert, in his declaration, testified that he took the information from one of those tables, entered it into a computer and built a model of a lens. 02:55:01 02:55:03 02:55:05 02:55:08 02:55:12 02:55:16 02:55:19 02:55:22

We are not -- our expert has not opined that there was anything wrong with that process, per se. The problem is that there is a typographical error in the data 02:55:23 02:55:26 02:55:28 02:55:32

that was entered. 02:55:36
And it's fairly apparent, according to our expert based on some other data within that prior art reference itself that shows there's a typographical error. 02:55:38 02:55:41 02:55:43 02:55:45
And the Japanese reference, our expert has not opined that you need to go there. He just went there because that had the correct data, and that was the easiest way to actually build the correct lens to do the analysis for getting to the patent. 02:55:48 02:55:53 02:55:54 02:55:56 02:55:59 02:56:00
And so the -- what's not at issue is whether somebody can take that information from the '990 patent and use that somehow in this prior art analysis. It's just not relevant to the issue. 02:56:04 02:56:11 02:56:13 02:56:18 02:56:21
JUDGE DERRICK: Okay. All right. Well, Counsel, we're going to put you on hold for a few minutes while we -- the Panel confers, and then we will get back to you shortly. Thank you. 02:56:27 02:56:30 02:56:35 02:56:37 02:56:39
MR. MURRAY: Thank you, Your Honor. 02:56:45

MR. BREGMAN: Thanks. 02:56:46
(Pause in testimony.) 02:56:48
JUDGE DERRICK: Okay. Thank you for waiting. Is counsel for Petitioner and Patent Owner still on the line? 03:09:55 03:09:57 03:09:59
MR. BREGMAN: Yes, I'm on for Petitioner. 03:10:02 03:10:04
MR. MURRAY: Yes, Your Honor. 03:10:04
JUDGE DERRICK: Thank you. 03:10:06
So we have conferred. And the witness needs to answer a question according to the trial -- the Consolidated Trial Practice Guide and the guidelines for testimony, in particular, Item 4 of those guidelines; that counsel may instruct a witness not to answer only when it's necessary to preserve a privilege, to enforce a limitation ordered by the board, or present a motion to terminate or limit the testimony here. 03:10:07 03:10:14 03:10:18 03:10:22 03:10:24 03:10:30 03:10:34 03:10:37 03:10:38 03:10:41 03:10:44
And then Item 9, a motion to terminate or limit testimony is only on the 03:10:48 03:10:52

ground that it's being conducted in bad faith or in a manner that unreasonably annoys, embarrasses, or oppresses a witness or a party. 03:10:57 03:10:58 03:11:01 03:11:04

Here on what we've heard, we don't see that it rises to that level, although we would emphasize that the scope of cross-examination is, in fact, limited to the direct testimony. 03:11:05 03:11:08 03:11:11 03:11:18 03:11:20

And so to the extent this reasonably is limited to the direct testimony, we do not see that it is improper, and as such, the witness should answer the question -- the question. 03:11:22 03:11:28 03:11:31 03:11:39 03:11:43

Does anybody need some clarification on that, or is that sufficiently clear? 03:11:44 03:11:48

MR. MURRAY: This is -- sorry. Go ahead. 03:11:52 03:11:59

MR. BREGMAN: I said sufficiently clear to Petitioner's counsel, Your Honors. 03:11:59 03:12:00

MR. MURRAY: So just for -- yeah, just for Patent Owner's counsel, so the 03:12:02 03:12:04

witness will answer the question, but we'd like to maintain our objection that it's outside of the scope. 03:12:10 03:12:14 03:12:17

Can we have authorization to file a motion to strike after the deposition is over? 03:12:19 03:12:21 03:12:24

JUDGE DERRICK: You can -- you can seek authorization to -- for a motion to strike. 03:12:26 03:12:28 03:12:31

MR. MURRAY: Okay. Thank you, Your Honor. 03:12:33 03:12:35

JUDGE DERRICK: Is there anything else then? 03:12:37 03:12:39

MR. MURRAY: Not from Patent Owner. 03:12:41

MR. BREGMAN: And nothing else for Petitioner. 03:12:43 03:12:45

JUDGE DERRICK: Okay. Thank you, all. This call then is concluded. 03:12:47 03:12:49

MR. BREGMAN: Thank you, Your Honor. 03:12:55

MR. MURRAY: Thank you, Your Honor. 03:12:55

(Whereupon, phone call concludes.) 03:12:58

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BY MR. BREGMAN: 03:15:42
Q. So, Mr. Aikens, we just completed a call with the board, and they said that you need to answer the question I had asked, so let's -- let's sort of step back a little bit, and we'll take it one step at a time. 03:15:46 03:15:48 03:15:50 03:15:53 03:15:55
I'd like you to go back to Exhibit 1001, and that's the patent, the '990 patent. Let me know when you're there. 03:15:57 03:16:00 03:16:05
A. I have it. 03:16:07
Q. So if you can go to page 23 of 27 in the bottom right-hand corner. I think we previously established that the two claims at issue per your declaration are Claims 5 and 21. 03:16:07 03:16:10 03:16:15 03:16:17
You would agree with that? 03:16:21
A. I think you mean page 22? 03:16:23
Q. Page 23 of 25. 03:16:26
A. I have page 22 of 27 in my exhibit. 03:16:29
Q. I'm sorry. That's what I meant. 03:16:31
A. Column 19? 03:16:33
Q. Yep. Column 19 has Claim 5. 03:16:34
Do you see that? 03:16:36

A. Yes. 03:16:37
Q. And Claim 5 is a method according to Claim 1. 03:16:38 03:16:41
Do you see that? 03:16:41
A. Yes. 03:16:44
Q. And Claim 1 is a method for capturing a digital panoramic image, et cetera. 03:16:45 03:16:47
Do you see that? 03:16:50
A. Yes. 03:16:50
Q. Claims 1 and 5 are method claims. 03:16:50
Would you agree with that? 03:16:53
A. They both contain the word "method." 03:16:54
Q. A method for doing something, right? 03:16:57
A. Presumably. But please recall, I did not do any claims construction for this. 03:17:03 03:17:05
Q. Okay. Claim 21 is a little bit different. That depends on Claim 17. Both of those claims are directed to a panoramic objective lens. 03:17:07 03:17:10 03:17:12 03:17:15
Do you see that? 03:17:17
A. I do. 03:17:17
Q. Okay. So that's a lens. You got 03:17:18

some claims directed to the actual lens and some claims directed to a method. 03:17:20 03:17:23

Would you agree with that? 03:17:27

A. I see that 17 talks about a panoramic objective lens comprising, and then has a paragraph. And 21 you said is also a paragraph -- a panoramic objective lens according to Claim 17. 03:17:30 03:17:31 03:17:34 03:17:37 03:17:40

Q. Now, I'd like you to point me to whatever you can in the patent that would allow a person of skill in the art to build a lens claimed in Claim 21? 03:17:41 03:17:45 03:17:52 03:18:01

A. I'm sorry. You broke up there. 03:18:03

Q. To build the lens claimed in Claim 21. 03:18:04 03:18:07

MR. MURRAY: Objection to form. And beyond the scoped. 03:18:09 03:18:11

You may answer. 03:18:12

BY MR. BREGMAN: 03:18:19

Q. Does the '990 patent contain any tables of lens characteristics? 03:18:19 03:18:22

MR. MURRAY: Are you withdrawing the 03:18:26

previous question? 03:18:27
MR. BREGMAN: I am. 03:18:28
MR. MURRAY: Okay. 03:18:29
BY MR. BREGMAN: 03:18:29
Q. Does the '990 patent contain any tables that give you lens characteristics? 03:18:29 03:18:32
MR. MURRAY: Objection to form. 03:18:37
THE WITNESS: In preparing my declaration, I did not do any modeling of lenses in the '990 patent. 03:18:38 03:18:45 03:18:49
BY MR. BREGMAN: 03:18:52
Q. Okay. Do you feel that you understand the '990 patent? 03:18:53 03:18:54
A. I feel I understand it well enough to discuss my declaration and that of Russell Chipman. 03:18:57 03:18:59 03:19:02
Q. Okay. So you've read the '990 patent. How many times would you say you've read it? 03:19:03 03:19:04 03:19:07
A. Recently. I think I read it yesterday. 03:19:08 03:19:10
Q. Okay. So you've read it maybe more 03:19:11

than five times? 03:19:13

A. Probably three or four. 03:19:13

Q. Okay. And you said earlier that you 03:19:15
are at least a person of ordinary skill in the 03:19:21
art; is that correct? 03:19:23

A. Yes, I am. 03:19:23

Q. Okay. So I'm going to ask you as a 03:19:25
person of ordinary skill in the art who has 03:19:27
provided a declaration related to the '990 03:19:28
patent, can you point to me any tables -- 03:19:33
there's not that many columns in this -- any 03:19:39
tables that contain information or data from 03:19:41
which you can build a lens? 03:19:43

MR. MURRAY: Objection to form. 03:19:48
Outside the scope. 03:19:49

THE WITNESS: Once again, I have not 03:19:51
tried to model any of the lenses in the 03:19:53
'990 patent, so I don't want to speculate 03:19:55
on what is or is not in here as far as 03:19:58
content to provide guidance for that. 03:20:01

BY MR. BREGMAN: 03:20:05

Q. So you can't tell me what's in the 03:20:05

patent? 03:20:06
MR. MURRAY: Objection. 03:20:08
BY MR. BREGMAN: 03:20:11
Q. That's fine. If you can't tell me what's in the patent, that's fine. That's the answer that you should give me. 03:20:12 03:20:13 03:20:15
MR. MURRAY: Objection to form. 03:20:18
THE WITNESS: As I said, I'm familiar with the patent well enough to discuss my declaration and that of Russell Chipman. I do not want to speculate and give a wrong answer to the Court. 03:20:18 03:20:20 03:20:21 03:20:23 03:20:26
BY MR. BREGMAN: 03:20:28
Q. In your declaration, did you take positions on what the numerical limitations in the claims mean? 03:20:28 03:20:31 03:20:35
MR. MURRAY: Objection to form. 03:20:38
THE WITNESS: What are you talking about specifically? 03:20:39 03:20:42
BY MR. BREGMAN: 03:20:42
Q. All right. Is there any numerical limitations in the claims? 03:20:44 03:20:46

A. Yes, there is. 03:20:50
Q. Okay. And do those numerical limitations in the claims, are they discussed in the patent that would allow you to make a lens that meets those, or model a lens as you've done with the prior art that meets the limitations of the claim? 03:20:51 03:20:54 03:20:59 03:21:04 03:21:07 03:21:11
MR. MURRAY: Objection to form. Beyond the scope. 03:21:13 03:21:14
THE WITNESS: The number that is listed in the claim is plus or minus 10 percent for the maximum divergence. And that's the only number that I've cited, I think, from the claims in my declaration. And it was in the context of whether or not Tada had at least plus or minus 10 percent of deviation. 03:21:14 03:21:20 03:21:22 03:21:24 03:21:27 03:21:29 03:21:31 03:21:34
BY MR. BREGMAN: 03:21:36
Q. And do you understand what plus or minus 10 percent of deviation means? 03:21:36 03:21:38
A. I believe I do, yes. 03:21:40
Q. What tells you what that means? 03:21:41

A. I believe -- well, I can simply use Dr. Chipman's definition, and it works fine. 03:21:44 03:21:48
Q. But you told me earlier that it comes from a -- a formula in the patent, right? That's what the deviation is? 03:21:51 03:21:52 03:21:57
A. Dr. Chipman cited a specific equation, and I think we were looking at it earlier. 03:21:58 03:22:02 03:22:04
Q. Okay. 03:22:05
A. I used his formalism. 03:22:05
Q. So you take no position on the meaning of anything in the patent. You're only taking positions on what Dr. Chipman said; is that right? 03:22:08 03:22:12 03:22:13 03:22:16
MR. MURRAY: Objection to form. 03:22:16
THE WITNESS: No, that's not correct. I've written a very carefully thought-out declaration -- 03:22:16 03:22:17 03:22:19
BY MR. BREGMAN: 03:22:20
Q. Okay. 03:22:20
A. -- specifically addressing the issues associated with Chipman's arguments. 03:22:20 03:22:22

Q. Okay. So as you sit here today, can you tell me if there are any tables in the '990 patent that contain data about lens characteristics? 03:22:24 03:22:26 03:22:30 03:22:33

MR. MURRAY: Objection to form. 03:22:34

THE WITNESS: I'm not going to speculate on something off the top of my head. 03:22:35 03:22:37 03:22:40

I would need to carefully go through the whole patent in order to form an expert opinion thinking about each section and each word and understanding in the context of this patent, whether or not a person of ordinary skill in the art could recreate the lenses that are described. 03:22:40 03:22:42 03:22:46 03:22:47 03:22:50 03:22:57 03:22:58

I did not consider that when I was preparing my declaration. 03:22:59 03:23:01

BY MR. BREGMAN: 03:23:02

Q. Does the '990 patent have any sag tables in it? 03:23:02 03:23:05

A. There are tables. I don't believe there are sag -- there is a sag table. 03:23:06 03:23:10

Q. Does the '990 patent provide you with a lens schematic for a lens that's covered by Claims 5 and 21? 03:23:14 03:23:19 03:23:23

