

Page 1 UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD APPLE INC.,) PETITIONER,) v.) Case IPR2023-00471 PATENT 6,844,990 IMMERVISION, INC.,) PATENT OWNER.) _____) DEPOSITION OF JAMES F. MUNRO APPEARING REMOTELY January 10, 2024 9:09 a.m. Reported by: Lori J. Goodin, RPR, CLR, CRR, RSA, California CSR #13959 DIGITAL EVIDENCE GROUP 1730 M Street, NW, Suite 812 Washington, D.C. 20036 (202) 232-0646	Page 3 INDEX TO EXAMINATION 1 2 WITNESS: JAMES F. MUNRO 3 4 EXAMINATION BY PAGE 5 Mr. Jhurani 5 6 Mr. Murray 50 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Page 2 1 REMOTE APPEARANCES: 2 FOR APPLE INC.: 3 FISH & RICHARDSON P.C. 4 BY: KARAN JHURANI, ESQUIRE 5 60 South Sixth Street 6 Suite 3200 7 Minneapolis, Minnesota 55402 8 612-335-5070 9 jhurani@fr.com 10 11 FOR IMMERVISION, INC.: 12 PANITCH SCHWARZE BELISARIO & NADEL LLP 13 BY: STEPHEN E. MURRAY, ESQUIRE 14 2001 Market Street 15 Suite 2800 16 Philadelphia, Pennsylvania 19103 17 215-965-1330 18 smurray@panitchlaw.com 19 20 21 22	Page 4 INDEX TO EXHIBITS JAMES F. MUNRO Apple Inc., v. ImmerVision Inc. Wednesday, January 10, 2024 Lori J. Goodin, RPR, CLR, CRR, RSA, California CSR #13959 7 8 DEPOSITION 9 EXHIBIT DESCRIPTION PAGE 10 Exhibit 1 Declaration of James F. Munro 10 11 Exhibit 2 U.S. Patent 6,844,990 33 12 13 14 15 16 17 18 19 20 21 22

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Page 5 1 WEDNESDAY JANUARY 10, 2024, 9:09 a.m. 2 PROCEEDINGS 3 4 * * * 5 JAMES F. MUNRO 6 a witness called for examination, having been 7 first duly sworn, testified as follows: 8 * * * 9 EXAMINATION 10 BY MR. JHURANI: 11 Q. Good morning. My name is Karan 12 Jhurani, and I am with Fish & Richardson and 13 appearing today on behalf of Petitioner, Apple 14 Incorporated. 15 Sir, could you just state your name 16 for the record. 17 A. Sure. James F. Munro. 18 Q. And have you been deposed before? 19 A. No, I have not. 20 Q. Okay. I'm going to go over some 21 ground rules today, sir, about today's 22 deposition.	Page 7 1 A. Yes. 2 Q. Okay. Thank you. And is there any 3 reason, medical or otherwise, you can't give 4 truthful, complete and accurate testimony today? 5 A. There are no reasons. 6 Q. Okay. All right. And I will plan 7 to take a break about five to ten minutes -- a 8 five to ten-minute break every hour. Does that 9 work for you? 10 A. Yes, it does. 11 Q. And, I'm happy to accommodate a 12 break sooner than that as well. All I will say 13 is if you need to take a break sooner than the 14 one-hour mark, and if there is a question pending 15 at that time, you let me know, you answer that 16 question and then we can take the break. Is that 17 fair? 18 A. That is fair, yes. 19 Q. Okay. Did you prepare for today's 20 deposition, sir? 21 A. Yes, I did. 22 Q. Okay. What did you do to prepare?
Page 6 1 And you understand that you are 2 testifying under oath today, correct? 3 A. Correct. Yes. 4 Q. And you understand that in today's 5 deposition, I'm going to ask you a series of 6 questions? 7 A. Yes. 8 Q. Now, if you don't understand a 9 question I pose, will you let me know that you 10 don't understand the question? 11 A. Yes, I will. 12 Q. Okay. But if you answer a question, 13 is it fair for me to assume that you understood 14 the question I asked? 15 A. That is a fair assumption, yes. 16 Q. Okay. And you understand that you 17 are to give truthful, complete, and accurate 18 testimony today, correct? 19 A. Correct, yes. 20 Q. If you ever want to take back, 21 change, add to, or modify in any way an answer 22 you have already given, will you let me know?	Page 8 1 A. I read a declaration. I read the 2 Kessler declaration. I read the '990 patent, as 3 well as the three cited patents and patent 4 applications, Baker, Shiota and Fisher. 5 Q. And about how long did you spend 6 preparing for the deposition? 7 A. Oh, in total, about 10 to 12 hours. 8 Q. Did you have any discussions with 9 counsel about today's deposition? 10 A. Yes, I did. 11 Q. And during those discussions, were 12 any non-lawyers present as well? 13 A. No. 14 Q. Sir, just to confirm, you received a 15 set of deposition exhibits electronically. Is 16 that correct? 17 A. That is correct. 18 Q. Okay. And do you have that 19 repository or link available and accessible right 20 now? 21 A. Yes, I do. 22 Q. Okay. The file name for each

Page 9 1 electronic exhibit has a Deposition exhibit 2 number in it. Do you see that? 3 A. Yes. 4 Q. Okay. So, if I am referring to Depo 5 Exhibit 1, you can simply access the file that 6 starts with that name. Sounds good? 7 A. Sounds great, yes. 8 Q. Okay. Do you have any paper copies 9 of the exhibits that you received? 10 A. I have in front of me my 11 declaration, the Kessler declaration, as well as 12 the '990 patent, as well as Baker, Shioti, and 13 Fisher. And they are all clean copies. 14 Q. Okay. And are you going to be using 15 the paper copies or the electronic copies for 16 deposition? 17 A. I would like to use both, if 18 possible. 19 Q. That is fine. And just, if you are 20 looking at the paper copy, I might ask you just 21 to let me know what you are looking at, just so 22 we are looking at the same things. Okay?	Page 11 1 A. Yes, I will. 2 Q. So, Depo Exhibit 1, sir, is the 3 declaration you submitted for the IPR proceeding, 4 IPR2023-00471 relating to the '990 patent, 5 correct? 6 A. That is correct. 7 Q. Okay. Sir, if you could turn to 8 Paragraph 25 of your declaration. 9 A. Okay. 10 Q. The first sentence states here that 11 "A person of ordinary skill in the art (POSA) at 12 the time of the invention would have had," and it 13 goes on. I will paraphrase here, but ends with 14 "familiarity with image processing algorithms and 15 optical design software." Do you see that? 16 A. Yes. 17 Q. Do you have familiarity with optical 18 design software? 19 A. Yes. 20 Q. Which ones? 21 A. Primarily Zemax, but I have also 22 used Oslo and Code 5 in the past.
