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Transcript of Durand Begault, Ph.D.

Date: May 22, 2023

Case: Eight kHz, LLC -v- Meta Platforms, Inc., et al.

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

Transcript of Durand Begault, Ph.D.
Conducted on May 22, 2023

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5 1 BE IT REMEMBERED that on MONDAY, the 22ND DAY OF 2 MAY, 2023, at the hour of 9:03 A.M., Pacific Standard 3 Time, of said day, before me via video conference, CHRISTA 4 YAN, a Certified Shorthand Reporter, State of California, 5 appeared via video conference DURAND BEGAULT, Ph.D., who 6 was examined as a witness in said cause; that said 7 transcript format was prepared in accordance with 8 California Code of Regulations Section 2473. 9 10 11 12 13 14 15 --oOo-- 16 17 18 19 20 21 22 23 24 25	7 1 BY MR. HENRY: 2 Q Dr. Begault, my name's Chris Henry. Nice to meet 3 you. 4 A Nice to meet you. 5 Q Would you please state your full name for the 6 record? 7 A Yes. Durand, D-u-r-a-n-d, René, R-e-n-é, with an 8 accent mark on the final E, Begault, B-e-g-a-u-l-t. 9 Q And, Dr. Begault, where are you sitting today? 10 A I am sitting in my home office, and that is 11 located in Muir Beach, California. 12 Q And what materials did you bring with you to the 13 deposition today? 14 A I brought a clean copy of my declaration in paper 15 form. So there are no notes or anything on it. It's a 16 clean copy. I also have a clean copy of an errata sheet 17 that we provided to you that is pertinent to that 18 declaration. 19 Q Anything else? 20 A No. 21 Q Great. 22 So what we're going to -- have you done a remote 23 deposition before, Dr. Begault? 24 A Yes. 25 Q And so you're probably already familiar with this
6 1 THE VIDEOGRAPHER: Here begins Media Number 1 in the 2 videotaped deposition of Durand Begault, PhD, in the 3 matter of Eight kHz, LLC, vs. Meta Platforms, Inc., et 4 al., in the United States District Court for the Western 5 District of Texas Waco Division, Case Number 6 6:22-cv-575-ADA-DTG. Today's date is May 22nd, 2023. The 7 time on the video monitor is 9:03 a.m., Pacific Standard 8 Time. 9 The remote videographer today is Mylene Santiano 10 representing Planet Depos. All parties of this video 11 deposition are attending remotely. Would counsel please 12 voice identify themselves and state whom they represent 13 starting with the taking attorney. 14 MR. HENRY: Chris Henry from the law firm Latham & 15 Watkins for defendants. 16 MR. ELLIOTT: Kyle Elliott and Patrick Dunn on behalf 17 of the law firm Spencer Fane on behalf of the plaintiffs. 18 THE VIDEOGRAPHER: The court reporter today is Christa 19 Yan representing Planet Depos. 20 Would the reporter please swear in the witness. 21 DURAND BEGAULT, Ph.D., 22 the Witness, called on behalf of the Defendants, being 23 duly sworn to state the truth, the whole truth, and 24 nothing but the truth, testified on oath as follows: 25 EXAMINATION	8 1 whole, what we're going to do is we're going to introduce 2 exhibits via the chat. 3 A Via the chat? Okay. So I should open the chat 4 window then? 5 Q Once they're in, it should pop up, but either 6 way, the exhibits will come via the chat function in Zoom. 7 Have you done that before in a remote deposition? 8 A Yes. Typically, the software is a little 9 different, in that there's sort of a split screen for the 10 documents. So they're large. Since we're going to be 11 doing it via the chat window, I might have to make a few 12 adjustments as we go, but yes. So I will indicate, show 13 chat previews. I'm not sure if I'm going to be doing it 14 right. So when you show your first exhibit, we might need 15 to take a moment to make sure that it's visible. 16 Q That's totally fine. As we go, if we need to -- 17 any clarifications throughout the day, just let me know, 18 including with exhibit distribution. Okay? 19 A Will do. 20 Q And let's just get your report, your declaration 21 on the record as Exhibit 1. And then we're going to get 22 your errata sheet on Exhibit 2. And that will give us a 23 chance to practice the chat distribution. Okay? 24 (Whereupon Deposition Exhibit 1 was 25 marked for identification.)