MR. MURRAY: Objection to form. 03:23:25

THE WITNESS: I haven't considered the '990 patent outside of the preparation of my declaration. If you can show something in my declaration that you would like to ask about, I'm happy to answer those questions. 03:23:29 03:23:30 03:23:32 03:23:35 03:23:37 03:23:39

BY MR. BREGMAN: 03:23:40

Q. I'd like to understand whether you have an understanding of the patent or not. I mean, if you are telling me you haven't read the patent or you don't understand it, I understand. But I'm asking you questions about the patent. You either understand it or you don't. 03:23:40 03:23:41 03:23:42 03:23:44 03:23:46 03:23:47 03:23:50

So can you tell me if there is any figures in this patent that show a lens schematic that is covered by the claims of the patent? 03:23:50 03:23:54 03:23:59 03:24:02

MR. MURRAY: Objection to form. 03:24:04
THE WITNESS: I don't want to mislead you. I don't want to give an incorrect answer. This is testimony under oath. 03:24:04 03:24:05 03:24:07 03:24:09
BY MR. BREGMAN: 03:24:10
Q. So you will not -- you won't answer the question? 03:24:10 03:24:12
A. I would happily answer anything associated with my declaration, because that's well thought-out expert opinion. But I do not want to speculate off the fly and give a wrong answer based on something I haven't prepared for. 03:24:14 03:24:17 03:24:18 03:24:21 03:24:25 03:24:27
Q. So how do you understand what the meaning of the claims are if you can't tell me if there are any lens schematics that relate to the claim in the patent? 03:24:27 03:24:29 03:24:31 03:24:34
MR. MURRAY: Objection to form. 03:24:35
BY MR. BREGMAN: 03:24:37
Q. Do you understand what the claims mean? 03:24:37 03:24:38

MR. MURRAY: Objection to form. 03:24:39
THE WITNESS: In my analysis, I 03:24:40
merely work from Dr. Chipman. My job was 03:24:44
not to determine whether or not '990 had 03:24:46
any particular attributes outside of 03:24:50
Dr. Chipman's assessment that the claims 03:24:54
were obvious. And he made his argument 03:24:56
based on Tada, Tada over Nagaoka, and Tada 03:24:58
over Baker. 03:25:02
Those specific claims I analyzed. 03:25:03
In fact, I found his logic completely 03:25:06
flawed because he had made a tragic error 03:25:08
in creating the third -- please let me 03:25:10
finish -- in creating the third embodiment. 03:25:13
It was so wrong, that the entire 03:25:15
argument was specious. I did not need to 03:25:17
go into any details in my mind in order to 03:25:20
address those errors. 03:25:23
MR. BREGMAN: I object to the answer 03:25:24
as being nonresponsive. 03:25:26
BY MR. BREGMAN: 03:25:26
Q. Let's look at your declaration, 03:25:29

page 13 of 94, section No. 6. I would like to see you point to anything from Dr. Chipman in that entire section. 03:25:32 03:25:42 03:25:44

A. This is, you said, 13 of 94? 03:25:45

Q. That's right. So Section 6 is entitled '990 Patent and Claim Summary. 03:25:50 03:25:53

A. Yes, I see that. 03:25:57

Q. So you have an understanding of what the patent means; is that correct? 03:25:59 03:26:02

A. I think so. 03:26:04

Q. And you have an understanding of what the claims mean; is that correct? 03:26:05 03:26:07

A. For the purposes of evaluating Dr. Chipman's assessment, yes. 03:26:09 03:26:11

Q. So I'm going to ask you about the claims, and if you tell me you don't understand them, then that's fine. 03:26:12 03:26:15 03:26:17

So the claims claim either a method of doing something or a lens. You have said in paragraph 30 that Claims 5 and 21 recite, and then you quote some claim language. And then the next sentence you say, "An example of this 03:26:19 03:26:23 03:26:31 03:26:34 03:26:37

is shown." 03:26:40
Do you see that? 03:26:41
A. Yes. 03:26:41
Q. So you've taken a position on what the claims include and what figures in the patent are examples of those claims? 03:26:42 03:26:45 03:26:48
MR. MURRAY: Objection to form. 03:26:52
BY MR. BREGMAN: 03:26:53
Q. So you've already given an opinion on this. I'm asking you about your opinion on the patent. 03:26:53 03:26:56 03:26:59
So you have said an example of this limitation -- this is in paragraph 30 -- is shown in the image point distribution plot in Figure 9. 03:27:01 03:27:05 03:27:07 03:27:12
My question is: Are there any other figures in the patent that are also examples of what is claimed in figures -- sorry -- Claims 5 and 21? 03:27:13 03:27:15 03:27:20 03:27:24
A. I know that Figure 9 is an excellent example of showing the compression in the center and the edge which is described in the 03:27:28 03:27:31 03:27:33

claims. 03:27:35
I have taken the claims construction that has been provided from Dr. Chipman's analysis and evaluated lenses following his methodology and using his equations. 03:27:36 03:27:38 03:27:41 03:27:46
Q. I'm not asking you anything about Dr. Chipman. I'm asking you about your opinion. Nothing to do with Dr. Chipman. Your opinion. 03:27:48 03:27:49 03:27:53 03:27:56
The entire section is talking about the patent. It's talking about the claims. It's talking about examples of things in the figures that are examples of the claims. 03:27:57 03:27:58 03:28:00 03:28:03
Let's go through the figures ones at a time and you can tell me if it's an example of something in the claims, okay? Let's start with Figure 1 of Exhibit 1001. 03:28:06 03:28:09 03:28:11 03:28:13
Is Figure 1 an example of the claims? 03:28:16 03:28:20
MR. MURRAY: Objection to form. Outside the scope. 03:28:23 03:28:25
THE WITNESS: Figure 1 is related to 03:28:26

the invention in that it's a picture representing prior art. 03:28:34 03:28:37
BY MR. BREGMAN: 03:28:38
Q. Okay. What about Figure 2? 03:28:38
MR. MURRAY: Same objection. 03:28:43
THE WITNESS: Same answer. 03:28:44
BY MR. BREGMAN: 03:28:45
Q. So Figure 2 is also prior art; is that right? 03:28:45 03:28:46
A. It is a picture of the resultant image that's expected from a prior art lens. 03:28:46 03:28:52
Q. What about Figure 3? 03:28:55
MR. MURRAY: Objection. Form. Outside the scope. 03:28:58 03:28:59
THE WITNESS: I'm not sure. I'd have to carefully think about that figure. 03:29:00 03:29:02
BY MR. BREGMAN: 03:29:04
Q. What about Figure 4A and 4B? 03:29:04
MR. MURRAY: Same objections. 03:29:07
THE WITNESS: I believe I referenced 4A and 4B in my report. It is an example, as you know, of an image point distribution 03:29:15 03:29:16 03:29:19

function and a pattern to explain what an image point distribution function is for a linear distribution. 03:29:22 03:29:24 03:29:26
BY MR. BREGMAN: 03:29:27
Q. And this is a prior art lens, right? 03:29:27
A. I believe that's the way it's stated, yes. 03:29:36 03:29:38
Q. So Figures 4A and 4B can't possibly be examples of the language from the claim that you had in paragraph 30 of your declaration because they're the prior art; is that correct? 03:29:38 03:29:41 03:29:44 03:29:46
A. They relate to the claims. They are the specific linear distribution from which the claims measure the deviation and the distortion. 03:29:54 03:29:56 03:29:59 03:30:02
Q. But they do not contain a compressed zone, an expanded zone at all; is that correct? 03:30:03 03:30:09
A. No. Figure 4A and B do not contain a compressed zone or an expanded zone. 03:30:12 03:30:17
Q. And you'd agree that the Claims 5 and 21 require two compressed zones and one expanded zone, right? 03:30:19 03:30:21 03:30:25

A. I've done no claims construction. I haven't analyzed exactly what those terms should be read as and how they should be interpreted in the context of the specification. 03:30:26 03:30:29 03:30:32 03:30:35 03:30:36
Q. You absolutely have told us in your declaration what the terms "expanded" and "compressed" mean. You want me to point you to that? We went through it a little bit earlier today. You had that in quotes. You said "compressed" means this, and "expanded" means this. 03:30:37 03:30:39 03:30:42 03:30:44 03:30:47 03:30:49 03:30:51
A. What was your question again? 03:30:52
Q. I want to know whether Figures 4A and B contain or display a zone of the lens, of a lens that has a compressed zone and an expanded zone. 03:30:54 03:30:57 03:31:06 03:31:09
A. As I mentioned before, 4A and 4B is a picture of an image point distribution function which does not have a compressed center or edge. 03:31:14 03:31:18 03:31:20 03:31:23
Q. Okay. 03:31:24

A. It is linear distribution function. 03:31:25
Q. Okay. And that would not be covered 03:31:27
by the claims, then, right? Claims require 03:31:29
certain areas of zones to be compressed and 03:31:31
certain zones to be expanded; is that correct? 03:31:34
A. The Figure 9 is the one that I drew 03:31:37
from in explaining what a compressed zone at 03:31:42
the center and edge would be. And that was 03:31:46
based on -- that's based on my understanding of 03:31:47
the language of the claims. 03:31:49
But that understanding is based 03:31:52
completely on Russ Chipman's presumed 03:31:55
definition and claims construction. 03:31:58
Q. Which you have adopted for the 03:31:59
purposes of your declaration? 03:32:01
A. My report and nothing more. 03:32:02
Q. Okay. So you said there's an 03:32:04
example that's Figure 9. I'd like to know, are 03:32:07
there any other examples in figures that have 03:32:10
this, what you say in paragraph 30, the 03:32:12
compressed -- let me read it to you. 03:32:16
"Lens compresses the center of the 03:32:19

image and the edges of the image and expands an intermediate zone of the image located between the center and the edges of the image." 03:32:21 03:32:25 03:32:27

Are there any other figures in the patent that display that, that have that? 03:32:30 03:32:32

A. As far as I can see, the only image point distribution functions shown in the '990 patent which include a compressed zone at the center and the edge is Figure 9. 03:32:45 03:32:49 03:32:51 03:32:54

Q. Thank you. 03:32:56

Now, what about -- you mentioned earlier there's something called a lens schematic. That's what I think you were referring to shown in Figures 15 and 16; is that right? 03:32:57 03:32:59 03:33:01 03:33:04 03:33:08

A. Well, we were discussing the meaning of the term "schematic" as it's used in the '990 patent versus the way I colloquially use the term, which is a lens schematic. 03:33:08 03:33:11 03:33:14 03:33:17

Q. Okay. Well, let's use your language for lens schematic. That's Figures 15 and 16 from the '990 patent; is that right? 03:33:20 03:33:22 03:33:25

A. Figures 15 and 16 are lens schematics, yes. 03:33:27 03:33:33
Q. Are there any other lens schematics in the '990 patent other than Figures 15 and 16? 03:33:34 03:33:36 03:33:39
A. Yes. There's another one in Figure 18. 03:33:39 03:33:42
Q. Do any of Figures 15, 16, or 18 have a lens with a center that is compressed, an edge that is compressed, and an intermediate zone that is expanded? 03:33:44 03:33:52 03:33:57 03:34:00
MR. MURRAY: Objection. Form. Outside the scope. 03:34:03 03:34:03
THE WITNESS: I didn't model these lenses, so I can't speak to that. 03:34:04 03:34:06
BY MR. BREGMAN: 03:34:09
Q. Did you read the description about these lenses? 03:34:09 03:34:11
A. The description is, "Figure 15 is a cross section of the first embodiment of the nonlinear panoramic objective lens according to the present invention." 03:34:12 03:34:16 03:34:18 03:34:21

And then Figure 16 just says that's an "Exploded view of the cross section of the system of lenses in a panoramic objective lens." 03:34:24 03:34:26 03:34:30 03:34:34

Is that what you meant? 03:34:34

Q. Yeah. So do you understand what Figure 15 -- do you understand whether Figure 15 has a compressed zone at the center and the edge and an intermediate zone between those two? 03:34:35 03:34:37 03:34:43 03:34:48 03:34:51

MR. MURRAY: Objection to form. 03:34:53

THE WITNESS: As I said, I didn't model it, so I can only say that they are meant to be examples of and embodiment of the panoramic lens exhibiting the properties of the invention. 03:34:57 03:34:58 03:35:02 03:35:07 03:35:09

So to the extent that they do that, one would presume that's what they do. I have no reason to doubt that they would work. 03:35:10 03:35:15 03:35:19 03:35:20

BY MR. BREGMAN: 03:35:21

Q. Why don't we look at Column 16, 03:35:49

line 5. 03:35:51
A. Yes. 03:36:01
Q. It says, "Figure 15 represents, by a cross section, an example of an embodiment of a nonlinear objective lens 30 according to the present invention. The distribution function FD obtained by means of the objective lens 30 is the function FD1 described above in relation to Figure 7B, the objective lens 30 thus expanding the image in the center"? 03:36:01 03:36:04 03:36:08 03:36:11 03:36:14 03:36:18 03:36:21 03:36:25
A. Yes, I see that. 03:36:33
Q. Would a lens that expands the image in the center be covered by Claims 5 and 21? 03:36:34 03:36:36
MR. MURRAY: Objection to form. 03:36:40
THE WITNESS: From this description, we can't determine if Figure 15 has only an expanded center or if it also has a compressed edge. It could actually have a compressed center and a compressed edge and an expanded center and still meet these -- this description. 03:36:41 03:36:51 03:36:55 03:36:58 03:37:03 03:37:06 03:37:08
But I will say, Figure 15 -- it says 03:37:10