Page 10 1 A. Sounds good. No problem. 2 Q. All right, sir. Could you bring up 3 Depo Exhibit 1, which is the Declaration of James 4 F. Munro. 5 (Deposition Exhibit Number 1 6 marked for identification.) 7 THE WITNESS: Okay. It is in front 8 of me on my monitor. 9 BY MR. JHURANI: 10 Q. All right. And so on the first page 11 you see the title, Declaration of James F. Munro. 12 Do you see that? 13 A. Yes. 14 Q. And staying on that page do you see 15 a reference to a case number, IPR2023-00471? 16 A. Yes. 17 Q. And there is a patent number listed 18 there, 6,844,990. Do you see that? 19 A. Yes, I do. 20 Q. If I refer to the 6,844,990 patent 21 as the '990 patent today, will you understand 22 that reference?	Page 12 1 Q. And how long have you been using 2 Zemax? 3 A. Over 30 years. 4 Q. And have you designed any optical 5 systems using Zemax? 6 A. Yes, I have. 7 Q. Can you give me examples of some 8 types of systems you have designed? 9 A. More recent one is a lens that is 10 used in space as part of a star tracker that is 11 used for pointing a satellite -- determining the 12 satellite's attitude and position in space, so it 13 is always pointing in the right direction. 14 It has to be a space qualified lens. 15 It has to be broadband. In other words it has to 16 use wavelengths from 400 nanometers, up to 17 900 nanometers. 18 It was a multi-element lens. It was 19 six elements using space qualified glass. That 20 is one example. I can list others if you like. 21 Q. Are you familiar with fisheye 22 lenses?

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Page 13 1 A. I have familiarity with fisheye 2 lenses, yes. 3 Q. And have you designed any optical 4 systems using fisheye lenses? 5 A. I have not actually designed a 6 fisheye lens. I have analyzed fisheye lenses in 7 the past. 8 Q. What do you mean by that? What does 9 it mean to analyze the fisheye lenses? 10 A. That is where I get a prescription 11 of a fisheye lens from a client and I enter it 12 into Zemax to see how it works, so I can provide 13 feedback to a client as to the quality of the 14 design. 15 So, I didn't actually change the 16 design. I just entered it into Zemax and ran an 17 analysis on it. 18 Q. Okay. Thank you for that, sir. 19 Looking at -- looking back at 20 Paragraph 25 of your declaration, in the last 21 sentence you note that the relevant time frame of 22 the invention of the '990 patent is May 11, 2001.	Page 15 1 want to draw your attention to the second 2 sentence. 3 You state here that "The horizontal 4 axis, alpha, is the angle of a light ray entering 5 the camera from a panoramic scene, measured from 6 the central optical axis of the camera." 7 Do you see that? 8 A. Yes. 9 Q. And this angle alpha referenced here 10 is also referred to as the field angle, correct? 11 A. That's correct. 12 Q. And as shown on Figure 9, I believe, 13 on the next page, the field angle is shown as 14 ranging from 0 to 90 degrees, right? 15 A. That's correct. 16 Q. So next I want to go back to 17 Paragraph 32 and focus in on the sentence that 18 starts with the vertical axis. And I will just 19 read it for the record. 20 "The vertical axis is labeled DR for 21 relative distance, which is equal to the radial 22 distance in the image plane where an incoming ray
Page 14 1 Do you see that? 2 A. Yes. Excuse me. Yes, I do. 3 Q. And you applied that day in forming 4 your opinions in this declaration; is that 5 correct? 6 A. That's correct. 7 Q. Sir, could you turn to Paragraph 31 8 of your declaration, which is Depo Exhibit 1. 9 A. Okay. 10 Q. Actually. Sorry, I misspoke. 11 Could you turn to Paragraph 32 of 12 your declaration. 13 A. Okay. I am at 32. 14 Q. All right. In the first sentence 15 you are referencing Figure 9 of the '990 patent. 16 Do you see that? 17 A. Yes. 18 Q. And I think you have provided a copy 19 of Figure 9 on the next page, Page 16 of your 20 declaration. Correct? 21 A. Correct. 22 Q. Okay. Looking at Paragraph 32, I	Page 16 1 of angle alpha lands, divided by the maximum 2 radius of the image." 3 Do you see that? 4 A. Yes. 5 Q. What do you mean by the maximum 6 radius of the image? 7 A. So, the lens produces an image, and 8 it is typically a round image with an extent away 9 from the optical axis. 10 The extent from the optical axis -- 11 the maximum extent away from the optical access 12 that the image occupies is that radius. 13 Q. So, it is effectively the radius of 14 the circular image; is that right? 15 A. Correct. 16 Q. And just so I understand the 17 relative distance concept, is it correct that it 18 is relative in that it represents a radial 19 distance of an image point at a particular field 20 angle that is relative to the maximum radius of 21 the image? 22 A. Yes, the relative distance is like a