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9 1 THE WITNESS: Sounds good. 2 MR. HENRY: All right. So, Mr. Akopyan, what I'd like 3 you to distribute to mark as Mr. Begault as Exhibit 1 and 4 distribute via the chat is a document that you will find 5 in the document folder with the file name 20230503, 6 parentheses, 92-7 Exhibit 7_Begault declaration. 7 THE TECHNICIAN: I see that, Counsel. Stand by, 8 please. (Indicating.) 9 Okay. It should be in the chat now. 10 BY MR. HENRY: 11 Q Dr. Begault, let me know if you see that 12 document. 13 A Give me a moment. Okay. I see what appears to 14 be a PDF that could be downloaded. 15 Q And now, Dr. Begault, as -- what I have found in 16 these remote depositions is what helps is for you to 17 download that and then just save it locally on your 18 desktop. It's a lot easier to maneuver through the 19 document as we go today. So I'd suggest you do that. 20 Okay? 21 A All right. And then what I will be doing if I 22 need to refer to the documents, is leaving the Zoom page 23 and then going to the document page and sort of 24 alternating back and forth. Is that the way that it -- 25 Q Yeah, what I would -- yes, sorry to interrupt.	11 1 MR. HENRY: All right. Mr. Akopyan, what I'd like you 2 to do now is circulate another PDF in the chat which we 3 will mark as Begault Exhibit 2. The filename for that is 4 errata sheet Begault-C.PDF. 5 THE TECHNICIAN: Stand by. 6 (Whereupon Deposition Exhibit 2 was 7 marked for identification.) 8 THE WITNESS: Okay. I am downloading it now. 9 BY MR. HENRY: 10 Q All right. Dr. Begault, let me know when you 11 have it open. 12 A Okay. I now have it open. 13 Q And Dr. Begault, do you recognize Begault 14 Exhibit 2 to be a document entitled, Errata sheet to 15 declaration of Durand R. Begault, PhD, dated May 22nd, 16 2023? 17 A I do. 18 Q And that's errata sheet for your May 3rd, 2023, 19 declaration fixing some typos, right? 20 A Right. Specifically Exhibit 2 corrects typos 21 that are found in Exhibit 1. 22 Q Okay. All right, Dr. Begault. Is there anyone 23 else with you in your office today? 24 A No. 25 Q Okay. And as we've already discussed, Zoom has a
10 1 What I would suggest is you open it in your separate Adobe 2 Reader so it's next to you. 3 A Right, right. Okay. Well, stand by then. I 4 need to do a little adjustment here to allow that to 5 happen. 6 All right. And then are you going to be doing 7 any sort of pointing to different lines or... et cetera in 8 this document? 9 Q Yeah, throughout the day, I'll invite your 10 attention to different lines in this document -- 11 A I see. 12 Q If they look familiar, and other documents. 13 A Got it. 14 Q I could screen share, but oftentimes it's enough 15 for us just to look at it. And I'll invite your attention 16 to certain things. 17 A Okay. That sounds fine to me. Okay. So I have 18 the document open now in a PDF reader, and I have my 19 screen split between Zoom and the exhibits that we have 20 downloaded. So I see now Exhibit 01. 21 Q Okay. And, Dr. Begault, you recognize Exhibit 1 22 as your May 3rd, 2023, declaration? 23 A Give me a moment. 24 Okay. I see my declaration, and then it's 25 followed by my CV. Yes.	12 1 chat feature on it. But you understand that throughout 2 the day, when we're on the record, you're not supposed to 3 be chatting with counsel for Eight kHz via that feature, 4 right? 5 A I will not be chatting with anybody via the chat 6 function or any other function. I will strictly be 7 communicating with you and examining documents that you 8 present in the chat. 9 Q Sounds good. 10 And it sounds like this is not the first time 11 you've been deposed, Dr. Begault. Do I understand that 12 correctly? 13 A That is correct. 14 Q How many depositions, about, have you been a part 15 of? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: I'd have to look at my CV to give you an 18 exact number. I know it's over -- see, I'm not 19 distinguishing trial and deposition since some trials 20 don't have depositions. Some trials do have depositions, 21 et cetera. But it's on the order of 70 or 80 times. I 22 think if you combine the trials and the depositions, I'm 23 up to about 90. 24 BY MR. HENRY: 25 Q So you have about 90 testifying experiences then,