Figure 15 corresponds to Figure 7B. 03:37:14
BY MR. BREGMAN: 03:37:23
Q. All right. So does Figure 7B, does that provide you any more information about whether there is a center that is compressed -- an edge that is compressed and an intermediate zone that is expanded? 03:37:23 03:37:25 03:37:29 03:37:35 03:37:38
A. It doesn't appear to be, no. 03:37:40
Q. Okay. So Figure 15, likewise 16, do not meet the limitations of Claims 5 and 21 that require a center and edge that are compressed and an intermediate zone that is expanded, right? 03:37:42 03:37:48 03:37:54 03:37:56 03:38:01
MR. MURRAY: Objection to form. Outside the scope. 03:38:02 03:38:05
THE WITNESS: I haven't tried to analyze the claims and determine what is or is not in the patent. 03:38:05 03:38:07 03:38:09
BY MR. BREGMAN: 03:38:09
Q. Okay. So as you sit here today, you cannot tell me whether there are any lens schematics in this patent that relate or that 03:38:10 03:38:12 03:38:15

are covered -- let me repeat -- let me say that again. 03:38:21 03:38:23

So as you sit here today, you cannot tell me whether there are any lens schematics in the '990 patent, Exhibit 1001, that are covered by Claims 5 and 21 of the patent; is that correct? 03:38:24 03:38:28 03:38:29 03:38:35 03:38:43

MR. MURRAY: Same objection. 03:38:43

THE WITNESS: You're getting at could a person of ordinary skill at the art create a lens with a compressed center and edge based on the content of this patent. I believe the answer is yes. 03:38:44 03:38:51 03:38:54 03:38:56 03:38:59

BY MR. BREGMAN: 03:39:00

Q. I did not ask you that, but seeing that you are telling me that, can you tell me how they can use the patents to create a lens as you just described, having a center and edge that are compressed and an intermediate zone that is expanded? 03:39:06 03:39:08 03:39:11 03:39:17 03:39:20 03:39:24

MR. MURRAY: Objection to form. Outside the scope. 03:39:28 03:39:29

THE WITNESS: A person of ordinary skill in the art would learn from the '990 patent the advantageousness of having different distribution functions of distortion in a lens. That's really eye-opening. 03:39:29 03:39:41 03:39:42 03:39:46 03:39:51 03:39:55

He can then look at Figures 15 and 16 and see a retrofocus lens which is an embodiment which he could easily recreate. 03:39:57 03:39:59 03:40:02

And from that, he could then, knowing what he's looking for a priori, which is a distribution function which is compressed at the center and the edge, he could modify this lens design to have it produce a desired shape of image point distribution function. 03:40:04 03:40:06 03:40:09 03:40:11 03:40:14 03:40:19 03:40:23

BY MR. BREGMAN: 03:40:24

Q. So, sorry. Modify which lens design? 03:40:24 03:40:25

A. I'm just saying from my point of view, if I were doing this, I would take the Figure 16, I would enter a lens that looked 03:40:26 03:40:28 03:40:31

like that, had those lens shapes specifically with three negative lenses in the front, an outer meniscus, an inner bi- -- an inner plano concave and a second plano concave with the opposite facing. 03:40:33 03:40:36 03:40:39 03:40:45 03:40:48

I would choose reasonable materials. I would enter the other elements, and I would re-optimize it and put in the merit function, among other things, a distribution of image points to reflect the compressed zones that I was targeting. 03:40:49 03:40:51 03:40:53 03:40:56 03:40:59 03:41:02

Q. So you would get all of that from this figure, from Figures 15 and 16 and Figure 9; is that right? 03:41:03 03:41:07 03:41:10

A. And my skill in the art. 03:41:11

Q. Okay. And you would play with different values, I guess, in Zemax or Code V until you got the desired output that you were looking for; is that right? 03:41:13 03:41:15 03:41:20 03:41:23

MR. MURRAY: Objection to form. 03:41:26

THE WITNESS: I'm saying that I could -- I could design a lens, starting 03:41:30 03:41:31

from this figure, which had a compressed center and edge. I believe I could. I haven't done it, so I can't say that I actually can. But I believe one skilled in the art could do that. 03:41:34 03:41:37 03:41:39 03:41:42 03:41:45

BY MR. BREGMAN: 03:41:46

Q. But this lens doesn't have a compressed center. It has an expanded center. We just looked at Figure 7, right? 03:41:46 03:41:48 03:41:50

A. But there are subtle differences. The design form is the right idea. Once you know what you're trying to do, it's actually not that hard to manipulate the lens to get it to do what you want. 03:41:53 03:41:55 03:41:58 03:42:00 03:42:02

Q. So you would start with this lens -- 03:42:04

A. Uh-huh. 03:42:09

Q. -- that's got an expansion in the center and a compression at the edge -- 03:42:09 03:42:11

A. Uh-huh. 03:42:15

Q. -- and you would play around with the values in Zemax until you got compression, expansion, compression from the center to the 03:42:15 03:42:20 03:42:27

edge -- from the center of the lens to the edge 03:42:29
of the lens; is that right? 03:42:32
MR. MURRAY: Objection to form. 03:42:33
Outside the scope. 03:42:34
THE WITNESS: I would say that from 03:42:35
the starting point of Figure 16 and 03:42:51
knowledge of what kind of image point 03:42:55
distribution function would be beneficial 03:42:57
given the specification that's been 03:43:02
provided from '990, I believe I could 03:43:04
recreate that lens. I could -- or not 03:43:07
recreate that lens. That's too strong. 03:43:09
I could create a lens which 03:43:12
exhibited the pattern of image point 03:43:13
distribution that's shown in Figure 9. I 03:43:16
believe I could do that. 03:43:19
BY MR. BREGMAN: 03:43:20
Q. And what would the lens look like? 03:43:21
A. It would probably look a lot like 03:43:26
Figure 16. All of these wide angle lenses tend 03:43:29
to have the same shape, the negative front 03:43:37
group and the positive back group with a pupil 03:43:40

sort of halfway between the back group. 03:43:44
That's a -- this is a pretty -- pretty reasonable-shaped lens to create a wide field of view image with controlled distortion. I've just never -- 03:43:47 03:43:49 03:43:53 03:43:57
Q. I see. 03:43:57
A. -- done it. 03:43:58
Q. So a person of ordinary skill in the art would know what a typical wide angle lens would look like, and then they would use Zemax and play with the values in Zemax until they got a lens that met their requirements; is that correct? 03:44:00 03:44:03 03:44:06 03:44:12 03:44:15 03:44:19
MR. MURRAY: Objection to form. 03:44:19
THE WITNESS: No, that's not correct. 03:44:20 03:44:21
BY MR. BREGMAN: 03:44:22
Q. Okay. Tell me -- 03:44:22
A. I was simply telling you what I would do. 03:44:23 03:44:26
Q. Okay. And what was that? 03:44:26
A. What I would do is I would start 03:44:27

from Figure 16 knowing that this has enough degrees of freedom that I can manipulate the distortion to get some values that are distinctly different from either linear or F10 theta. 03:44:29 03:44:31 03:44:37 03:44:39 03:44:43

And given those degrees of freedom, I should be able to vary that lens solution using optimization and other references and probably quite a bit of my own expertise in designing lenses, and I could create a distribution which looks like Figure 9. 03:44:44 03:44:47 03:44:49 03:44:52 03:44:57 03:45:00

I am fairly confident I could do that. Not exactly, perhaps, but -- but something that had a compressed center and edge. 03:45:03 03:45:05 03:45:08 03:45:10

Q. Would that be easy for a person of ordinary skill in the art to do? 03:45:11 03:45:15

MR. MURRAY: Objection to form. 03:45:16

THE WITNESS: I wouldn't say it's -- 03:45:17

BY MR. BREGMAN: 03:45:18

Q. I'm sorry. What's that? 03:45:19

A. I wouldn't say it's easy. I would 03:45:19

not say it's easy, but I would say it is -- it's something that I would certainly be comfortable in doing. 03:45:21 03:45:24 03:45:26

I would want to spend some time really thinking about what the POSA is, and what the claims mean, and exactly what the content is of the specification and where it points to say necessarily, as an expert opinion, that a POSA could or could not recreate that invention. 03:45:27 03:45:29 03:45:31 03:45:33 03:45:36 03:45:42 03:45:45

Q. And how long would it take you to do all of that, to design the lens you just mentioned? 03:45:46 03:45:48 03:45:51

MR. MURRAY: Objection to form. Outside the scope. 03:45:54 03:45:55

THE WITNESS: I really don't know without trying. 03:45:55 03:45:57

BY MR. BREGMAN: 03:46:00

Q. 40 hours? A hundred hours? A thousand hours? 03:46:00 03:46:02

MR. MURRAY: Objection. Form. Outside the scope. 03:46:04 03:46:05

THE WITNESS: I think it would be a matter of a couple days. But I haven't done it, so it's just a guess. 03:46:05 03:46:10 03:46:13
BY MR. BREGMAN: 03:46:16
Q. And in your analysis, what -- would you need to use wavelengths of light to determine whether or not you ended up with the image point distribution as shown in Figure 9? 03:46:17 03:46:21 03:46:24 03:46:28
A. I would have to have at least one wavelength, yes. 03:46:36 03:46:38
Q. And what wavelength would you use based on what you know from the '990 patent? 03:46:39 03:46:42
A. It would depend completely on the application of the lens and what I was trying to accomplish. 03:46:49 03:46:51 03:46:53
Q. What about if you were trying to accomplish the lens that's described in this patent? 03:46:53 03:46:55 03:46:57
MR. MURRAY: Objection to form. 03:47:01
THE WITNESS: I believe -- I believe the '990 patent -- yes, here it is -- discusses the application field and gives 03:47:02 03:47:11 03:47:14

us some wavelengths. 03:47:16
Column 1, paragraph 3, round about 03:47:20
35. This is discussing the prior art, but 03:47:24
it shows up later as well. 03:47:27
BY MR. BREGMAN: 03:47:29
Q. Uh-huh. 03:47:29
A. "This digital panoramic image is 03:47:29
delivered by Camera 1 in the form of a computer 03:47:31
file containing image points coded RGBA 03:47:34
arranged in a two-dimensional table, R being 03:47:38
the red pixel; image point G, the green pixel; 03:47:41
B, the blue pixel; and A, the alpha parameter 03:47:47
for transparency." 03:47:49
So that gives us the -- that tells 03:47:50
us that this is a visible application. 03:47:51
So I would -- I would -- if I were 03:47:53
going to be working in the '990 trying to 03:47:55
create a lens that I thought best reflected 03:48:00
this application, I'd start with red, green, 03:48:03
and blue. Probably a photopic curve like I 03:48:05
showed in my report. 03:48:09
Q. This says the computer file contains 03:48:10

RGB pixels. I could have an infrared camera that is not in the visible spectrum, and I could output a computer program with RGB values. In fact, it would, so I could see it. 03:48:12 03:48:18 03:48:21 03:48:24

This is talking about the computer file that's generated from the camera, right? 03:48:27 03:48:28

MR. MURRAY: Objection. 03:48:30

THE WITNESS: It says, "The digital panoramic image is delivered by the Camera 1 in the form of a computer file containing image points coded RGBA." 03:48:31 03:48:32 03:48:35 03:48:37

BY MR. BREGMAN: 03:48:40

Q. All right. So it's the image file that has image points coded RGBA? That says nothing about what the sensor is, right? 03:48:40 03:48:42 03:48:48

A. RGBA is a sensor format. 03:48:50

Q. That's also an output for television, or any image for that matter, right? 03:48:55 03:48:56 03:49:01

A. A visual image, yes. 03:49:01

Q. So that -- that paragraph does not seem to be helpful in telling us what 03:49:03 03:49:06

wavelength you would use in a calculation if you are trying to figure out -- as you said earlier, if you were trying to design -- design the lens that you mentioned earlier? 03:49:09 03:49:13 03:49:16 03:49:18

MR. MURRAY: Objection to form. 03:49:21

THE WITNESS: Is that your opinion? 03:49:21

MR. MURRAY: Objection. Form. 03:49:23

BY MR. BREGMAN: 03:49:24

Q. I'm asking you. I asked you about wavelength and you pointed to a computer file and having RGBA values. 03:49:24 03:49:28 03:49:30

I'm asking you, are you sticking -- are you sticking with your testimony that because the computer file has RGB values, pixels in an image, that those would be the same wavelengths of light that you would use in performing your calculations of the lens? 03:49:32 03:49:34 03:49:36 03:49:41 03:49:43 03:49:47