Page 17 1 percentage. When you are halfway out in the 2 image plane, to the maximum extent of the image, 3 you are at, for example, a relative distance 4 of 0.5. 5 Q. I see. Okay. And then the values 6 of this relative distance effectively range from 7 0 to 1; is that right. 8 A. Correct. 9 Q. So, in a way, the relative distance 10 is a normalized distance value. Is that fair? 11 A. That is correct, yes. 12 Q. And here, and at the end of the 13 paragraph you note that DR is 1, meaning the ray 14 is at the extreme edge of the image. 15 Do you see that? 16 A. Yes. 17 Q. And I think you might have mentioned 18 it, but can you explain what the extreme edge of 19 the image is as you are referencing here? 20 A. That is the location at which the 21 image stopped, basically. And it is limited by 22 the characteristics of the lens.	Page 19 1 relative distance and relative height in this 2 context are basically synonymous? 3 MR. MURRAY: Objection to form. 4 BY MR. JHURANI: 5 Q. Well, since there was an objection, 6 let me just ask a different question. 7 Is there any difference between 8 relative distance and -- strike that. 9 Is there any difference between 10 relative distance as used in the '990 patent and 11 relative image height as used in the field of 12 optics? 13 A. I would say they are equivalent. 14 Q. Okay. So, for purposes of our 15 discussion today, the relative image height and 16 relative distance are synonymous, fair? 17 A. I would say that is fair, but there 18 could be exceptions. But, let's go with that, 19 yes. 20 Q. Let's look at Figure 9 that you have 21 reproduced on Page 16 of your declaration. And 22 let me know when you have that in front of you.
Page 18 1 Q. And that would be at the field angle 2 of 90 degrees, correct? 3 A. In Figure 9, that is correct. 4 Q. Okay. I want to turn briefly to 5 Paragraph 36 of your declaration. Let me know 6 when you are there. 7 A. Okay, I am there. 8 Q. All right. In the middle of the 9 paragraph you reference -- well, somewhere in the 10 middle of the paragraph you state, "relative 11 image height DR." Do you see that? 12 A. Yes. 13 Q. And earlier, I believe, in 14 Paragraph 32, you had referred to DR as relative 15 distance, correct? 16 A. So in Paragraph 32, I am borrowing 17 terms from the '990. DR really stands for 18 relative distance. 19 And in Paragraph 36, I am really 20 taking language from the field of optics. It is 21 more of a common term, relative image height. 22 Q. So, is it safe to assume then	Page 20 1 A. Okay. I am there. 2 Q. Okay. What is Figure 9 showing? 3 A. Figure 9 is a graph. The horizontal 4 access goes from 0 to 90 degrees, and that is the 5 field angle of the light rays coming in from a 6 field of view. 7 The vertical axis is DR, which goes 8 from 0 to 1, which is the relative distance. 9 Plotted are two curves, one labeled FDC, which is 10 a linear curve relating DR to alpha, the field 11 angle. 12 And there is a second curve labeled 13 FD3, which is a piece-wise linear curve, excuse 14 me, piece-wise linear curve, yes, made up of 15 three linear segments that represent in aggregate 16 a non-linear relationship between DR and alpha. 17 Q. And that non-linear relationship is 18 shown using a solid line in Figure 9, correct? 19 A. Correct, yes. 20 Q. Okay. So then looking at the solid 21 line, that would tell you the relative height or 22 distance of an image point at a particular field

Page 21 1 angle? 2 A. Yes, it has a relationship -- 3 describes a relationship between relative image 4 height and field angle, yes. 5 Q. So, for example, at the field 6 angle 30 degrees, the relative image height would 7 be .1, looking at Figure 9; is that correct? 8 A. That's correct. 9 Q. Why is this relationship between 10 field angle and image height shown with respect 11 to the relative height or distance and not the 12 actual radial distance of the image points? 13 A. So, when it is normalized from 0 14 to 1, it makes the math more generic, more 15 applicable to a wider range of lens 16 configurations. And this is commonly done 17 throughout the field of optics and lens design. 18 Q. Why do you say that it makes the 19 math more generic? 20 A. Because it makes it independent of 21 the actual image size. It is just standardized 22 to 1. And when we design a lens, for example,	Page 23 1 tell you not to answer, you can answer the 2 question. Sorry. 3 THE WITNESS: Oh, I'm sorry. Please 4 repeat the question. 5 BY MR. JHURANI: 6 Q. No worries. So, I believe you said 7 that the math is made more generic because it is 8 now independent of the actual image size and 9 standardized to 1. 10 A. Uh-huh. 11 Q. And, you are saying -- I'm just 12 saying what is standardized to 1? 13 A. The image height. 14 Q. Okay. Why does using the image 15 height of 1 make it independent of the actual 16 image size? 17 A. So, it is a relative height. So, it 18 is the location in the image -- the radial 19 distance in the image divided by the maximum 20 extent of the image. So, it is just scaled so it 21 ranges from 0 to 1. 22 Q. And so when you are considering an