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13 1 right? 2 A Yeah, that sounds about right. I haven't counted 3 in a while. But it's present on my CV if you need an 4 accurate number. 5 Q Okay. Oh, and you mentioned that your CV is an 6 exhibit to your May 3rd, 2023, declaration, right? 7 A That's correct. I note that my latest CV has 8 maybe one or two additional publications that aren't on 9 this version of the CV because they just came out 10 recently. So I'm happy to provide that if you would like 11 it. As I say, I think it's just -- there's no change at 12 all to the CV, including in terms of the trials and 13 depositions, other than I think two additional 14 publications. 15 Q So beyond the two publications that you just 16 mentioned, the CV you attached on your declaration was 17 accurate? 18 A Yes. 19 Q And it accurately reflects your experience in the 20 industry and your testifying experience? 21 A It represents it to the degree that a CV can. 22 Q And you don't have any other changes besides the 23 two publications that you mentioned; is that right? 24 A Two or three. Yeah. I don't remember the exact 25 number. I think it might have been three. I don't recall	15 1 can tell you my standard hourly rate, but I don't know 2 what the billing rate is for this particular deposition 3 nor do I know what the billing rate is for the attorneys 4 at Spencer Fane. 5 Q Yeah, I don't need you to tell me Spencer Fane's 6 rates. 7 What's your standard hourly rate, Dr. Begault? 8 A My standard hourly rate is \$400 an hour and 580 9 for testimony or deposition. 10 Q So \$400 an hour for nontestifying work in the 11 cases in which you're engaged? 12 A That's correct. 13 Q Okay. And \$580 an hour for testifying work? 14 A Yes, that's correct. 15 Q And as far as you know, that's the rate being 16 charged for your services, plus a markup fee for the 17 expert retention firm, right? 18 A As far as I know -- 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: My apologies for talking over. 21 MR. HENRY: Yeah, sorry. I did interrupt a little 22 bit. Just give me -- 23 THE STENOGRAPHIC REPORTER: I'm sorry. Because of the 24 talking over each other, I did not hear the objection 25 correctly, I don't think.
14 1 exactly. 2 Q And you have a number of patents in your own 3 name, right? 4 A That's correct, yes. 5 Q About how many? 6 A Well, referring to my CV, my name is present on 7 four patents that were published. 8 Q Did you file for other patents that didn't issue? 9 A Well, I filed these patents through NASA, 10 National Aeronautics and Space Administration. And so I 11 have submitted other patents, but they ultimately were not 12 developed to the point where they were submitted for 13 publication. 14 Q Do you mean that you submitted invention 15 disclosure statements that were not submitted to the 16 patent office or do you mean you filed applications with 17 the patent office that didn't issue? 18 A The former. 19 MR. ELLIOTT: Objection to form. 20 BY MR. HENRY: 21 Q Dr. Begault, what's your hourly rate for work in 22 this case? 23 A Well, I have been retained through a third party, 24 if you will. So I don't know what their hourly rate is, 25 but I know it's a markup over my standard hourly rate. I	16 1 MR. ELLIOTT: Yeah, just objection to form. 2 And, Dr. Begault, if you can, give a little bit 3 of pause so you can tell whether I'm going to object or 4 not. I think there's probably a little bit of lag over 5 this stuff, and I apologize for that. 6 BY MR. HENRY: 7 Q Do you want me to repeat the question, 8 Dr. Begault? 9 A Yes. 10 Q Okay. 11 All right. As far as you know, your \$400 an hour 12 and \$580 an hour rates are the rates being charged for 13 your services in this case, plus a markup for the expert 14 retention firm, right? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I am not exactly sure if those are the 17 exact rates that were settled with the outside firm that 18 is handling the billings, et cetera, et cetera. It might 19 have been negotiated differently. I don't recall exactly. 20 But I can tell you that's usually my rate for these sorts 21 of things. 22 BY MR. HENRY: 23 Q Do you know who Glen Norris is? 24 A I believe he's one of the named individuals on 25 one of these patents.

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17 1 Q Did you know who Glen Norris was before you got 2 involved in this lawsuit? 3 A No. 4 Q Do you know who Philip Lyren is? 5 A Same answer as about Glen Norris. I only heard 6 of him or of that person, in connection with his name on 7 the patents. 8 Q So you didn't know of Philip Lyren before you got 9 involved in this lawsuit? 10 A No, I did not. 11 Q Had you ever heard of Eight kHz, the plaintiff in 12 this case, before you got involved in this lawsuit? 13 A No. 14 Q When did you get involved in this lawsuit? 15 A Honestly, I don't recall. It was sometime last 16 year I was contacted, I believe. And then I think there 17 was a period of time where I didn't hear anything from the 18 counsel. And then I was retained later on formally. I 19 think there was an initial discussion. 20 Q Around when in 2022 was the initial discussion 21 you had with counsel about this case? 22 A I do not recall. I'd have to research that. 23 Q Do you remember around when you were formally 24 retained in this case? 25 A Same answer.	19 1 Q Is it more than 5 hours? 2 A Yes. 3 Q Is it more than 10 ten hours? 4 A Yes. 5 Q Is it more than 15 hours? 6 A Probably. 7 Q Is it more than 20 hours? 8 A Yeah, that sounds reasonable. Yes. 9 Q Is it more than 25 hours? 10 A Well, now you're getting into an area of 11 estimates that are difficult for me to make. I think I 12 could say safely that it's been somewhere over a certain 13 amount of hours. And that's about as best I can do for 14 you. 15 Q Can you estimate a number under which you spent 16 hours reviewing the patents? 17 A I don't understand that question. 18 Q Sure, you said you could estimate for me some 19 number over which you've spent in hours reviewing the 20 patents. I'm just asking you, can you tell me whether 21 you've spent less than 30 hours reviewing the patents? 22 A Oh, I understand what you're asking. I could 23 tell you I spent less than 100 hours. 24 Q Did you spend less than 50? 25 A That, I'm not certain about.
18 1 Q Is that a no? 2 A I don't recall. 3 Q Do you understand that Eight kHz has asserted 4 patents in this case against the Meta defendants, right? 5 A Yes, I do. I do understand that. 6 Q How many asserted patents are at issue in this 7 case? 8 A Well, based on my declaration, I can count them 9 for you. Those are the ones I'm familiar with. 1, 2... 10 Did I hear an objection? 11 MR. ELLIOTT: No. 12 THE WITNESS: Okay. 13 1, 2, 3, 4, 5, 6, 7, 8, 9. 14 BY MR. HENRY: 15 Q So you know there are nine asserted patents at 16 issue in this case? 17 A That's my understanding. 18 Q And have you reviewed each of those patents? 19 A Briefly. 20 Q You've briefly reviewed each of those patents? 21 A Well, should I say it this way, I'm still 22 reviewing them. 23 Q How much time have you spent reviewing all of the 24 patents? 25 A I don't recall exactly.	20 1 Q Did you spend less than 75? 2 A That, I'm not certain about. 3 Q Spent less than 85? 4 A That, I'm not certain about. 5 Q Did you spend less than 95? 6 A That, I'm not certain about. 7 Q You keep records of your time spent on this case, 8 right? 9 A I submit my hours. 10 Q Okay. About how much time have you spent total 11 on this case to date? 12 A I honestly don't recall. 13 Q Give me your best estimate, please. 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: Under 100 and over 20. 16 BY MR. HENRY: 17 Q So you spent somewhere between 20 hours and 18 100 hours on this case to date? 19 A Yes. 20 Q You can't give me any further specificity in the 21 amount of time you spent on this case between those two 22 numbers? 23 A Not without looking at my billing records. 24 Q Can you tell me a little bit more about how you 25 got hired for this case?