MR. MURRAY: Objection to form. 03:49:51

THE WITNESS: You were asking me what wavelengths I would use? 03:49:51 03:49:54

BY MR. BREGMAN: 03:49:54

Q. Yes. 03:49:56

A. I see Figures 1 and 2 showing prior art -- 03:49:57 03:50:02
Q. Uh-huh. 03:50:02
A. -- which looks to be a conventional video camera and a conventional outdoor scene in daylight. 03:50:03 03:50:05 03:50:09
Q. Uh-huh. 03:50:10
A. I read the Column 1 and saw that the output was formatted in RGBA, and, therefore, I conclude that this is a visual application, and, therefore, I would choose red, green, and blue or a photopic color distribution in making any analysis of '990, which I have not done. I am merely saying this is what I would do next. 03:50:10 03:50:14 03:50:17 03:50:20 03:50:24 03:50:31 03:50:33
Q. So you would use the visible spectrum of light? 03:50:35 03:50:37
A. Yes, I would. 03:50:40
Q. Would you have used a chief ray analysis or a centroid analysis? 03:50:42 03:50:54
A. As I said in my report, I believe that the correct way to analyze this kind of an image point distribution function is with a 03:50:57 03:50:59 03:51:02

centroid. 03:51:04

And I do that for a few reasons, the chief most of which is that I can validate centroids and I can't validate chief rays. 03:51:05 03:51:11 03:51:14

Chief rays are fictitious. They're just -- they're a construct, if you will, where a centroid is a real, measurable thing. 03:51:16 03:51:18 03:51:20

Q. In a physical lens, right? 03:51:22

A. In a physical lens, yes. 03:51:25

Q. But these lenses that we're talking about are not physical lenses. This is just lenses that are described in patents. These are not physical lenses. 03:51:26 03:51:27 03:51:31 03:51:33

You would agree with that, right? 03:51:35

MR. MURRAY: Objection to form. 03:51:37

THE WITNESS: When I'm doing lens design, I try to be very careful to do the kinds of analysis that actually can be validated in the laboratory so that assuming the lens get built, we can actually test and verify that we built the lens that we had intended to build. 03:51:37 03:51:39 03:51:43 03:51:45 03:51:48 03:51:50 03:51:53

BY MR. BREGMAN: 03:51:55
Q. Do you always build a lens if you -- 03:52:00
if you model something in software? 03:52:02
MR. MURRAY: Objection to form. 03:52:08
THE WITNESS: As I mentioned 03:52:10
earlier, I use Zemax to do a lot of 03:52:12
different things. The chief purpose of my 03:52:15
starting up a lens file is to design a lens 03:52:17
that will hopefully get built. 03:52:19
But occasionally I'll use it to 03:52:22
teach my class so I can teach an optical 03:52:24
designer how to, you know, split a doublet 03:52:28
or design an eyepiece or whatever. And 03:52:30
those lenses are classroom examples. 03:52:33
They're never going to get built. 03:52:35
But when I'm being paid as a 03:52:37
consultant, which is what I do for a 03:52:39
living, to design lenses for people, it 03:52:41
is -- it is rare, if ever, that someone 03:52:45
has -- does not have the intention to build 03:52:50
the lens. Why would they pay me to design 03:52:52
it if they didn't plan to build it? 03:52:54

BY MR. BREGMAN: 03:52:54
Q. What about patents? Are all lenses 03:52:56
that are described in patents built? 03:52:59
MR. MURRAY: Objection to form. 03:53:07
THE WITNESS: Well, I -- I really 03:53:11
don't know to what extent in patents the -- 03:53:13
the various optical design patents have 03:53:19
been constructed and which ones haven't. I 03:53:23
mean, I guess I'm not an expert in patent 03:53:26
law, so I don't know what the rules are 03:53:27
exactly. 03:53:29
BY MR. BREGMAN: 03:53:30
Q. So you're not aware of any rule that 03:53:32
you have to build a model, a prototype of what 03:53:34
you describe in your patent? 03:53:37
MR. MURRAY: Objection to form. 03:53:40
THE WITNESS: I'm -- like I said, 03:53:41
I'm not a legal expert. I rely on 03:53:45
attorneys to do all of my patent 03:53:47
applications. I do the initial invention 03:53:49
disclosure, and then they turn it into a 03:53:51
patent. 03:53:53

BY MR. BREGMAN: 03:53:54

Q. Right. Why don't we go back to your declaration, and let's turn to paragraph 108. 03:53:57 03:53:59

A. Just a second. 03:54:27

Yes, I'm there. 03:54:28

Q. Just give me a second to get there. 03:54:29

You said, "In a well-corrected lens, there is very little difference between an image point defined by the centroid and the location of the chief ray." 03:54:30 03:54:33 03:54:35 03:54:37

Do you see that? 03:54:39

A. Yes. 03:54:40

Q. Why would a person of skill in the art perform a centroid analysis rather than a chief ray height analysis to determine if the lens meets the claimed 10 percent maximum divergence of the '990 patent if there is typically little difference? 03:54:41 03:54:44 03:54:46 03:54:49 03:54:53 03:54:56

A. Well, as I said, I prefer to run analysis on parameters that can be physically realized so that we can validate that the design was constructed correctly. 03:55:02 03:55:03 03:55:07 03:55:09

I might do a chief ray analysis to get started just so I can get something on paper. But ultimately a chief ray analysis and a centroid analysis are going to be very similar, but not exactly the same for a well-corrected lens. 03:55:11 03:55:13 03:55:16 03:55:21 03:55:23 03:55:26

Moreover, as the field of view becomes larger, like it is in all of these cases, that difference can become extreme. And we saw -- we see that with -- with the case of Dr. Chipman's lens that he describes in his declaration. 03:55:27 03:55:29 03:55:31 03:55:34 03:55:39 03:55:43

Q. Which -- which of a centroid analysis or a chief ray analysis is simpler? 03:55:44 03:55:47

A. I'm sorry? 03:55:50

Q. Which of a centroid analysis or a chief ray analysis is simpler? 03:55:52 03:55:54

A. These days, they're both -- they're both pretty straightforward. You could -- you can -- you can do either one relatively simply. 03:55:58 03:56:02 03:56:06

The difference is that you've got to be a little closer to having a corrected lens, 03:56:11 03:56:13

that is to say you have to have lens apertures. 03:56:17

I described this all in my report. You need to have the sizes of the lenses so you can calculate the vignetting. Again, especially in these very wide field cases. 03:56:20 03:56:21 03:56:25 03:56:27

In a typical lens where you've got a 5-degree field of view, it mostly doesn't matter. Lens is well corrected, the chief ray and the centroid are the same. 03:56:30 03:56:32 03:56:36 03:56:39

But there's an optical aberration called coma which displaces the chief ray and the centroid. And if you have a lot of coma, those two analyses get different answers. And they can be different by quite a bit for very large fields. 03:56:40 03:56:42 03:56:45 03:56:49 03:56:51 03:56:53

One of these wide field lens designs, you're fighting coma constantly. Not just third order coma, but fifth order coma, elliptical coma. It's a -- it's a difficult problem to design these -- these wider and wider fields. 03:56:54 03:56:56 03:57:01 03:57:03 03:57:05 03:57:09

Q. Is there anything in the '990 patent 03:57:10

that would instruct a person of skill in the art to perform a centroid analysis to determine the image point distribution function? 03:57:12 03:57:15 03:57:17

A. I don't recall seeing anything in the '990 patent that specifically defined how the image point was to be calculated. It merely starts at the image point distribution function. 03:57:23 03:57:27 03:57:31 03:57:34 03:57:37

So as far as I recall, there is no language saying either centroid or chief ray in the '990 patent. 03:57:38 03:57:42 03:57:45

Q. Does the -- 03:57:47

A. It could be there, but I don't recall seeing it. 03:57:48 03:57:50

Q. Does the '990 patent, for example, Figure 6, show chief rays? 03:57:50 03:57:54

A. No. 03:57:59

Q. What are those rays that are being shown in Figure 6? 03:57:59 03:58:03

A. Well, as I mentioned earlier, Figure 6 is just a -- well, we'll use the patent's term, schematic, but it's just a 03:58:07 03:58:09 03:58:11

cartoon to show the relative orientation of the object angles on the left-hand side and the image field heights on the right-hand side. 03:58:13 03:58:16 03:58:19

But those are -- those are not chief rays. And that's not a real lens. It's just a -- a notion of a lens that's been put in the figure. 03:58:21 03:58:25 03:58:28 03:58:30

Q. Go to the lens that you created, for example. Why don't we look at page 65 of 94 in your declaration. 03:58:33 03:58:52 03:58:55

A. I have it. 03:59:01

Q. Are there any chief rays shown there? 03:59:01 03:59:03

A. I don't believe the chief rays are shown here. 03:59:04 03:59:11

Q. So what rays are these? 03:59:13

A. These are just the center and edge rays. The issue is that it's vignetted. So this is -- this is the version that I did in order to do the centroid analysis. And when you've vignetted it, then the pupil position shifts depending on the field angle. So -- 03:59:15 03:59:20 03:59:23 03:59:25 03:59:27 03:59:30

Q. Where is the pupil position here? 03:59:32
A. It's the black line. 03:59:34
Q. Black line? 03:59:39
A. Uh-huh. 03:59:41
Q. Where -- 03:59:42
A. I believe -- 03:59:42
Q. Where is the black line? I mean, I see -- oh, the black line at the right -- the focal plane? 03:59:43 03:59:45 03:59:50
A. Let me -- hold on. Let me just verify this real quickly from Tada. I don't remember off the top of my head. 03:59:51 03:59:53 03:59:56
But I use a specific convention to mark where the chief ray -- or the -- where the aperture stop usually is, but let's see. We're talking about Figure 11, right? 03:59:57 03:59:59 04:00:04 04:00:07
Yeah, that's the location. So that's the place where -- the black line between the third lens and the fourth lens. 04:00:09 04:00:11 04:00:13
You see that? 04:00:18
Q. Uh-huh. 04:00:18
A. That is Tada nominally placed his 04:00:20

diaphragm. And you can see that the rays cluster on axis just after that. At the top far to the right of it, and at the bottom a little bit to the left of it. 04:00:25 04:00:31 04:00:35 04:00:41

So you can see from that that we're vignetting these rays, and it's plotting the center of those bundles based on the -- based on the rays. So those are not -- in short, those are not chief rays. 04:00:43 04:00:44 04:00:47 04:00:50 04:00:54

Q. So the rays do not pass, they don't bundle at the focal plane? Or the focal point? 04:00:55 04:00:59

A. Oh, I'm sorry. Yeah. So there are two conjugate planes in an optical design that are important. The one that we all think about is the focal plane. That's where all the rays from any given object point should come to a focus. They should all come -- they should bunch together, right? 04:01:03 04:01:05 04:01:08 04:01:10 04:01:12 04:01:15 04:01:17

Q. Uh-huh. 04:01:19

A. And you can see that's the far right line where the three rays traced from each of the field points come together. 04:01:19 04:01:21 04:01:23

Q. Uh-huh. 04:01:26
A. The second plane that's critically important in an optical design is the -- is the pupil plane. And the pupil plane is the place which limits the amount of light that can get through the lens. 04:01:26 04:01:29 04:01:31 04:01:36 04:01:39
In a nominal starting design, or in most conventional designs, that stop is the place where all the chief rays go through the center of the stop, and they're all the rays that go through that stop go all the way through the lens. 04:01:39 04:01:43 04:01:48 04:01:50 04:01:53 04:01:55
Q. Uh-huh. 04:01:56
A. So it would be an un-vignetted lens. 04:01:56
That's not the case with this lens. This lens is significantly vignetted at the top and bottom. And that's in order to provide better image correction across the field. 04:01:59 04:02:01 04:02:05 04:02:08
Q. But the rays should all pass through the center of the pupil, right? 04:02:10 04:02:12
A. In a -- in a simple lens design where apertures are infinite, then, yes, all 04:02:13 04:02:17

the rays that go through the pupil go to the field. And all of the rays that are the chief rays go through the center of the pupil. 04:02:21 04:02:26 04:02:30

Q. Uh-huh. 04:02:33

A. But that's not the case with these complex wide angle lenses. I do quite a few of these wide angle lenses in my work, and I always use vignetting to clean up the field. 04:02:34 04:02:35 04:02:40 04:02:43

Q. So the diaphragm doesn't just have a hole in the middle of the background? What is -- physically, what is the diaphragm? 04:02:46 04:02:48 04:02:51

A. No. You're thinking of it right. It's a -- it's typically an iris. In this case, I mean Tada, I don't remember he gave -- I don't think Tada gave much of a description. 04:02:53 04:02:55 04:02:57 04:03:00

But in a typical camera lens, the diaphragm would be like a literal diaphragm, like an opening and closing iris. And so that would be used to stop down the energy if it was in a really bright environment, or to open it up in a -- in a -- in a really dark environment, right? 04:03:02 04:03:06 04:03:08 04:03:11 04:03:14 04:03:16 04:03:20

But you can see, you can imagine thought-wise what would happen as you stop that iris down. It's not actually going to clip all the rays uniformly, and that's because of the vignetting. 04:03:21 04:03:23 04:03:26 04:03:28 04:03:31