Page 22 1 the different aberrations, spherical, conal, what 2 not, they come into play at different ranges, 3 from 0 to 1. 4 And when we always have to deal from 5 a range of 0 to 1, it is just really easier to 6 communicate, you know, higher field angles, or, 7 excuse me, higher image heights on that scale of 8 0 to 1. It is just the way it works out. 9 Q. I see. And so when you are saying 10 it makes it independent of the image, the actual 11 image size, it is just standardized to 1, are you 12 saying that the image size is just standardized 13 to 1 when you have considered this type of a 14 relative distance? 15 MR. MURRAY: Objection to form. 16 BY MR. JHURANI: 17 Q. Sorry, sir. Are you waiting on me 18 or are you -- 19 A. I thought there was an objection, 20 or -- 21 Q. Oh, you can still answer. 22 MR. MURRAY: Unless I specifically	Page 24 1 actual application, then you would have to scale 2 up to account for the actual image size? 3 A. That is true, yes. 4 Q. And so, the benefit, if I am 5 understanding correctly, of using these relative 6 or normalized distance values is that it allows 7 generalizing across different types of lens 8 configurations. 9 Is that correct? 10 A. That's correct. 11 Q. Okay. Let's turn to Paragraph 36 on 12 Page 17 of your declaration. 13 A. Okay. 14 Q. In the first sentence you note that 15 certain lens characteristics can produce a 16 non-linear image expansion/compression lens. 17 Do you see that? 18 A. Yes. 19 Q. What do you mean here by the 20 non-linear image expansion and compression? 21 A. What I mean is, for example, going 22 back to Figure 9, there are three segments there

Page 25 1 of the solid curve. And, the first segment 2 from 0 to 30 degrees has relatively low slope and 3 that corresponds to image compression. 4 The middle segment is image 5 expansion. The last segment to the right is 6 image compression. And we can design a lens with 7 those characteristics. 8 Q. I see. And looking at the next 9 sentence back in Paragraph 36, you state that 10 "The algorithm (described at Columns 10 through 11 15) that can back-out or eliminate the non-linear 12 compression expansions of the image, which can be 13 visually distressing, relies on a priori 14 knowledge of the alpha-DR curve (which becomes 15 known during the process of designing the lens) 16 and the relative image height DR." 17 Do you see that? 18 A. Yes. 19 Q. What do you mean here by a priori 20 knowledge of the alpha-DR curve? 21 A. If you want to back-out the effects 22 of the non-linear compression/expansion you need	Page 27 1 back to Paragraph 36, about, I will draw your 2 attention towards the end of that paragraph. It 3 says, "the relative image height DR; note that DR 4 is known and available to the algorithm based on 5 the location of a pixel within the image, and the 6 outer image radius, while field angle alpha is 7 not known." 8 Do you see that? 9 A. Yes. 10 Q. And the outer -- when you say outer 11 image radius here, is that the same as what you 12 were previously referring to as the maximum 13 radius of the image? 14 A. Yes. 15 Q. And so then as part of the design 16 process, a designer would know the actual image 17 radius of the image? 18 MR. MURRAY: Objection to form. 19 THE WITNESS: The answer is yes. 20 BY MR. JHURANI: 21 Q. If we can turn to the next 22 paragraph, sir, Paragraph 37 of your declaration.
Page 26 1 to know what the characteristics of that 2 non-linear compression/expansion is. And one way 3 to do that is by a priori knowledge of the 4 alpha-DR curve which falls out of the lens design 5 process. 6 Q. So, as part of the lens design 7 process, you would know this alpha-DR 8 relationship? 9 A. Yes. In fact, you can go a step 10 further. You wouldn't -- you not only know it 11 but you can actually prescribe that curve. 12 Q. What do you mean by that? 13 A. I can command Zemax to produce a 14 prescription of a lens that has that curve. 15 Q. So, you could take the solid line 16 curve in Figure 9 and input that to a Zemax-type 17 software. And it would generate a lens 18 prescription corresponding to that distribution? 19 A. It is not that straightforward; it 20 is not that simple. But the long and short of it 21 is, that is what we do, yes. 22 Q. I understand. All right. Coming	Page 28 1 A. Okay. 2 Q. Here you are discussing the elements 3 of Claim 27, correct? 4 A. Uh-huh. Yes. 5 Q. I will draw your attention to the 6 second sentence of this paragraph, and I will 7 read it for the record. 8 "Claim elements are directed to 9 generating an image having a non-linear 10 distribution function, (i.e., the alpha DR 11 curve), the amount of non-linearity in the 12 distribution function exceeding 10 percent, and 13 having at least one expanded zone and one 14 compressed zone in the image." 15 Do you see that sentence? 16 A. Yes. 17 Q. And then you further state, "The 18 elements of Claim 27 are also directed to 19 algorithmically removing the non-linear 20 distortions within the image by using the 21 non-linear distribution function (i.e., the alpha 22 DR curve) and the size of the image."