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21 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: I believe a phone call interview was set 3 up between myself and the attorneys via the third party 4 that I had mentioned before. 5 BY MR. HENRY: 6 Q Which attorneys? 7 A I believe it was the attorneys that we are -- are 8 present today. 9 Q Who is that? 10 A I see Kyle Elliott and I see Patrick Dunn. But 11 there might have been other attorneys involved in the 12 initial interview. I don't recall. 13 Q Do you remember any other attorneys by name who 14 might have been involved in the initial interview? 15 A I don't recall, no. 16 Q In your work on this case, do you remember any 17 other attorneys besides Kyle Elliott and Patrick Dunn that 18 you've interacted with? 19 A There -- I can give you some names I have heard, 20 but you asked me specifically about interaction. So you'd 21 have to define what you mean by interaction. 22 Q Sure. 23 Have you emailed, spoken with, or met with any 24 attorneys other than Kyle Elliott and Patrick Dunn 25 representing Eight kHz?	23 1 THE WITNESS: I reviewed a brief. I believe I also 2 reviewed, in part or briefly, an expert declaration as 3 well. 4 BY MR. HENRY: 5 Q Okay. So you mentioned having reviewed your 6 declaration, a document from defendants, and the asserted 7 patents. And now you also mentioned reviewing an expert 8 declaration, at least briefly; is that fair? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: That's -- that's some of the things I 11 mentioned that I reviewed. 12 BY MR. HENRY: 13 Q What else did you review? 14 A You would have to look at my answer from about 15 three minutes ago, but I believe I also just said that I 16 reviewed some of the patents. 17 Q Yeah, I'm asking if there's anything you haven't 18 identified yet that you reviewed. 19 A No, not that I could recall. 20 Q The expert declaration that you reviewed, do you 21 recall the name of that -- of the expert on that 22 declaration? 23 A I don't know how to pronounce it or exactly how 24 to say the name. I believe the name was from -- I'm 25 sorry. I would munge it. So I'm not going to attempt it.
22 1 A The only name I can pull out for you out of my 2 memory, I believe, is a Mr. Brian Bear who was on an 3 email. I remember that name from an email. I don't 4 believe I've spoken directly with Mr. Bear. I really 5 don't recall. 6 Q Can you tell me a little bit about what you did 7 to prepare for this deposition, Dr. Begault? 8 MR. ELLIOTT: Objection to form, ambiguous. 9 THE WITNESS: I reviewed my declaration. I reviewed a 10 document from defendant that pertained to claim 11 construction. And I also reviewed the patents at issue. 12 BY MR. HENRY: 13 Q What was that document that you said you reviewed 14 from defendants that pertains to claim construction? 15 MR. ELLIOTT: Objection to form, and may call on 16 attorney work product as to the actual contents of the 17 document that was reviewed. 18 Go ahead and you can answer, Dr. Begault. 19 THE WITNESS: I don't recall the exact title of that 20 document. I believe that it had to do with defendants' 21 arguments regarding claim construction. That's all I 22 recall about its title or its general topic area. 23 BY MR. HENRY: 24 Q Was it a brief or an expert declaration? 25 MR. ELLIOTT: Objection to form.	24 1 I know that the first initial is K, last initial is M. 2 Q Kyle McMullen, does that help? 3 A It does, if that's the person. 4 Q Do you know if that's the person? 5 A I would have to look at the document to confirm 6 that, but I'll trust you on that. 7 Q Do you know Dr. Kyle McMullen? 8 A I do not. 9 Q Have you ever met Dr. Kyle McMullen? 10 A Not that I recall. 11 Q Do you know anything about Dr. Kyle McMullen's 12 reputation in the field? 13 A No. 14 Q Had you ever seen the asserted patents before you 15 got involved in this lawsuit? 16 A No. 17 Q Have you reviewed the file histories for the 18 asserted patents? 19 A No. 20 Q Did you have any meetings to prepare for today's 21 deposition? 22 A Yes. 23 Q How many? 24 A One. 25 Q When was that meeting?