But you don't really care. As you stop it down, the uniformity gets better and better, which is what you would want with a high intensity image. But in a low intensity image, you want that thing wide open, and you want to collect as many photons as you can across the field. 04:03:32 04:03:34 04:03:37 04:03:40 04:03:42 04:03:44 04:03:46

Q. Why wouldn't you move the diaphragm to where the lines cross a little bit further down -- down field? 04:03:47 04:03:49 04:03:52

A. I probably would if it were my lens design. But I was merely modeling what Tada had, and I didn't want to deviate anywhere that I didn't need to. 04:03:53 04:03:56 04:03:58 04:04:00

Q. Because if you -- if your diaphragm is small, if it's mostly closed, it's going to clip most of that light, right? It's not going 04:04:02 04:04:05 04:04:09

to pass through? 04:04:12
A. **That's correct. As the diaphragm gets stopped down, you're clipping more and more of the light.** 04:04:13 04:04:17 04:04:19
Q. But if you put the diaphragm where they cross, most of that light can still get through? 04:04:20 04:04:22 04:04:25
A. **Well, you still get less and less light. I mean, as you stop the lens down, you trim out more and more light. What you're seeing is kind of an optical illusion. It's created by the very highest field point --** 04:04:25 04:04:27 04:04:32 04:04:34 04:04:37
Q. Uh-huh. 04:04:40
A. **-- which is the innermost rays which is the most vignetted.** 04:04:40 04:04:43
So if you imagine as you stop it down, you're not losing any of the light at the edge of field, which is good because you don't have much to begin with. You're trimming out more of the center of the field of view aperture, and that's okay because you got plenty of light there. 04:04:45 04:04:48 04:04:51 04:04:54 04:04:57 04:04:59 04:05:02

So but to answer your question, if I were designing this lens and it were a wide angle lens, I would probably move the stop back. 04:05:03 04:05:06 04:05:10 04:05:13

Q. Uh-huh. 04:05:14

A. Just because I think it would be more symmetric. I think it would be more pleasing to see the field of view dim more uniformly. And I think you would get that with the stop a little further back than it's shown. 04:05:14 04:05:16 04:05:19 04:05:22 04:05:25

Q. When you said the field of view dimming more uniformly, how would it dim non-uniformly? What would it look like, you know, if my eye was where the image sensor would be? 04:05:27 04:05:29 04:05:32 04:05:35 04:05:41

A. Okay. So imagine your eye is where the image sensor is, and you can see on axis you've got a lot of rays. See how big that angle is? You're collecting a lot of light there. 04:05:41 04:05:44 04:05:47 04:05:49 04:05:51

And all of that light goes through the edges of the aperture stop, right? And it 04:05:52 04:05:53

comes out of -- it comes to the lens from the -- from the center of the -- along the optical axis, goes through the pupil, and then gets focused onto the axis. Lots of rays there, lots of light. 04:05:56 04:05:59 04:06:02 04:06:05 04:06:08

Look at the edge ray, and you've got a much smaller cone of light getting to the focal plane. And that smaller bundle of light is trimmed at lenses 3 and 4 by vignetting. 04:06:09 04:06:11 04:06:13 04:06:18

And that's done on purpose. That's not an accident. That's right. Because although we lose light, we gain image fidelity. It's cleaner that way. 04:06:22 04:06:25 04:06:27 04:06:31

So what would happen is when you use this camera, it would be non-uniformly illuminated with the center having more light than the edges. When the camera is in a bright field condition, that's fine. I'm going to stop down that iris. And even in the position where it's at, it would still look perfectly fine. 04:06:32 04:06:34 04:06:37 04:06:39 04:06:46 04:06:49 04:06:51 04:06:53

But if I left the iris where it is 04:06:54

and I started stopping down the image, what I would see is the intense -- if I measured the intensity across the focal plane, the intensity at the center of the field would start dropping before the edge of the field. 04:06:56 04:06:59 04:07:01 04:07:04 04:07:07

Q. Uh-huh. 04:07:08

A. So it would get dimmer in the middle, bringing the whole field to a more uniform brightness. 04:07:10 04:07:12 04:07:14

Q. Uh-huh. You mentioned a few times "vignetting." Can you explain what that is? 04:07:17 04:07:19

A. Yes. Vignetting is the -- it is the phenomenon when -- the best way to think about it is the stop is poorly defined. But it's done on purpose, so don't read too much into that. 04:07:22 04:07:27 04:07:31 04:07:37 04:07:39

And that's the case here. So what I'm doing is for the on-axis rays, the stop is the stop, right? The stop is that diaphragm. 04:07:39 04:07:41 04:07:45

Q. Uh-huh. 04:07:49

A. But as I get further and further up in field of view, then some of the rays get 04:07:49 04:07:52

trimmed off. They don't actually get all the way through the lens. Or to think about it differently, the lens doesn't see with as wide an angular spectrum. 04:07:56 04:07:58 04:08:01 04:08:04

So that trimming is occurring on lens 3, and you can also see it sort of occurring on lenses 4 and 5. So that's that trimming effect. That's -- that's what's called vignetting. 04:08:05 04:08:07 04:08:10 04:08:16 04:08:18

So if you looked at -- if you were at the detector looking out, you would see a diaphragm in the center. And then in the -- towards the edge it would become more of an ellipse as the rays became vignetted. 04:08:19 04:08:21 04:08:24 04:08:27 04:08:30

Does that make more sense? 04:08:34

Q. It would become more of an ellipse where? Towards the edge, right? 04:08:35 04:08:38

A. Towards the edge, yes. 04:08:39

Q. Uh-huh, uh-huh. 04:08:41

A. Towards the corner. 04:08:42

Q. And vignetting -- so firstly I see you've got a scale on this figure of 5 mms, 04:08:43 04:08:47

right? 04:08:51
A. Yes. 04:08:51
Q. Is that common to put on a lens schematic when you're building something to scale? 04:08:52 04:08:57 04:09:00
A. I always include a scale. I think it's helpful. 04:09:00 04:09:02
Q. Does Zemax do that automatically? 04:09:03
A. You can turn it on or off. I always leave it on. 04:09:07 04:09:10
Q. And in order to do vignetting, you need diameters of the lenses, right? 04:09:11 04:09:15
A. In order to recreate the amount of vignetting in Tada, I had to make assumptions about the lens diameters. Because unlike the way I document my lenses, Tada did not include the outer aperture information in his tables, which is unfortunate. Because we know from Chipman's model, and my own, that the F 1.3 beam that's going through this lens cannot possibly get through these lenses. 04:09:18 04:09:24 04:09:28 04:09:31 04:09:33 04:09:36 04:09:38 04:09:44 04:09:46
Q. So you got the diameters off 04:09:47

Figure 11? No. Off which -- where did you get the diameters from? 04:09:52 04:09:56

A. So a few of them you could actually get from the specification. The diameter of lens 2 is actually pretty clear. You get -- you have a description of the asphere, and the asphere description stops at the edge of the sag table. 04:09:57 04:09:59 04:10:03 04:10:08 04:10:13 04:10:16

So one great place to start is go to the sag table and look at the most extreme lens height. That tells you the aperture of both surfaces on lens 2 in Tada. 04:10:16 04:10:19 04:10:22 04:10:25

Q. Uh-huh. 04:10:28

A. I didn't need to trim lens 1 at all. The only other lenses that looked wrong, and you can see this from my report 64 out of 94, the right-hand picture is the one that Chipman showed in his report. 04:10:29 04:10:33 04:10:36 04:10:41 04:10:43

And you can see these lenses don't look the same. Just qualitatively, that doesn't look right. And that's because Tada has not told us about his -- his choice of 04:10:45 04:10:47 04:10:50 04:10:55

vignetting.

The next thing you can do is you've got that stop, you see that? The aperture stop on the left-hand side of the Tada snippet.

Q. Uh-huh.

A. That, we know exactly what that is as well, because we have the F number on axis as 1.3. So I could calculate the diameter of that, and I could use really any number between that aperture diameter and maybe a 10th of a millimeter larger and get the figure that you see on the next page of my report where now the lenses really do look much more like Tada's Figure 11.

Q. So --

A. And I can't say that I've exactly recreated his vignetting. I can't do that, because he didn't provide the diameters. But I've certainly gotten a lot closer.

Q. So I'm not understanding how you went about doing this.

Did you measure off Figure 11 or did

you estimate size as a relative dimension from Figure 11 and then play with that size in Zemax until you got something that looked similar? 04:11:53 04:11:58 04:12:02

A. As I said, you can get the exact numbers on lens 2. But you're talking about how did I pick the diameters of lenses 3, 4, 5, 6, and 7, right? 04:12:03 04:12:05 04:12:08 04:12:11

Q. Right. 04:12:13

A. Yeah. So the way I did that is I literally had a copy of the figure sitting in front of me. This is the Figure 11 from Tada. 04:12:13 04:12:16 04:12:19

Q. Yeah. 04:12:22

A. And then I just started reducing the aperture until I got something that looked like Figure 11. Just visually. 04:12:23 04:12:25 04:12:27

Q. For each of them? 04:12:29

A. I wasn't scaling or measuring anything. Yeah, I was just getting the same picture, getting that image right. 04:12:30 04:12:32 04:12:34

Q. And if a different person of skill in the art did this, they might get a slightly different analysis, right? That seems pretty 04:12:36 04:12:41 04:12:44

subjective that you were playing with it until 04:12:47
you got something that you thought looked -- 04:12:49
looked like the Figure 11. 04:12:51

MR. MURRAY: Objection to form. 04:12:53

THE WITNESS: I think -- I think 04:12:53
they came out really nice. I actually was 04:12:57
very happy with how close I could get those 04:12:59
figures to match. 04:13:02

And I was making adjustments of a 04:13:03
10th of a millimeter if I remember right. 04:13:05

BY MR. BREGMAN: 04:13:08

Q. Uh-huh. 04:13:08

A. And plus or minus a 10th of a 04:13:08
millimeter in these lenses looks very 04:13:10
different. So I'm pretty sure I got it to 04:13:13
within about a 10th of a millimeter. 04:13:15

Q. If I took 10 optical engineers, gave 04:13:17
them Tada, told them, you know, we want it to 04:13:19
look similar to the figures, they would get the 04:13:24
exact same values as you? 04:13:26

MR. MURRAY: Objection to form. 04:13:29

THE WITNESS: I think it would 04:13:31

depend on which 10. But the short answer is: There might be differences of a 10th of a millimeter, but not much more than that. 04:13:33 04:13:35 04:13:38 04:13:40

BY MR. BREGMAN: 04:13:41

Q. And where did you get -- sorry. Where did you get the millimeter scale from in the first place? 04:13:42 04:13:43 04:13:45

A. So it is arbitrary, right? I chose -- so Tada doesn't tell us what his focal length is. He merely has scaled it to 1. So I could use one foot, one meter. I just -- I let the Zemax default as 1 millimeter, so I set the focal length to 1 millimeter. 04:13:46 04:13:50 04:13:52 04:13:56 04:13:59 04:14:03

In a vignette, you can't do -- 04:14:07

Q. There was a foot. You said one-tenth of a millimeter difference, but if you add a foot, now it becomes pretty material. Or if it was a meter, or 10-meter wide lens, a difference of a 10th of that is not insignificant? 04:14:07 04:14:09 04:14:11 04:14:13 04:14:18 04:14:21

MR. MURRAY: Objection to form. 04:14:23

THE WITNESS: Yeah, you're sort of going the right way. The real -- I mean, we have to choose a scale factor. So a better way to think about it is I was making adjustments of a 10th of a millimeter because my focal length was a millimeter. 04:14:24 04:14:26 04:14:28 04:14:30 04:14:32 04:14:34 04:14:37

A better way to think about it is I was making adjustments in the diameter of order of 10th of a focal length. And that's a small number on a wide angle lens. 04:14:38 04:14:40 04:14:42 04:14:45

BY MR. BREGMAN: 04:14:48

Q. So you don't take any measurements of the figures? 04:14:49 04:14:50

A. No, I didn't. 04:14:51

Q. You sort of eyeballed it? 04:14:51

A. Yeah. I thought it came out okay. I did what any optical designer would do. When you're -- when you've got a heavily vignetted wide field lens and you don't know what the vignetting is, you've got to kind of dial it in. 04:14:54 04:15:01 04:15:03 04:15:07 04:15:09 04:15:12

Q. Did you include the diameters in your declaration, any of these diameters? 04:15:13 04:15:20

A. I don't recall if we provided the prescription. I'm not -- I don't think I did, no. 04:15:25 04:15:31 04:15:35

Q. Is your complaint with Tada that its description doesn't provide enough information for you to -- to perform -- to perform a centroid analysis properly? 04:15:35 04:15:49 04:15:51 04:15:57

MR. MURRAY: Objection to form. 04:16:00

THE WITNESS: I had a lot of problems with Tada. I really do not like this patent. 04:16:03 04:16:04 04:16:08

BY MR. BREGMAN: 04:16:10

Q. Why? 04:16:10

A. But nevertheless, it was the one that we had to work from. 04:16:10 04:16:12

So is your -- if your question is: Should I have provided my lens diameters? I'd say I suppose if the objective was to have someone check my work. 04:16:14 04:16:17 04:16:23 04:16:26