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Page 29 1 Do you see that? 2 A. Yes, I see that. 3 Q. And when you are referring to the 4 non-linear distortions within the image, is that 5 a reference back to the image having at least one 6 expanded zone and one compressed zone, in the 7 previous sentence? 8 A. Yes. 9 Q. Here, so, looking at the last 10 sentence then, removing the non-linear 11 distortion, according to Claim 27 which required 12 the use of the non-linear distribution 13 function -- both the non-linear distribution 14 function and the size of the image, correct? 15 A. That is correct. 16 Q. And the non-linear distribution 17 function, which is the alpha DR curve, that as we 18 discussed earlier identifies the relative height 19 or distance of an image point at particular field 20 angle, right? 21 A. Could you repeat that question? 22 Q. Sure. So the non-linear	Page 31 1 Also, the -- there is the scaling 2 going on that we have talked about earlier. 3 When you go to algorithmically 4 remove the non-linear distortions, you need to 5 remove -- you need to eliminate the scaling and 6 use an actual image height so you know where you 7 are in the image to -- where you are to be able 8 to back-out that, those non-linear distortions. 9 Q. So, am I understanding this 10 correctly that the size of the image is used 11 to -- strike that. 12 The size of the image is used to 13 scale and use the image height, and as you said, 14 to know where you are in the image. Is that 15 right? 16 A. Not exactly, no. Basically you are 17 removing the scaling. The scaling gives you that 18 range from 0 to 1, the relative image height. 19 Now you need to remove that scaling 20 by multiplying -- by including the actual size of 21 the image height so the algorithm can provide the 22 right answer.
Page 30 1 distribution function effectively would identify 2 a relative height or distance of an image point 3 at a particular field angle. Right? 4 A. Yes. But -- yes, that is correct. 5 Q. Why does removing the non-linear 6 distortion require both the relative distance 7 values, I guess obtained from this non-linear 8 distribution function and the size of the image? 9 A. All right. That is explained -- the 10 algorithm that utilizes those parameters is 11 explained in detail in the '990 patent. 12 We can go into that in more detail 13 if you would like, but it is laid out fairly well 14 in that patent. 15 Q. Okay. So, what is your 16 understanding of why it uses both the size and 17 the non-linear distribution function? 18 A. So, the non-linear distribution 19 function is that function that you need to 20 back-out. So you need to know what the shape of 21 that curve is in order to compensate for it in 22 the algorithm.	Page 32 1 Q. So, the size of the image is then 2 being used to remove the scaling; is that 3 correct? 4 A. That is correct. 5 Q. And it does that by multiplying that 6 relative distance or height with the actual image 7 height, correct? 8 A. That is a bit of a stretch. It is 9 not a straight -- the algorithm is not as 10 straightforward as just a simple multiplication 11 of that value. 12 It is -- 13 Q. Sir, are you looking at -- just so 14 we are looking. 15 Are you looking at the '990 patent 16 right now? 17 A. I am sorry, yes. I am looking at -- 18 Q. Let's introduce that for the record 19 and then we can look at it together. 20 So, just formally, let's, if you can 21 bring up Depo Exhibit 2. Let me know when you 22 have it.

Page 33 1 (Deposition Exhibit Number 2 2 marked for identification.) 3 THE WITNESS: It is not letting me 4 download it. I have a paper copy here. 5 BY MR. JHURANI: 6 Q. Okay. And so if you are looking at 7 the paper copy, the copy should have the Patent 8 Number 6,844,990 at the top right. Do you see 9 that? On the first page. 10 A. Yes. 11 Q. And on at the bottom of the first 12 page there is a stamp that says APPLE 1001. Do 13 you see that or do you have that? 14 A. On my paper copy it does not have 15 that. Why is it not letting me download that? 16 Okay. I got '990 on my monitor now. 17 Q. Okay. All right. So, if you open 18 it and look at the first page, again it has got 19 the Patent Number 6,844,990 at the top right? 20 A. Yes. 21 Q. And a stamp of APPLE 1001 at the 22 bottom of the page?	Page 35 1 Line 18 and 19, towards the end of 2 Algorithm 2, has that value of L, the scale 3 factor, multiplied in, similar to what you are 4 suggesting. But I am reluctant to say it is just 5 a straight multiplication without really 6 analyzing what is going on in Lines 18 and 19 in 7 detail. 8 But I think we are at least to an 9 approximation we are in agreement. 10 Q. Okay. So, just so I understand, 11 then, the Size L is being used there to remove 12 the scaling. Is that correct? 13 A. Yes. As, that is a, that is at 14 least what is going on there. There might be 15 some more going on as well. But, yes. 16 Q. And how is it removing the scaling? 17 A. So, the -- in Lines 18 and 19, you 18 will see FD of alpha, FD of alpha, those are the 19 distribution curves which -- whose values are 20 dimensionless. They go from 0 to 1, as we 21 discussed earlier. 22 There is also U and V, which are