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25 1 A Yesterday. 2 Q How long was that meeting? 3 A Somewhere between two and three hours. 4 Q Who was present at that meeting besides you? 5 A Mr. Kyle Elliott. 6 Q Was Patrick Dunn there? 7 A No. 8 Q Nobody other than Mr. Kyle Elliott? 9 A That's correct. 10 Q Have you ever spoken to anyone at Eight kHz? 11 A No. 12 Q And, Dr. Begault, because you've been in so many 13 depositions before, I sort of skipped the rules of the 14 road, but I'll cover a few them just quickly so that we're 15 on the same page. 16 You understand that as we go today, you can ask 17 me for breaks as we go, right? 18 A I do understand that. 19 Q And when you do and if you need one, I'm happy to 20 take a break. It's totally fine. At your convenience, 21 okay? 22 A Sounds good. 23 Q Okay. And you already understand the process 24 that I'll ask you questions throughout the day. And your 25 counsel may intersperse objections, but then you still	27 1 Q Now, with respect to the '090 Patent, you 2 understand that's one of the asserted patents in this 3 case, right? 4 A I do. 5 Q Okay. When you read that patent, did you reach 6 any conclusion as to whether what was being claimed was 7 new and different as opposed to things that had come 8 before the '090 Patent? 9 MR. ELLIOTT: Objection to form, also scope and 10 objection to relevancy. 11 THE WITNESS: No. 12 BY MR. HENRY: 13 Q When you read the '196 Patent, did you reach any 14 conclusion as to whether what was being claimed was new 15 and different, as opposed to things that had come before 16 the '196 Patent? 17 MR. ELLIOTT: Objection to form, ambiguous, scope, and 18 relevancy. 19 THE WITNESS: No. 20 BY MR. HENRY: 21 Q When you read the '090 Patent, did you anything 22 jump out to you though based on your experience where you 23 said, oh, wow, that's something new and different that 24 you've never seen before? 25 MR. ELLIOTT: Objection to form and relevancy.
26 1 have to proceed and answer my questions unless instructed 2 not to, right? 3 A I do understand that. 4 Q All right. Is there any reason that you can't 5 provide accurate and truthful testimony to my questions 6 today? 7 A There's no reason. 8 Q You're not under the influence of any drugs or 9 medication that would prevent that, right? 10 A That's correct. 11 Q Now, when you read the -- or also you've been 12 a -- strike that. 13 Dr. Begault, in your experience as a testifying 14 expert in patent cases, are familiar with the sort of 15 shorthand used to refer to patents, where they're referred 16 to by their last three numbers? 17 A Yes. 18 Q Okay. And can we use that shorthand today, and 19 you'll know the patents that I'm discussing with you? 20 A Well, I'll qualify that by saying I will know 21 that if you use the last three digits of a patent that 22 that's a unique identifier for a longer patent number. 23 Q Okay. But similar to how you did that in your 24 May 3rd declaration, right? 25 A Precisely.	28 1 THE WITNESS: Repeat your question? I want to make 2 sure I'm answering it correctly. 3 BY MR. HENRY: 4 Q Sure. 5 When you read the '090 Patent, did anything jump 6 out to you based on your experience, where you said oh, 7 wow, that's something new and different that you've never 8 seen before? 9 MR. ELLIOTT: Same objection. 10 THE WITNESS: At this point, no, I haven't -- let's 11 put it this way, analyzed the patent thoroughly yet. So I 12 can't answer that question about jumping out. 13 BY MR. HENRY: 14 Q When you read the '196 Patent, did anything jump 15 out to you based on experience where you said, oh, wow, 16 that's something new and different that you've never seen 17 before? 18 MR. ELLIOTT: Objection to form and relevancy. 19 THE WITNESS: I would give you the same answer I gave 20 you for the prior patent that you mentioned. 21 BY MR. HENRY: 22 Q And same answer for each of the other seven 23 asserted patents? 24 MR. ELLIOTT: Objection to form and relevancy. Scope 25 also.