Q. Right. And do you think Dr. Chipman 04:16:31

would have liked to have checked your work? 04:16:34
A. I think frankly he can do the same thing I did and get the same answer. And he should be able to look at my centroids and -- I don't -- I don't think they would be materially different. 04:16:36 04:16:38 04:16:41 04:16:44 04:16:46
This eyeballing strategy is -- is pretty common. I would -- I would have all the confidence that Dr. Chipman could recreate my work from what's been provided. 04:16:48 04:16:51 04:16:56 04:16:58
Q. Does the '990 patent specify any of the diameters of its lenses? 04:17:03 04:17:15
A. I don't recall. 04:17:16
Q. Why don't we look at Column 17, lines 30 to 33. 04:17:17 04:17:30
A. Oh, the '990? 04:17:40
Q. Yes. 04:17:40
It says, "The determination of the parameters defining the spherical sides mentioned above, the formula of the diffraction" -- sorry -- "of the diffraction grading of the lens L6, the calculation of the 04:17:40 04:17:41 04:17:44 04:17:46 04:17:52

diameters of the lenses, and the other 04:17:54
distances between the lenses are well within my 04:17:56
understanding of those skilled in the art using 04:17:58
classical computer-aided lens design tools." 04:18:01
Do you agree with that? 04:18:04
A. I think that's very similar to what 04:18:05
I was saying earlier, that the -- that you 04:18:12
can -- you can use ordinary skill in the art 04:18:17
to -- once you know what the rough length 04:18:20
shapes are and where the aspheres are, you can 04:18:22
design that lens to achieve some kind of a 04:18:25
merit function. 04:18:29
The trick is figuring out what merit 04:18:30
function to use, and that's what the -- that's 04:18:32
what this specification helps with, as well as 04:18:34
the people with skill in the art. 04:18:36
Q. And it says -- it says a classical 04:18:38
computer-aided lens designs tools, are we 04:18:42
talking about Code V and Zemax? 04:18:45
A. That's correct. Well, I don't know, 04:18:47
right? I don't know what was in their head, 04:18:52
but I would presume based upon reading that 04:18:54

paragraph, that's probably what they meant. 04:18:57

Q. Code V and Zemax are the two most common types of classical computer-aided lens designs tools? 04:18:59 04:19:01 04:19:05

A. I'm not sure. OpTaliX is pretty big in Europe. There are probably a dozen codes that are in use worldwide. Certainly in North America, Code V -- and Japan, North America and Japan, Code V and Zemax dominate the market. 04:19:06 04:19:10 04:19:15 04:19:17 04:19:20

Q. Sorry. Turning back to the figure we were discussing in the determination between paragraphs -- 04:19:25 04:20:03 04:20:06

(Audio technical difficulties; stenographer asks for clarification.) 04:20:06 04:20:06 04:20:06

THE WITNESS: Yes. 04:20:06

BY MR. BREGMAN: 04:20:12

Q. Turning back to the figure between your paragraphs 111 and 112 in your declaration, we were looking at a figure. This figure is modeled using the Table 5 data in Tada; is that correct? 04:20:12 04:20:14 04:20:17 04:20:23 04:20:26

A. As I explain in my declaration, that -- that model actually came about from starting with Table 5 and then going through this torturous debugging process to figure out what the aspherical coefficient should be, and then ultimately finding them in the Japanese patent and just typing them in correctly. 04:20:30 04:20:32 04:20:36 04:20:38 04:20:42 04:20:44 04:20:46

And then after doing that, then I chose wavelengths that seemed appropriate, and I trimmed the lenses to get them to look more like Figure 11. And I think that's all I did. 04:20:49 04:20:51 04:20:54 04:20:57

Oh. And I used the sag table to verify, of course. 04:21:03 04:21:05

Q. And the title of this is just underneath the diagram on the left. It says, "Tada Embodiment 3 fixed." 04:21:06 04:21:09 04:21:13

Do you see that? 04:21:15

A. Correct. 04:21:17

Q. And "fixed" is what you just said, it's all the changes that you made? 04:21:17 04:21:20

A. "Tada Embodiment 3 fixed" was the name of the file where I had fixed the 04:21:22 04:21:26

aspherical coefficients that Chipman had incorrectly entered. 04:21:30 04:21:32

Q. And takes into account vignetting as well? 04:21:33 04:21:38

A. No. In my files, Tada Embodiment 3 fixed -- just fixes those aspherical coefficients. To generate this picture, I trimmed those lenses and then ran the centroid analysis. Whether I saved that file or not, I'm not sure. 04:21:38 04:21:42 04:21:44 04:21:47 04:21:49 04:21:51

Q. So this -- this diagram between paragraphs 111 and 112 that you gave the name of Tada Embodiment 3 fixed undertook your vignetting process in order to get this -- the lenses to look like they do, right? 04:21:52 04:21:53 04:21:57 04:22:04 04:22:08

A. This figure has the vignetting added, yes, so that I could do the centroid analysis. 04:22:10 04:22:13 04:22:15

Q. You also mentioned in paragraph 112 underneath there, "I added a hundred of these operands." 04:22:16 04:22:28 04:22:30

What are those? 04:22:31

A. "Operand" is a term in the art. It's the same term in Zemax and Code V, I think, which is a thing which is to be achieved. So that is an operand. 04:22:33 04:22:36 04:22:40 04:22:45

There are two things about optimization. One is operand, which is what I'm targeting, and the other is variable, the thing I'm allowing the computer to change. 04:22:47 04:22:49 04:22:51 04:22:54

So in this case I created a merit function which consisted of 100 CENY targets, and that 100 centroid heights exactly matched the hundred field points that I had done for my chief ray analysis so I could get them to match exactly. 04:23:00 04:23:02 04:23:12 04:23:16 04:23:20 04:23:22

Q. And where -- 04:23:23

A. So we had 100 field points is a better way to think of that. 04:23:24 04:23:26

Q. And where -- where in Tada did you get the hundred field points from? 04:23:27 04:23:30

A. It's just 58.5 divided by 100. Like Chipman, I had to figure out how to parse the field in order to get some kind of image point 04:23:32 04:23:37 04:23:40

distribution function. 04:23:42
Q. And why did you pick 100? 04:23:43
A. It was the default in Zemax. 04:23:45
Q. In that sentence you say, "Once the 04:23:49 model was completed, I was able to generate the 04:24:10 information about the centroids of each of 100 04:24:12 field points from zero to 58.5 which is 04:24:15 analogous to our real height data from the 04:24:18 distortion analysis we discussed previously." 04:24:22
What do you mean by "our real 04:24:25 height"? Who is "our"? 04:24:29
A. I guess I was being a little 04:24:31 **colloquial there. I meant that I used those** 04:24:34 **hundred field points to replace the hundred** 04:24:36 **field points that I had in my earlier analysis.** 04:24:39
Q. Does a centroid analysis require the 04:24:42 selection of a hundred field points? 04:24:44
A. The centroids are actually 04:24:47 **determined point by point. So you could have** 04:24:50 **five points across the field or 50 points** 04:24:53 **across the field, or a hundred points across** 04:24:55 **the field. You can actually have probably** 04:24:58

thousands of points. 04:24:59
But in order to stay consistent with my earlier analysis, I just used the same number of field points as we had for the chief ray based analysis. 04:25:01 04:25:04 04:25:06 04:25:09

Q. And reading this, how would a person of skill in the art know where you selected your hundred field points? 04:25:12 04:25:18 04:25:19

A. There are a hundred field points equally spaced from zero to 58.5 just as they are in the chief ray analysis. Like Chipman, I just did a whole series of points evenly distributed across the field. 04:25:21 04:25:23 04:25:27 04:25:36 04:25:38

Q. Would the value of the centroid change depending on how many field points were chosen, which ones? 04:25:40 04:25:41 04:25:45

A. The value of the centroid change depending on which... 04:25:46 04:25:48
The image point distribution function should have the same shape. You know, the -- the image point distribution function that I show is on the bottom of page 66 of 94. 04:25:50 04:25:52 04:25:56 04:26:00

I mean, this is an example. 04:26:03

And you can see that, you know, a hundred points is more than enough to get the general shape of that curve. 04:26:04 04:26:08 04:26:11

Q. And if you had more points, you would get a more accurate curve? 04:26:16 04:26:19

A. It depends on what I would try to do. If what you're saying is -- I really, really want to know exactly where the DIVmax is. I want to know it to a thousandth of a degree. Well, you can do that. Just add more points. 04:26:21 04:26:25 04:26:28 04:26:32 04:26:34 04:26:37

Or you could do like Chipman did, a regression step where you start with some course array, figure out about where the peak is, and then just do a thousand points around where you think the peak is and you'll find the peak. 04:26:38 04:26:40 04:26:42 04:26:47 04:26:50 04:26:52

For this analysis, the difference between 24 and 24.001 degrees was immaterial. And for that matter, the difference between minus 7.66 and 7.7 is probably immaterial. It 04:26:53 04:26:56 04:27:02 04:27:04

was significantly less than minus 10, which is what I was looking for. 04:27:11 04:27:13

Q. Let's go to paragraph 117, the last sentence on page 68 of 94. You say, "For example, if we were using a sensor and 2500 pixels across the diagonal." 04:27:15 04:27:21 04:27:24 04:27:28

Do you see that? 04:27:31

A. Yes. 04:27:31

Q. Where did you get the sensor with 2,500 pixels from? 04:27:32 04:27:34

A. Well, it seems to me the COOLPIX came out in, like, '99, so it's kind of an easy camera to just pull. I mean, could have had more. But I knew that the COOLPIX, Nikon COOLPIX was available in 2001. 04:27:37 04:27:40 04:27:44 04:27:45 04:27:51

Q. Is the Nikon COOLPIX a CCTV camera? 04:27:53

A. It's just a camera. It's a -- it's a standard combo still video camera like -- like a lot of people have. Like everyone has in their phone these days. 04:27:57 04:28:00 04:28:05 04:28:08

Q. So it's not a CCTV camera that you would use for monitoring a parking lot, for 04:28:09 04:28:12

example? 04:28:20
A. No. This is just the number I happened to pick. I knew the camera -- I wanted to make sure the sensor was available. Because if the sensor is available, someone could make a camera out of it to do practically anything. 04:28:20 04:28:21 04:28:24 04:28:26 04:28:27 04:28:30
So Nikon buys those sensors from somebody, probably Sony or Micron or someone. And then Sony or Micron or someone mass produces these chips and other people can put them in different form factors. 04:28:30 04:28:33 04:28:38 04:28:40 04:28:44
Q. Are you aware of this chip ever being in a CCTV camera? 04:28:46 04:28:47
A. I didn't try to find one. I didn't look. I -- and I was only merely using the 2,500 pixels as a -- kind of a benchmark to see where these calculations would get you in terms of number of pixels. 04:28:49 04:28:51 04:28:56 04:28:58 04:29:01
It could be 5,000 or 10,000. But I just wasn't sure. But I knew the 2,500 was available, so that's why I picked that one. 04:29:04 04:29:09 04:29:11

Q. What do you mean by "pixels"? 04:29:14
A. The -- all of these -- all of these sensors have an array of pixels, usually CMOS, but not always CMOS, and the pixels divide up the chip into -- you know, a thousand across by a thousand down. That would be a mega-pixel camera or a million pixels total. 04:29:16 04:29:22 04:29:27 04:29:31 04:29:34 04:29:38
The Apple iPhones have something like 8.4 mega-pixels. So that's 8.4 million pixels distributed across the array. 04:29:41 04:29:44 04:29:48
Q. So pixels obviously have different sizes, right? 04:29:49 04:29:52
A. For different sensors, yes. 04:29:53
Q. So what is the size of the pixel in your calculation here? 04:29:59 04:30:04
A. It's unitless. I did the analysis in pixels. 04:30:05 04:30:09
Q. So it makes no difference how big the actual sensor is whether or not, you know, how many pixels you're going to -- going to change depending on how the lens behaves? 04:30:12 04:30:15 04:30:20 04:30:22
A. That's correct. The lens -- the 04:30:27

lens has some focal length, and it has some chip size. It has some field of view and some number of pixels. 04:30:30 04:30:34 04:30:37

I felt the most meaningful analysis to do would not be to take some cell phone chip that was available in 2001. 04:30:38 04:30:40 04:30:44

It would be more meaningful to just say, okay, we'll just -- we'll just generalize it and say if you've got 2,500 pixels instead of, you know, exactly this many pixels with each pixel being 4 microns or something like that, it's all sort of immaterial. 04:30:47 04:30:48 04:30:51 04:30:55 04:30:57 04:31:01

What matters to the image and the display function, and whether or not it is significant for the purposes of this compression and expansion, the pixel is the correct quantity. I don't care if it's a 20-micron pixel or a 2-micron pixel. What I care about is how many more pixels did I get. 04:31:03 04:31:05 04:31:07 04:31:09 04:31:12 04:31:15 04:31:18

Q. So, I mean, how big is a pixel normally? 04:31:20 04:31:23

A. It depends completely on the camera. 04:31:23

On some of the satellites that I do, the pixels are in the 10-micron range. In some of the spectrometers that I design for laboratory equipment, they are 15 to 30 microns. 04:31:26 04:31:30 04:31:33 04:31:35