Page 34 1 A. Correct. 2 Q. Okay. And this is the patent that 3 we are referring to as the '990 patent, correct? 4 A. Yes. 5 Q. Okay. So, let's reorient, just so 6 it is clear for the record. 7 My question was, why does removing 8 the non-linear distortion require use of both the 9 size of the image and the relative distance 10 values? 11 A. You need to know the distortion 12 function because that is the function that you 13 are trying to eliminate. 14 So you need to have information 15 about that in order to have the algorithm, you 16 know, back out and remove the effects of that 17 non-linear distortion. 18 And the scaling -- excuse me. The 19 image size comes into play in the algorithm in 20 column -- it is Algorithm 2, Column 14 of '990. 21 That is the value of L, which is the size of the 22 image disk in number of pixels, for example.	Page 36 1 multiplied in as well. U and V are the 2 coordinates of a point in the original image, but 3 I believe as shown in Column 11 and the UMPV of 4 the Cartesian coordinates of an image point in an 5 image disk. 6 So, yes, that is a scaling operation 7 there. 8 Q. So, how is the use of size L 9 achieving the scaling operation? 10 A. So, we are scaling FD of A, of alpha 11 which goes from 0 to 1. U and V are the 12 coordinates in the original image. 13 So, you've got that distribution 14 function, times the coordinate of the original 15 image, times the image size. 16 And that gives you the size of the 17 image point and the image disk in the final 18 coordinate system. 19 Q. Earlier you mentioned that you need 20 to remove that scaling by multiplying by 21 including the actual size of the image height. 22 How is that being done in this

Page 37 1 operation shown in Lines 18 and 19? 2 A. I'm sorry. Can you repeat that 3 question? 4 Q. Sure. Earlier you testified that 5 removing that scaling by multiplying by including 6 the actual size of the image height. 7 So how is that being performed in 8 the context of Lines 18 and 19 of the algorithm? 9 A. Right. So, the quantity, U FD of 10 alpha in Line 18, that is still unscaled -- I'm 11 sorry. That is still scaled by FD of A, of 12 alpha. So, FD of alpha still goes from 0 to 1. 13 So, multiplying by L removes that 14 scaling and gives it a dimension. 15 Q. And so that uses the actual image 16 height then as part of that scaling? 17 A. The size of the image disk, yes. 18 Q. So is the actual size of the image 19 height not used for the scaling? 20 A. It is the extent of the image 21 produced by the lens. 22 Q. What is the extent of the image	Page 39 1 Q. Sure. Because the FD alpha function 2 is provided in relative terms, one would need to 3 scale that using the image size to obtain the 4 actual image point, correct? 5 MR. MURRAY: Same objection. 6 THE WITNESS: The actual image 7 point, that is corrected. 8 BY MR. JHURANI: 9 Q. I see, yes. So, because the FD 10 alpha is provided in relative terms, one would 11 need to scale it using the image size to obtain 12 the corrected image point, right? 13 A. Corrected, yes. 14 MR. JHURANI: Okay. We are coming 15 up on the one hour mark. Why don't we take a 16 ten-minute break, or whichever, whatever is 17 convenient for you, Mr. Munro, and we can come 18 back. 19 THE WITNESS: Yes, ten minutes would 20 be good. 21 MR. JHURANI: Okay, great. Thank 22 you. Off the record.
Page 38 1 produced by the lens? 2 A. The quantity L. 3 Q. And when you say the extent of the 4 image produced by the lens, is that the extent 5 from the optical axis? 6 A. Yes. 7 Q. Could the non-linear distortion be 8 removed using only the non-linear distribution 9 function and not the size of the image? 10 A. It would be incomplete. The answer 11 really is no. 12 Q. So, because this FD alpha function 13 is provided in relative terms, one would need to 14 scale that using the image size to obtain the 15 actual image point on the sensor; is that 16 correct? 17 MR. MURRAY: Objection to form. 18 THE WITNESS: No, I don't believe 19 that is a correct statement. The, we are talking 20 about not the location -- well, before I say much 21 more, can you repeat the question, please? 22 BY MR. JHURANI:	Page 40 1 (Recess taken -- 9:59 a.m.) 2 (After recess -- 10:13 a.m.) 3 BY MR. JHURANI: 4 Q. Welcome back, Mr. Munro. 5 Thank you for coming back. 6 A. Absolutely. 7 Q. No one has ever left on me during a 8 deposition, but I am always grateful when they do 9 come back after a break. 10 A. Can't take anything for granted, 11 huh? 12 Q. Yes, exactly. 13 Sir, during your break did you have 14 any discussions with counsel? 15 A. No. 16 Q. Did you have discussions with 17 anybody during the break? 18 A. I just touched base with my wife, to 19 say hi. 20 Q. Okay, great. 21 Okay. Sir, if we can go back to 22 your declaration, which is Depo Exhibit 1. If I