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29 1 THE WITNESS: Correct. 2 BY MR. HENRY: 3 Q And, Dr. Begault, you obtained a PhD in 1987 from 4 the University of California San Diego, right? 5 A Correct. 6 Q What other degrees have you earned? 7 A Master of fine arts in electronic music and 8 recording media from Mills College in 1981. And I 9 received my bachelor's degree in a hybrid major at UC 10 Santa Cruz in 1979 called music and heuristic models. 11 Q And you're currently a director of the Audio 12 Forensic Center; is that right? 13 A I currently hold that title, yes. 14 Q What's the Audio Forensic Center? 15 A It is a wholly owned subsidiary of Charles M. 16 Salter Associates. 17 Q And what type of company is it? 18 A Salter Associates or Audio Forensic Center. 19 Q Audio Forensic Center. 20 A Oh, Audio Forensic Center is a -- represents the 21 legal work that is done as part of consulting for Charles 22 M. Salter Associates for various types of cases involving 23 litigation or due diligence, not necessarily litigation. 24 Q It's a consulting firm? 25 A Charles M. Salter Associates is a consulting firm	31 1 A That's correct. I do most of the forensic work 2 that involves things such as audio authentication, for 3 instance. 4 Q What do you mean by that, you do the forensic 5 work? What do you mean by forensic work? 6 A By forensic work, I mean issues that have -- 7 pertain to a legal matter. 8 Q Can you explain that a little more? I'm not 9 understanding the connection you're making between the 10 term forensic and legal? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: Well, I'm doing my best to give you a 13 kind of dictionary definition of forensic, which usually 14 has to do with things -- well, when you're talking about a 15 forensic expert, you're talking about an expert who might 16 have greater expertise than a layperson in certain areas, 17 that that expert has a background in. 18 And so I have expertise in both audio acoustics 19 and video. There are other people at Charles M. Salter 20 Associates that also have these types of expertise. And 21 so people are brought together either under the title of 22 Audio Forensic Center or under Charles M. Salter 23 Associates on occasion to do consulting for legal matters, 24 as opposed to let's say consulting for an architect who is 25 designing the acoustics of a room.
30 1 in the area of acoustics, telecommunications, and 2 security. And certain types of cases generally come to me 3 that are typically of a forensic nature. 4 Q And typically come to you at the Audio Forensic 5 Center; is that fair? 6 A Yes. That's a way of putting it. 7 Q How many employees are there that are employed in 8 the Audio Forensic Center subsidiary of Charles M. Salter 9 Associates? 10 A There is not a group of employees specifically 11 titled with that. It is, again, a wholly owned subsidiary 12 of Salter Associates, which has -- I believe we have 25 or 13 30 engineers with expertise in acoustics, 14 telecommunications, and security. It may be more. And so 15 as I direct the Audio Forensic Center for these types of 16 cases, if I need other people power to assist with the 17 case, I will draw from those employees of Charles M. 18 Salter Associates. 19 Q Okay. But then do I understand correctly from 20 that response that there aren't other employees besides 21 you that are assigned specifically to the Audio Forensic 22 Center? 23 A There may be or there may not be depending on the 24 particular matter that we're dealing with. 25 Q But that's matter specific, right?	32 1 BY MR. HENRY: 2 Q Do you also do that type of consulting for 3 architects? 4 A No. Not so much now. I don't do that. I used 5 to, but not now. 6 Q Is most of your work litigation oriented at the 7 Audio Forensic Center? 8 MR. ELLIOTT: Objection to form. 9 THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, I'm 10 not hearing you very well right now. 11 MR. HENRY: I will turn up my volume and speak up. 12 BY MR. HENRY: 13 Q My question for you, Dr. Begault, is, is most of 14 your work at the Audio Forensic Center litigation 15 oriented? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: So litigation is a legal term, and I 18 don't know if my understanding of that word is the same as 19 yours. Because if litigation means that something is 20 actually litigated, at times, I will provide information 21 to attorneys where litigation has not occurred. If I 22 understand what litigation means, where an actual lawsuit 23 is filed. 24 So at times, for instance, I might analyze 25 evidence before actual litigation occurs, presuming I'm

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33 1 understanding the precise definition of litigation. So 2 legal matters might be a better word than litigation here 3 or potentially legal matters. 4 BY MR. HENRY: 5 Q Sure, that's fine. 6 Is most of your work at the Audio Forensic Center 7 related to legal matters or potential legal matters? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Yes. Yes. Most of it is. There's a 10 percentage of it that's also concerned with due diligence, 11 product development, testing. That sort of thing. 12 BY MR. HENRY: 13 Q And what's your ballpark of that percentage? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: I don't know exactly, but I could give 16 you a guess. 17 BY MR. HENRY: 18 Q Sure, what's your best guess? It's your work. 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: Oh, my best guess is maybe 10 percent is 21 due-diligence-type of work, and the other 90 percent is 22 some sort of legal matter. 23 BY MR. HENRY: 24 Q Have you ever designed (indecipherable utterance) 25 a CPU?	35 1 Q When you say spatial audio, what do you mean by 2 that? 3 A I use that as a kind of general description for 4 audio presentation where there is likely an intention on 5 the part of someone who's operating the software to create 6 a spatial presentation of audio, in other words, to 7 manipulate it somehow in acoustic space for the perception 8 of a listener. 9 Q And would the manipulation include trying to 10 position sound sources around a user, maybe -- 11 MR. ELLIOTT: Objection -- 12 BY MR. HENRY: 13 Q -- so they're perceived from different locations? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: Yes. 16 BY MR. HENRY: 17 Q Are you -- did you see in the asserted patents 18 that the patents often use the term sound localization 19 point? 20 A I believe that is the phrase that's associated 21 with the acronym S, as in Sam, L, as in Larry, P, as in 22 Paul. 23 Q And you saw that phrase and that acronym used in 24 the asserted patents, right? 25 A I did.
34 1 THE STENOGRAPHIC REPORTER: I'm sorry. Can you repeat 2 that, Mr. Henry? 3 MR. HENRY: Sure. 4 BY MR. HENRY: 5 Q Have you ever designed a CPU? 6 A I have not designed an entire central processing 7 unit. 8 Q Have you designed some component of a CPU? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: I have designed signal processing for 11 spatial audio that uses a CPU. 12 BY MR. HENRY: 13 Q And what did that design work entail? 14 A It entailed designing sound processing in order 15 to take and input sound and spatially distribute it to a 16 listener. 17 Q What do you mean when you say spatially 18 distributed to a listener? 19 A I mean many things. Basically my interests, my 20 career has been focused on either measuring or propagating 21 sounds that contain spatial audio cues of various types 22 using different techniques. That could include unrelated 23 transfer functions. That could include beamforming. That 24 could include microphone arrays or loud speaker arrays. 25 So a whole variety of different things.	36 1 Q And what do you understand a sound localization 2 point to be? 3 A A location in acoustic space as perceived by a 4 listener. I will give you a qualification to that, that I 5 have not read every mention of the word sound localization 6 point in all of the asserted patents. Therefore, I've 7 given you my understanding of that phrase. I may come to 8 a different conclusion as I understand the totality of the 9 contents of these patents. 10 So I would like to qualify what I just said by 11 stating that. 12 Q Sure, and as we go today, Dr. Begault, as I'm 13 sure other attorneys have told you in other depositions, 14 if you want to make a clarification or qualification, just 15 let me know. I'm happy to make sure that you get your 16 testimony on the record clearly as you prefer. Okay? 17 A I appreciate that. 18 Q Yeah, sure. 19 And I'm not -- I wasn't trying to trick you with 20 the asking you about SLPs. I'm just trying to make sure 21 that we can talk about them in a way where we don't get 22 tripped up by that term as we go today. Okay? 23 A That's fair enough. I thought you might be 24 referring to the use of that phrase throughout the 25 totality of the patents, which is why I made the