Q. Uh-huh. 04:31:38

A. In your cell phone camera, there are probably 2 or 3 microns. 04:31:38 04:31:40

Q. So less than a full pixel is a negligible amount, right? 04:31:42 04:31:46

A. Actually not always. And I -- I wasn't exactly sure how to quantify this, so that's why I sort of just left it in pixels so that the reader could decide, you know, how much is this and is it a lot. 04:31:50 04:31:53 04:31:57 04:32:00 04:32:02

A pixel is a kind of -- it's a quanta, right? It's an easily understood number. 04:32:04 04:32:07 04:32:09

But in some applications that I do -- like I do reconnaissance mapping cameras. And those oftentimes -- we're talking about 10th pixel as a significant difference in terms of distortion, because they're mapping cameras. 04:32:09 04:32:11 04:32:14 04:32:18 04:32:21

It's really very important. 04:32:24
But I think that's extreme. I think 04:32:25
a pixel is a pretty reasonable number to say if 04:32:29
it's less than a pixel, it's probably not that 04:32:32
important. And if it's more than a pixel, it 04:32:35
probably is, just as a -- just as a number to 04:32:37
kind of put it in context. 04:32:40
It's hard to -- hard to get your 04:32:41
head around what's the difference between -- at 04:32:43
least for me. It's hard for me to get my head 04:32:45
around what's the difference between 9.88 and 04:32:48
7.7, for example. How big a deal is this? So 04:32:52
this little analysis helped me kind of get my 04:32:55
head around it. 04:32:57
Q. Uh-huh. And if the change is less 04:32:58
than a pixel, you mean it will have little 04:33:08
effect on the performance of the lens? 04:33:14
A. It depends on the application, 04:33:16
but -- but as a good rule of thumb, if it's 04:33:18
less than a pixel, it's -- there are probably 04:33:20
bigger issues to confront than that. 04:33:23
If it's more than a pixel, then it's 04:33:25

certainly in play. It's something that -- that it's a -- it's a significant parameter. 04:33:28 04:33:30

Q. Let's go to paragraph -- let's go to paragraph 123. 04:33:32 04:33:58

A. That was 123? 04:34:00

Q. Yeah, 123. 04:34:02

A. I'm there. 04:34:13

Q. So about the third line down it says, "As we can plainly see, Embodiments 1 and 2 have a maximum deviation less than 2 percent, nowhere close to the at least plus or minus 10 percent described in the '990 patent. And these embodiments in Tada's view are substantially the same as Embodiment 3." 04:34:13 04:34:16 04:34:20 04:34:23 04:34:27 04:34:32 04:34:34

Do you see that? 04:34:37

A. Yes, I do. 04:34:37

Q. Where in Tada does it say that Embodiment 3 is substantially the same as Embodiments 1 and 2? 04:34:39 04:34:41 04:34:44

A. Oh, did I not indicate that? My apologies. It is -- hang on. I can find it quickly. I know where it is. It's between the 04:34:45 04:34:54 04:34:59

tables. 04:35:01

So if you look at the bottom of Column 8, Figure 11 chose a third embodiment, et cetera. "The basic structure of the lens system of the third embodiment is substantially the same as that of the second embodiment." 04:35:01 04:35:04 04:35:08 04:35:11 04:35:12

And then we have the same comment introducing the fourth embodiment as substantially the same as the third embodiment. I should have probably included those references. 04:35:14 04:35:16 04:35:17 04:35:23 04:35:25

Q. So you calculate the maximum deviation of Embodiment 3 on the -- what you believe to be the corrected Table 5 as 4.5 to 5 percent; is that correct? 04:35:30 04:35:32 04:35:34 04:35:40

A. Depends on the analysis method and the wavelengths chosen, but 4.5 is a pretty reasonable number, yes. 04:35:41 04:35:43 04:35:46

Q. Uh-huh. But if you used 380 nanometers of wavelength of light, your deviation would be more like 5.2 percent, correct? 04:35:47 04:35:59 04:36:02 04:36:05

A. I think I included that figure just because I thought somebody would want to know. Let me see. Where did I put that? Just a minute. It was before the centroids I remember. The centroids doesn't make any sense at 380. 04:36:05 04:36:08 04:36:18 04:36:20 04:36:22 04:36:25

Here it is. Yes. It's the figure at the bottom of page 58 of 94. And it's 5.2. You were exactly right. 04:36:26 04:36:28 04:36:32

Q. Sorry. 58 of 94? 04:36:34

A. 58 of 94. It shows a max of minus 5.2. 04:36:37 04:36:44

Q. I see. 5.2, uh-huh. 04:36:45

A. Uh-huh. 04:36:47

Q. So even under your corrected analysis of Embodiment 3, you're getting almost two to three times the maximum deviation of Embodiments 1 and 2, right? 04:37:01 04:37:03 04:37:09 04:37:12

A. I think that's correct. I want to make sure that that's apples to apples. Please give me a moment. 04:37:15 04:37:20 04:37:23

Q. Okay. 04:37:25

A. That's a long document. 04:37:30

There we are. Yes, let's see. So Table 1 -- yes. That's -- that is a centroid-based analysis. And I was getting 1.2 from Embodiment 1, 1.1 for Embodiment 2, and I got 4.6 for Embodiment 3. 04:37:42 04:37:53 04:37:57 04:37:59 04:38:04

Q. And just using the same technique that you used to get 5.2 for Embodiment 3, what -- what was the value you got for Embodiments 1 and 2? 04:38:07 04:38:13 04:38:16 04:38:20

A. For the -- I didn't do the UV analysis of Embodiments 1 and 2. I felt it was specious. As I said in my report, I think it's disingenuous to analyze the system at 380 nanometers. 04:38:22 04:38:25 04:38:28 04:38:30 04:38:35

Q. So you've got 1.2 or something for the first embodiment, and you got 5 or 5.2 for the third embodiment. 04:38:36 04:38:38 04:38:41

Do you believe that those, at least with respect to maximum deviation, those embodiments are substantially the same? 04:38:44 04:38:46 04:38:48

A. Just to be clear, it wasn't 5.2. 04:38:51

5.2 was the UV analysis which I consider specious. 04:38:54 04:38:57

If I were to say for an apples-to-apples comparison, Embodiment 1 was minus 1.2, Embodiment 2 was minus 1.1, Embodiment 3 was minus 4.5. 04:38:57 04:39:00 04:39:03 04:39:06

And the question, do I think those are substantially the same, that's -- that's an interesting question, because what -- what -- I wasn't the one who said that they were all substantially the same. That's Tada. 04:39:09 04:39:13 04:39:16 04:39:22 04:39:24

Tada felt these were substantially the same. And that's telling, right? When Tada was doing his distortion analysis, he showed an F10 theta distribution. 04:39:25 04:39:27 04:39:30 04:39:33

So, in his mind, the difference between these three solutions was negligible, because he didn't care about DIVmax, right? 04:39:35 04:39:37 04:39:42

This is -- this is completely a construct that he did not look at and never reported and had no interest in. He was reporting on the peak distortion like we 04:39:46 04:39:48 04:39:50 04:39:53

ordinarily do in optical design. 04:39:56
So it was Tada's words that said 04:39:58
these are substantially the same which tells us 04:40:00
that he didn't care about DIVmax. 04:40:07
Q. Do you think they're substantially 04:40:09
the same, 1.2 and 5? 04:40:11
A. Well, again, 4.6. Please stop using 04:40:12
the 5 term, because that's not an 04:40:17
apples-to-apples comparison. 04:40:20
Q. 4.6 and 1.2. 04:40:21
Do you believe the maximum deviation 04:40:24
of 1.2 and a maximum deviation of 4.6 are 04:40:25
substantially the same? 04:40:29
A. No, I do not. I think those are -- 04:40:29
Q. Why not? 04:40:31
A. -- pretty different. 04:40:32
Well, as I explained in my little 04:40:35
pixel analysis, the difference -- I think -- if 04:40:37
you -- if you start from my arbitrary 2,500 04:40:40
pixels, each percentage change from linear 04:40:45
moves the image height more than 5 pixels. 04:40:51
So to go from 4.6 to 1, that's 3.5 04:40:55

percentage points, so that would be 15, 16, 04:41:01
maybe even 20 pixels. That's a big difference. 04:41:05
MR. BREGMAN: Why don't we take a 04:41:10
little break. 04:41:11
THE WITNESS: Okay. 04:41:11
MR. BREGMAN: 15 minutes or so, if 04:41:14
you don't mind. 04:41:15
(Whereupon, a recess was taken at 04:41:22
4:41 p.m.) 05:00:55
BY MR. BREGMAN: 05:00:56
Q. So getting into the home stretch 05:00:57
here, Mr. Aiken. Why don't we turn to 05:00:59
paragraph 78 of your declaration. 05:01:03
A. And it's Mr. Aikens, by the way. I 05:01:06
didn't want to correct you before, but it's 05:01:10
showing up on a lot of documents. 05:01:14
What was the page again? 05:01:16
Q. 42 of 94. 05:01:18
A. Thank you. 05:01:21
I'm there. 05:01:27
Q. The last sentence on that page says, 05:01:28
"Here I am referring to the RGB telemodel, or 05:01:29

the additive color model for human vision 05:01:34
perception which dates back to 1931 (CIE 05:01:36
1931)." 05:01:40
Do you see that? 05:01:40
A. Yes. 05:01:40
Q. And the color model is shown on the 05:01:41
following page; is that correct? 05:01:47
A. Yes. That's the -- I think that's 05:01:48
the figure from Pedrotti, if I remember right? 05:01:51
Yes. 05:01:57
Q. Why don't we open Pedrotti, which is 05:01:58
Exhibit 2012. 05:02:03
A. Yes, I have it. What page? 05:02:14
Q. So if I'm looking at this reference, 05:02:30
Exhibit 2012, page 13 of that reference has got 05:02:34
a title, "Photometry." 05:02:39
Do you see that? 05:02:44
A. Yes, I do. 05:02:44
Q. And the second sentence of that 05:02:45
paragraph says, "Photometry, on the other hand, 05:02:47
applies only to the visible spectrum portion of 05:02:50
the optical spectrum." 05:02:52

Do you see that? 05:02:54
A. Yes. 05:02:54
Q. And carries on saying, "Whereas 05:02:54 the" -- 05:03:02
(Audio technical difficulties; 05:03:03 stenographer asks for 05:03:03 clarification.) 05:03:03
BY MR. BREGMAN: 05:03:03
Q. "Whereas radiometry involves purely 05:03:04 physical measurements, photometry takes into 05:03:13 account the response of the human eye to 05:03:16 radiant energy at various wavelengths and so 05:03:18 involves psychophysical measurements." 05:03:21
So we're talking about what the 05:03:26 human eye sees, right? 05:03:28
A. Yes, photometry is based on human 05:03:30 **vision.** 05:03:38
Q. And it says, "The distinction rests 05:03:38 on the fact that the human eye, as a detector, 05:03:40 does not have a 'flat' spectral response." 05:03:43
Do you see that? 05:03:46
A. Yes. 05:03:46

Q. If we keep going a little bit, I'm going to skip a bit. It says, "When we use photometric quantities, then, we are measuring the properties of visual radiation as they appear to the normal eye rather than as they appear to an 'unbiased' detector." 05:03:47 05:03:54 05:03:57 05:04:00 05:04:03 05:04:06

Do you see that? 05:04:08

A. Yes. 05:04:08

Q. So when we're talking about photometry and the chart that you have on the next page, which we'll get into in a minute on Figure 2.7, this is all with respect to what a human eye sees and not as it says here, "rather than they appear to an 'unbiased' detector," right? 05:04:08 05:04:12 05:04:14 05:04:17 05:04:19 05:04:23 05:04:27

A. It's referring to visible light, right? So, yes, that's correct. 05:04:27 05:04:29

Q. As detected by a human eye? 05:04:31

A. As detected by a human eye; that's correct. 05:04:33 05:04:35

Q. And when we're talking about all of these cameras, the lens directs the light to a 05:04:35 05:04:40

sensor, not into a human's eye, right? 05:04:45
A. Yes, that's correct. 05:04:49
Q. A little bit further, it says, "The relative response or sensation of brightness for the eye is plotted versus wavelength, showing that peak sensitivity occurs at the 'yellow-green' wavelength of 555 nm. 05:04:51 05:05:08 05:05:10 05:05:12 05:05:16
"Actually the curve shown is the luminous efficiency of the eye for photopic vision, that is, when adapted for day vision. For lower levels of illumination, when adapted for night or scotopic vision, the curve shifts towards the 'green,' peaking at 510 nanometers." 05:05:18 05:05:21 05:05:25 05:05:28 05:05:31 05:05:34 05:05:37
Do you see that? 05:05:38
A. Yes, I do. 05:05:39
Q. So this curve is just for daylight of what a human eye sees, but as you get in towards dimmer illumination, such as night, the entire curve shifts and is centered about 510, right? 05:05:39 05:05:44 05:05:47 05:05:52 05:05:59
A. That's incorrect. 05:05:59