Page 41 1 can draw your attention to Paragraph 50 and let 2 me know when you are there. 3 A. Okay. 4 Q. I will draw your attention to the 5 middle of the paragraph where you appear to be 6 quoting the '990 patent and saying the L is the 7 size of the image disk in number of pixels. 8 Do you see that? 9 A. Yes. 10 Q. And in the last sentence of that 11 paragraph, you are giving an example using an 12 image sensor data sheet. 13 Do you see that? 14 A. Yes. 15 Q. And you note that, "the E2V EV76C560 16 image sensor data sheet specifies that its square 17 pixels are 5.3 micrometers times 5.3 micrometers 18 in size." 19 Do you see that? 20 A. Yes. 21 Q. What are you conveying via this 22 example?	Page 43 1 L as the size of the image disk in number of 2 pixels. Right? 3 Sorry. Let me know when you are 4 there. 5 A. We are talking Column 13? 6 Q. Correct. 7 A. I am there. 8 Q. And the Column 13 and 14 disclosure 9 is part of a broader discussion that begins at 10 Column 12 around Line 58 in the context of the 11 second embodiment of the correction method. 12 Correct? 13 A. Correct. 14 Q. And looking at Column 12, Line 59, 15 it begins, "The second embodiment of the 16 correction method according to the present 17 invention is shown in Figure 13." 18 Do you see that? 19 A. Yes. 20 Q. Let's take a look at Figure 13. 21 A. Okay. 22 Q. I believe it is Page 9 of this
Page 42 1 A. Just conveying that L is a dimension 2 quantity having units of pixels as described 3 in '990. 4 But, equivalently L could also have 5 units of microns, micrometers, which is a length 6 dimension. 7 Q. And so in the context of this image 8 sensor, what is the L? 9 A. I'm not sure it applies to the 10 context of the image sensor, because L is the 11 size of the obtained image, which is not 12 necessarily the size of the image sensor. 13 Q. So, is this example purely just 14 indicating that L could be a pixel dimension or a 15 length dimension? 16 A. Yes, that is correct. 17 Q. If we could go back to your 18 declaration -- or, sorry. If you could go back 19 to the '990 patent, Depo Exhibit 2. 20 A. Okay. 21 Q. In Column 13, I believe we were 22 previously discussing the reference on Line 47 to	Page 44 1 exhibit. 2 A. Okay. 3 Q. Where is the image disk in 4 Figure 13? 5 A. The image disk is the shaded portion 6 to the left in Figure 13, having axes U, V, and 7 the image disk is, well, like I said, it is that 8 shaded portion within that plane. 9 Q. So, then the image disk is that dark 10 gray-shaded circle with the axes U and V in 11 Figure 13 on the left, correct? 12 A. Correct. 13 Q. There is a square drawn around that 14 circle or disk. Do you see that? 15 A. Oh, the parallelogram? Yes, the 16 parallelogram that is bisected by the axes U, V? 17 Q. Yes. 18 A. Yes. 19 MR. MURRAY: The problems of 2D and 20 3D. 21 BY MR. JHURANI: 22 Q. What does that parallelogram

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Page 45 1 represent? 2 A. That just denotes that that is a 3 plane. 4 Q. Is that an image plane? 5 A. Yes, that is the image plane. That 6 is the -- you have to be careful there. The 7 word, image, is used on multiple contexts. 8 In this case the image plane that we 9 are talking about there is the image produced by 10 the lens. It is not a corrected image or 11 anything like that. 12 Q. And that image is that image 13 produced by the lens onto the image sensor, 14 correct? 15 A. Yes. 16 Q. So, that parallelogram that is drawn 17 around the image circle, is that representing the 18 sensor? 19 A. Not necessarily, no. That 20 parallelogram just denotes a plane. The image 21 sensor could be smaller or larger, yes. 22 Q. If you could turn to Figure 2, sir,	Page 47 1 it is the image as produced by the panoramic 2 lens. 3 Q. So, Figure 2 in your opinion does 4 not show the image sensor? 5 A. That's correct. 6 Q. What do the dark edges represent? 7 A. So, the actual image produced by the 8 lens is 3, as we just discussed. 4 is 9 highlighting the fact that that image is round. 10 The, if that was overlaid on a square, the 11 corners of that square would be dark. 12 And if we were -- well, I'm going to 13 leave it at that. 14 There is no information in the 15 corners of that square. That is where it 16 represents -- excuse me. Those dark corners 17 represent really the distortions that are 18 objectionable that need to be removed. 19 Q. What distortions are they 20 representing? 21 A. Let me rephrase it. 22 So, with the fisheye lens, the image
Page 46 1 of the '990 patent. 2 A. Okay, I am there. 3 Q. And, looking at Figure 2, there is a 4 circular image shown in the middle denoted by 5 numeral three. 6 Do you see that? 7 A. Yes. 8 Q. And there is a -- would that be a 9 parallelogram drawn around? 10 A. In this case, it is a square because 11 we are looking straight at it. Yes. 12 Q. Okay. The square drawn around the 13 circular image there. 14 Do you see that? 15 A. Yes. 16 Q. And does that square 4 represent the 17 image sensor over there? 18 A. I am looking at Column 1 of '990 19 where it says what call out Number 4 is. It is 20 the 4 represents the dark edges of the image. 21 Q. Uh-huh. 22 A. That is, it is, the context is that	Page 48 1 that is produced has the form of a disk. It is 2 round as we see in Figure 2. 3 And that image, if we were to 4 directly display it, it would appear as in 5 Figure 2. And, you know, the trees are all bowed 6 and warped. And the flat horizon is curved and 7 it is just not a true representation. 8 So, the goal is to remove those 9 distortions -- yes. 10 So, does that answer your question? 11 Q. So, I understand that. 12 I'm trying to understand your 13 testimony regarding the dark edges being 14 distortions. 15 A. They are not really so much 16 distortions as they are just dark areas in the 17 plane of the image. Caused by the distortions, 18 put it that way. 19 Q. So, if you could turn back to 20 Paragraph 32 of your declaration, which is Depo 21 Exhibit 1. 22 A. Okay.