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37 1 qualification that I made. So I'm giving you my 2 understanding of that phrase as I understand it today. 3 Q Yeah, that's totally fine. And I'm happy to 4 represent to you that the parties are in general agreement 5 that that term means a location where a listener localizes 6 sound. Okay? 7 A Yes. 8 Q And so when I use that phrase, is that fair 9 between us that you'll understand that's what I'm talking 10 about when I use either sound localization point or SLP, 11 we're talking about a location where a listener localizes 12 sound, you understand that? 13 A I do. 14 Q Okay. And that that's consistent with your 15 understanding of that term, right? 16 MR. ELLIOTT: Objection to form. 17 THE STENOGRAPHIC REPORTER: I'm sorry. What was your 18 answer, Doctor? 19 THE WITNESS: As of today. 20 THE STENOGRAPHIC REPORTER: Thank you. 21 BY MR. HENRY: 22 Q Have you ever designed a digital signal 23 processor? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Yes.	39 1 BY MR. HENRY: 2 Q Did you also work on the VIEW system? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: The VIEW system came about, I believe, a 5 year before I came on the scene at NASA. When I came to 6 NASA, the VIEW system, which was a virtual reality system 7 that had audio controlled by a device called the 8 Convolvotron had already been implemented. So I was 9 working in the area of auditory perception and 10 psychoacoustics, where we would use the Convolvotron in 11 studies. 12 So I could say that my research work might have 13 fed back into the usage of the VIEW system or 14 understanding of its capabilities. But the design of the 15 VIEW system was done by some folks about a year or so 16 before myself. 17 THE STENOGRAPHIC REPORTER: I'm sorry. Are you saying 18 VIEW System, V-I-E-W? 19 THE WITNESS: Yes. 20 THE STENOGRAPHIC REPORTER: Thank you. 21 THE WITNESS: All caps. 22 BY MR. HENRY: 23 Q Dr. Begault, what does VIEW stand for? 24 A I don't recall all of the letters, but I believe 25 it was Virtual Interactive Environment. And then I forget
38 1 BY MR. HENRY: 2 Q And what did that design work entail? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: That involved designing -- or should I 5 say, using the facilities afforded by a Motorola 56001 6 digital signal processing chip. 7 BY MR. HENRY: 8 Q And what did you use that DSP chip in? 9 A What did I use it in? I think you're asking what 10 was that DSP part of? 11 Q Yes, that's what I'm asking. 12 A It was part of a spatial audio communication 13 system. 14 Q Okay. So did that spatial audio communication 15 system have a name? 16 A Yes, it did. 17 Q What was that name? 18 A The Ames Spatial Auditory Display. 19 Q Is that the same as or different than the VIEW 20 system, The NASA VIEW System. 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: Different. This was a prototype device 23 that I designed and demonstrated to launch control at 24 Kennedy Space Center. 25	40 1 the W. Might have been wearable. I don't recall exactly. 2 Q And so Dr. Begault, is it fair to say your 3 research used the Convolvotron in the VIEW system? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: Over the years my research has used 6 components of the total VIEW System. I think the VIEW 7 system could -- you know, it's been 35 years or something, 8 what you're referring to. So I'm having to go back 9 thinking about its initial implementation. But it was a 10 goggles and glove and 3D audio interactive system. 11 And there might have been some variants on it, 12 even, as we went along, for instance, instead of a 13 head-mounted display, there could have been another type 14 of display on a boom, that you look through. So the 15 hardware components would change. And I don't really 16 recall if these variants still were described under the 17 rubric of VIEW System. 18 So to answer your question, my research involved 19 components of the VIEW system, but I think if you went 20 back 35 years and looked at the literature, I think the 21 literature was mostly talking about the system originally 22 compiled by Scott Fisher, which involved a interactive 23 system involving a beta glove, a head-mounted display, and 24 3D audio. And I believe it had six degrees of freedom 25 capability as well.