Q. So this article is incorrect? 05:06:00
A. No, no. It's correct. What you said is incorrect. The entire curve doesn't shift. The peak shifts. But the curve stays roughly the same. 05:06:02 05:06:03 05:06:06 05:06:09
Q. The curve stays identical but the peak shifts -- 05:06:10 05:06:12
A. No, not identical. No, it shifts. I actually have the scotopic curve. I don't think it's in Pedrotti. 05:06:12 05:06:16 05:06:19
But the scotopic curve starts to rise a little faster than the photopic curve around about 450, and it peaks out at about 510, 515, somewhere in there. And then it rolls off and continues all the way out to, like, 650. 05:06:21 05:06:24 05:06:27 05:06:31 05:06:34 05:06:37
So it -- it kind of -- it skews, but it doesn't just -- it doesn't just shift. The cutoff is still down at the 410, 420 range for both photopic and scotopic. And that's just because of physiology. 05:06:38 05:06:41 05:06:45 05:06:48 05:06:51
Q. Of a human eye? 05:06:52

A. Yeah. 05:06:53

Q. Okay. But we're not talking about a human eye when we're talking about cameras, aren't we? 05:06:56 05:06:57 05:07:00

A. Oh, yeah we are. We are displaying information. And people find it really disturbing to be displayed information that is not consistent with the photopic curve. They don't even like the scotopic curve. They prefer the photopic curve. 05:07:00 05:07:03 05:07:06 05:07:08 05:07:11 05:07:11

So what we do is we usually put a filter over the camera which is usually silicon. So its response function doesn't look like this and we have to put a special piece of glass in, probably right where that cover glass goes in Tada, for example. 05:07:13 05:07:15 05:07:18 05:07:20 05:07:22 05:07:24

And it would be a filter which reverses the silicon function and replaces it with the photopic function. So that way the camera senses what we would see which is what we want displayed. 05:07:26 05:07:28 05:07:32 05:07:34 05:07:41

Now, that's not universally true. 05:07:43

But that's a common scenario. On equipment that I make, for example, I can -- anything that is going to get back to a person as the observer, I would use a photopic reversal filter. 05:07:44 05:07:46 05:07:50 05:07:52 05:07:56

Q. So in a CCTV camera that often you want to look at things at night, and sometimes you even have infrared illumination, you are going to still follow what the -- sorry -- what the photopic -- photopic curve looks like for a standard human eye during daylight? 05:07:56 05:07:59 05:08:04 05:08:11 05:08:13 05:08:18

A. In the absence of any other information except red, green, blue or visual application, yeah, the photopic curve is pretty standard. 05:08:21 05:08:22 05:08:26 05:08:29

Q. And at what level of light is the lowest that you can start seeing the human -- that human beings can start seeing? 05:08:29 05:08:33 05:08:36

A. Actually that's really interesting. I remember reading a while ago that at even 100 photons, if the eye is perfectly dark adapted, it still sense -- can still be sensed by the 05:08:38 05:08:40 05:08:43 05:08:46

human eye. Can't really make out shapes or resolution or anything at that level, but you can actually detect it. 05:08:49 05:08:52 05:08:53

Q. I'm sorry. At what wavelength? 05:08:55

A. At 100 photons. Oh, I'm sorry. I thought you were talking intensity. You mean in wavelengths? 05:08:56 05:09:00 05:09:04

Q. Yes. 05:09:04

A. Well, this curve is fairly accurate. So the energy content below about 450 nanometers is pretty much zero for any visual application. There might be a percent of light down there. 05:09:05 05:09:07 05:09:10 05:09:12 05:09:20

Q. So if we turn to your Figure 4, this PMMA glass, which is just about paragraph 82. 05:09:22 05:09:29

A. Yes. 05:09:35

Q. And I look directly under the figure, it says, "At wavelengths above 400 nm, the transmission is constrained by the Fresnel losses" -- which amount to two times 3.86 percent, i.e., approximately 8 percent. 05:09:35 05:09:37 05:09:41 05:09:44 05:09:47

"Below 400 nm, the bulk absorption 05:09:50

of Plexiglass becomes dominant." The sample doesn't transmit any light to 360 nm. 05:09:54 05:09:58

So this is letting in light -- some lights above 360, no light below 360. And that includes, you know, below 400 nm. 05:10:02 05:10:05 05:10:10

You'd agree with that? 05:10:14

A. I think actually in the paper it refers to 405 as the wavelength where the PMMA starts absorbing. So anything below 405. But I said 400 because that's sort of the accepted definition of the top of the UVA range. 05:10:15 05:10:17 05:10:24 05:10:27 05:10:30

Q. What do you mean, "starts absorbing"? 05:10:33 05:10:34

A. Well, you can see if the curve is flat in this relative transmission plot, it means that the amount of light is invariant with thickness. 05:10:35 05:10:39 05:10:42 05:10:46

It's just -- it's losing light simply because of the air/glass and glass/air interface. And here I'm using that term generically because, of course, it's a plastic. 05:10:49 05:10:50 05:10:54 05:10:56

Q. Uh-huh. 05:10:58

A. But those two interfaces drop about 8 percent. So you would expect the performance in a region where the glass or plastic is not absorbing to be 92 percent or higher. 05:10:59 05:11:02 05:11:04 05:11:08

And you can see it starts rolling off right at -- you know, right at about 405. And then anything below that, the more glass you put in, or the more plastic in this case, the more light you're going to lose. And in this case, by 380 nanometers you've lost more than half the light for 2 mms of thickness. 05:11:11 05:11:13 05:11:18 05:11:21 05:11:23 05:11:26 05:11:30

Q. So only half of the light will make it through at 380 nanometers? 05:11:32 05:11:34

A. That's correct. With 2 mm thickness, yeah. 05:11:38 05:11:41

Q. Why don't we go to Exhibit 1005. Let me know when you're there. 05:11:41 05:12:11

A. Is that Baker? 05:12:12

Q. Yeah. 05:12:14

A. I have it open. 05:12:16

Q. Is that U.S. Patent 5,686,957 referred to as Baker in your declaration? 05:12:17 05:12:22

A. Yes. 05:12:27
Q. Let's go to Column 13. Last 05:12:27
paragraph of Column 13. 05:12:35
Do you see that? 05:12:39
A. Not yet. Hang on. 05:12:40
Okay. I'm there. 05:12:43
Q. So it says, "The panoramic image 05:12:44
provided by the Image A is ideally suited for 05:12:47
teleconferencing." 05:12:50
I think we discussed that earlier; 05:12:52
is that correct? 05:12:56
A. Yes, I think we did discuss this 05:12:56
when we were talking about my overview of Baker 05:12:58
perhaps. 05:13:00
Q. It says, "For example, with the 05:13:01
image lens apparatus mounted in the center of 05:13:02
the conference table, from the plane of the 05:13:05
table, a hemispheric view is presented." 05:13:07
What does that mean? 05:13:10
A. It means that if you're using a 05:13:11
panoramic image which has a plus and minus 05:13:20
90-degree or more field of view and you've 05:13:24

imaged that onto the -- onto the sensor using Baker's method of expanding the outer part while contracting the inner part, then you would see on the projected screen, you would see a circle. And in the center of it would be the ceiling, and around the edges would be the people. 05:13:26 05:13:31 05:13:34 05:13:39 05:13:41 05:13:44 05:13:46

Q. So we're trying -- we're trying to enhance the image by expanding where the people are, right? 05:13:48 05:13:50 05:13:54

A. Right. 05:13:55

Q. And if you can expand some where you got to compress somewhere else so we are sort of losing image quality of the ceiling and we're getting better image quality of the people, right? 05:13:56 05:13:59 05:14:01 05:14:05 05:14:07

A. That is what Baker says, yes. 05:14:09

Q. And then it goes on to say, "If the participants of the conference are seated around the table and the microphone array located conveniently on the table, the important image information, i.e., the 05:14:11 05:14:15 05:14:16 05:14:19 05:14:21

participants, are found with the imager along a 10- to 30-degree or 45-degree segment of the horizon, by far the bulk of the images of interest." 05:14:23 05:14:26 05:14:32 05:14:36

Do you see that? 05:14:37

A. Yes, I do. 05:14:37

Q. So it's the area of interest that they're focusing on is along a 10- to 30-degree or 10- to 45-degree segment of the horizon; is that correct? 05:14:38 05:14:41 05:14:44 05:14:48

A. Yeah. Baker is solely about the horizon; that's correct. 05:14:48 05:14:50

Q. Okay. And then it goes on to say, "Therefore, using the present invention with audio detection to determine the direction of the current speaker, the desired image segments can be electronically manipulated," blah, blah, blah, blah, blah, blah. 05:14:51 05:14:56 05:14:58 05:15:01 05:15:04 05:15:04

I think really what we -- I am trying to get at here is once Baker knows where the people are, it will expand the image where the people are and otherwise compress the image 05:15:08 05:15:11 05:15:15 05:15:21

elsewhere; is that correct? 05:15:23

A. No. Baker is always talking about the periphery. So we know where his people are. The people are always around the periphery. 05:15:25 05:15:27 05:15:29 05:15:31

Q. Around the periphery of the lens, I get that. 05:15:32 05:15:34

A. The view, yeah, the -- around -- 05:15:35

Q. From the horizon down, starting at the horizon is the border -- is the conference room table, right? 05:15:36 05:15:39 05:15:41

A. At the -- no. Well -- I'm not sure. But, yeah, the horizon is all the way out at, let's say, 90 degrees, just to make it convenient, right? 05:15:42 05:15:45 05:15:47 05:15:49

Q. So if that's the horizon, that's 90 degrees -- 05:15:50 05:15:58

A. So that's everybody's -- that would be everybody's belly button, say -- 05:15:58 05:15:58

(Simultaneous unreportable cross-talk occurs among parties.) 05:15:58 05:15:59

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(Stenographer requests one speaker at a time.) 05:15:59 05:16:00

BY MR. BREGMAN: 05:16:00

Q. So we -- 90 degrees -- I guess that's zero degrees when you're talking about here, right? 05:16:05 05:16:09 05:16:12

A. We should stick to 90 degrees just because that's the convention of the other patents, so... 05:16:13 05:16:15 05:16:17

Q. Okay. But when it's talking about this 10 degrees or 30 degrees or 45 degrees, that's measuring from the horizon, right? 05:16:18 05:16:20 05:16:26

A. That's correct. 05:16:28

Q. Okay. So just in trying to stick with what this patent's saying, you would say that -- that the horizon is at sort of the person's belly button, right? 05:16:29 05:16:32 05:16:34 05:16:39

A. As I understand it, yeah. 05:16:40

Q. Okay. And then 10 degrees up from the horizon would be where? 05:16:42 05:16:44

A. Depends on the size of the table and the application and the lens design, but the 05:16:46 05:16:50

way he's describing it, he's saying -- let's see. What is -- what is his word? 05:16:52 05:16:56

The participants are found along the 10- to 30-degree or 45-degree segment of the horizon. So he's saying small table, maybe it's 45 degrees; big table, maybe it's, you know, 10 or even -- you know, 10 to 30 degrees depending on how big the table would be. 05:16:59 05:17:01 05:17:04 05:17:07 05:17:11 05:17:14

Q. Right. 05:17:16

A. So I took that as a -- anywhere from 80 degrees to 90 or from all the way to 45 degrees to 90. That's the potential range of what Baker is talking about. 05:17:16 05:17:20 05:17:24 05:17:28

Q. Well, hold on a second. I mean, it says here found with the image along a 10 to 30 degrees or 45 degrees. So that's from 10 to 30 or from 10 to 45, right? 05:17:31 05:17:33 05:17:36 05:17:40

A. Oh, I see your point. Yeah, yeah. So that would be from 80 to 60 degrees. 05:17:42 05:17:44

Q. Okay. 05:17:49

A. Yeah. You're right. 80 to 60 degrees in the space of these -- these images 05:17:50 05:17:53

that we've been talking about. 05:17:55
Q. All right. 05:17:57
A. Or from 80 to 45 degrees, yeah. I'm 05:17:57
sorry. I was wrong. 05:18:02
Q. Okay. I think that's all the 05:18:02
questions I've got for now. Unless there's 05:18:06
going to be some redirect, I might come back 05:18:08
with cross. 05:18:11
Thank you, Mr. Aikens. 05:18:12
A. Thank you. 05:18:16
MR. MURRAY: I can say I have no 05:18:17
questions about belly buttons or anything 05:18:20
else. We reserve the right to read and 05:18:22
sign. 05:18:31
(At 5:18 p.m., the proceedings
adjourn.)
04:24:58

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.)

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

____
JESSICA R. WAACK
Registered Diplomate Reporter
Certified Realtime Reporter
California Certified Realtime Reporter
New York Realtime Court Reporter
New York Association Court Reporter
Notary Public, State of New York
Licensed in New Jersey

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: ___________________________________

(Seal)

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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(α)	not clear as written
74	20	equals K alpha	= Kα	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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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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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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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	coeffcient	coefficients	omission

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Pg.	Ln.	Now Reads	Should Read	Reasons Therefore
247	3	chose	shows	Transcription error
250	15	F10 Theta	f tan (Theta)	not clear as written

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F