Page 49 1 Q. I believe we discussed this earlier 2 that the value of 1, the DR value of 1 means that 3 the array is at the extreme edge of the image. 4 A. Yes. 5 Q. Are you familiar with edge detection 6 in the context of image processing? 7 A. Yes. 8 Q. What is your understanding of the 9 edge detection? 10 A. Edge detection is a software 11 algorithm that is executed on an image to detect 12 and localize edges in an image. And those edges 13 are usually characterized by abrupt changes in 14 intensity or color. 15 Q. So, the edge detection algorithm 16 would then be used to identify the extreme edge 17 of the image, right? 18 MR. MURRAY: Objection to form. 19 THE WITNESS: Yes, it could. 20 BY MR. JHURANI: 21 Q. And were edge detection algorithms 22 known in the May 2001 time frame?	Page 51 1 Paragraph 36. 2 A. Okay. 3 Q. Do you recall being asked questions 4 about the algorithm described here? 5 A. Yes. 6 Q. What algorithm are you discussing in 7 this paragraph? 8 A. I am discussing the algorithm as I 9 say here described at Columns 10 through 15 that 10 can back-out or eliminate the non-linear 11 compression/expansion of the image. 12 But in particular, it is 13 Algorithm 2. 14 Q. And Algorithm 2 from what source? 15 A. As in '990, the patent '990. 16 MR. MURRAY: Thank you. No further 17 questions. 18 MR. JHURANI: I have no further 19 questions. 20 (Whereupon, signature not having 21 been waived, the deposition ended at 10:43 a.m.) 22 * * *
Page 50 1 A. Yes. 2 Q. And in the context of Paragraph 32, 3 when we were talking about the extreme edge of 4 the image having the DR value of 1, is that the 5 radius -- is that effectively the radius of the 6 image? 7 A. DR equals 1 occurs at the circle 8 that demarcates the bright area in Figure 2 and 9 the dark corners within Figure 2. 10 Q. So, the edge detection algorithms 11 could be used to detect the extent of the image 12 from the optical access, correct? 13 MR. MURRAY: Objection to form. 14 THE WITNESS: Yes, it could be used. 15 It is conceivable. 16 MR. JHURANI: All right. I have no 17 further questions at this time. 18 EXAMINATION 19 BY MR. MURRAY: 20 Q. I just have one redirect question. 21 Mr. Munro, if you could just go to 22 Deposition Exhibit 1 and specifically	Page 52 1 CERTIFICATE OF COURT REPORTER 2 I, LORI J. GOODIN, RPR, CLR, CRR, 3 CA CSR # 13959, the reporter before whom the 4 foregoing deposition was taken, do hereby certify 5 that the witness whose testimony appears in the 6 foregoing deposition was sworn by me; that the 7 testimony of said witness was taken by me in 8 machine shorthand and thereafter transcribed by 9 computer-aided transcription; that said 10 deposition is a true record of the testimony 11 given by said witness; that I am neither counsel 12 for, related to, nor employed by any of the 13 parties to the action in which this deposition was taken; 14 and, further, that I am not a relative or 15 employee of any attorney or counsel employed by 16 the parties hereto, or financially or otherwise 17 interested in the outcome of this action. 18 19 LORI J. GOODIN, RPR, CLR, CRR 20 Notary Public in and for: 21 STATE OF FLORIDA, COUNTY OF SARASOTA 22 Notary Commission Number: GG987804 23 My Commission expires: May 12, 2024 24 STATE OF CALIFORNIA, CA CSR# 13959 25 My Commission expires: February 22, 2024 26 STATE OF MARYLAND, COUNTY OF ANNE ARUNDEL 27 My Commission expires: August 2, 2025 28 29 DISTRICT OF COLUMBIA, WASHINGTON DC 30 My Commission expires: May 31, 2026 31 STATE OF DELAWARE: COUNTY OF KENT 32 My Commission expires: September 9, 2025 33 34 STATE OF PENNSYLVANIA, COUNTY OF LEHIGH 35 My Commission expires: April 5, 2025 36

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1 James F. Munro, c/o PANITCH SCHWARZE BELISARIO & NADEL LLP 2 2001 Market Street, Suite 2800 Philadelphia, Pennsylvania 19103 3 4 Case: Apple Inc. v. ImmerVision, Inc. Date of deposition: January 10, 2024 5 Deponent: James F. Munro 6 7 Please be advised that the transcript in the above 8 referenced matter is now complete and ready for signature. 9 The deponent may come to this office to sign the transcript, 10 a copy may be purchased for the witness to review and sign, 11 or the deponent and/or counsel may waive the option of 12 signing. Please advise us of the option selected. 13 Please forward the errata sheet and the original signed 14 signature page to counsel noticing the deposition, noting the 15 applicable time period allowed for such by the governing 16 Rules of Procedure. If you have any questions, please do 17 not hesitate to call our office at (202)-232-0646. 18 19 20 Sincerely, Digital Evidence Group 21 Copyright 2024 Digital Evidence Group Copying is forbidden, including electronically, absent 22 express written consent.	1 Digital Evidence Group, LLC 2 1730 M Street, NW, Suite 812 3 Washington, D.C. 20036 4 (202)232-0646 5 6 ERRATA SHEET 7 8 Case: Apple Inc. v. ImmerVision, Inc. 9 Witness Name: James F. Munro 10 Deposition Date: January 10, 2024 11 Page No. Line No. Change 12 13 14 15 16 17 18 19 20 21 22 Signature Date
Page 54 1 Digital Evidence Group, L.L.C. 1730 M Street, NW, Suite 812 2 Washington, D.C. 20036 (202) 232-0646 3 4 SIGNATURE PAGE Case: Apple Inc. v. ImmerVision, Inc. 5 Witness Name: James F. Munro Deposition Date: January 10, 2024 6 7 I do hereby acknowledge that I have read 8 and examined the foregoing pages 9 of the transcript of my deposition and that: 10 (Check appropriate box): 11 () The same is a true, correct and complete transcription of the answers given by 12 me to the questions therein recorded. 13 () Except for the changes noted in the attached Errata Sheet, the same is a true, 14 correct and complete transcription of the answers given by me to the questions therein 15 recorded. 16 17 DATE WITNESS SIGNATURE 18 19 20 21 22 DATE NOTARY	