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41 1 THE STENOGRAPHIC REPORTER: I'm sorry. Did you say 2 what glove? 3 THE WITNESS: Boy, what did I say? 4 MR. HENRY: Data. It's d-a-t-a, right, Dr. Begault? 5 THE WITNESS: Thank you, that's what they referred to 6 it as, a data glove. 7 BY MR. HENRY: 8 Q And, Dr. Begault, when in time did that system 9 you just described with the HMD, the data glove, and the 10 3D audio that was designed or developed by Scott Fisher 11 exist? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: So you're asking me to give you an exact 14 historical point, which I'm unable to do. So I arrived at 15 NASA in I believe it was 1988. The system had already 16 existed, I believe. If you look at the literature, you 17 would find an article authored by Fisher, Wenzel, 18 W-e-n-z-e-l, and -- yeah, Fisher, Wenzel, and... there's 19 another person -- Foster, F-o-s-t-e-r. And I don't recall 20 the exact date of that. 21 And, again, publications usually follow 22 embodiments or whatever the proper term is, you know, the 23 manifestation by a year or two. So I can't give you an 24 exact historical point in time. That's a historical 25 question which could be researched, I guess.	43 1 had sensors in the fingers so that different gestures 2 could be interpreted by a computer, such as gripping and 3 pointing and that sort of thing. 4 Q And you said, for the benefit of the court 5 reporter, Polhemus. Could you spell that, please? 6 A Sure. Capital P-o-l-h-e-m-u-s. 7 THE STENOGRAPHIC REPORTER: Thank you. 8 BY MR. HENRY: 9 Q So a user of the data glove would wear that data 10 glove on the user's hand? 11 MR. ELLIOTT: Objection; relevancy. I'm just going to 12 object to the line of questioning as being irrelevant. 13 This is on claim construction. So obviously, you can 14 continue down the line of questioning if you want, but 15 none of this is relevant to the claim construction we're 16 here for today. 17 THE WITNESS: So your question again, please? 18 BY MR. HENRY: 19 Q Sure. So the user of the data glove would use 20 that glove on the user's hand, right? 21 A It's hard to imagine somebody wearing a glove 22 somewhere else other than their hand. 23 Q And you said sensors could track gestures like 24 pointing; is that fair? 25 A Well, again, I'm relying on 35 years of memory
42 1 BY MR. HENRY: 2 Q Totally fair. 3 But by the time you got to NASA in 1988, the VIEW 4 system and the Convolotron system already existed; is 5 that fair? 6 A Yes. So they were going through different 7 iterations and development of the systems. But some form 8 of those existed, yes. 9 Q And the system already had an HMD, which is a 10 head-mounted display, right? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: Yes. 13 BY MR. HENRY: 14 Q And the system, there's a data glove, right? 15 A Yes. 16 Q Okay. And you said the system also used 3D 17 audio, fair? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: Yes. 20 BY MR. HENRY: 21 Q What's a data glove? 22 A A data glove was a thin glove which had both a -- 23 oh, I'm going to give you the 1980s version of what a data 24 glove was. It had a Polhemus tracker device on it so that 25 the position of the hand could be registered. And it also	44 1 here, but what I recall was that there was a type of 2 sensor that went along the fingers and maybe in the hand 3 part. And those sensors would transmit a voltage based on 4 the position of the fingers. And then there was also, 5 again, this tracker device. So the idea was at the time 6 that you might be able to point to a menu, a virtual menu 7 floating in the sky that you would see through the HMD or 8 you might be able to grab a virtual object and move it. 9 I don't know, honestly, how much development was 10 present at the time. I mean, again, it was a continual 11 evolution. So I know that in theory, that's what these 12 things were capable of doing. I don't know how often the 13 computer needed to be restarted or how successful these 14 things were. If you give me a particular year or, you 15 know, if smoke was coming out of the computer at a certain 16 point. 17 But conceptually, that's how all this stuff was 18 supposed to work, and I actually did try it at some of 19 these demonstrations when I was at NASA in the late 1980s. 20 So I think it was developed pretty well by that point. 21 BY MR. HENRY: 22 Q I apologize. I thought you were done. 23 A No, that's my fault. I didn't give you a proper 24 pause. I am done now. 25 Q Thank you.

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45 1 So you actually used that system in the late 2 1980s? 3 MR. ELLIOTT: Objection; relevance, scope. 4 THE WITNESS: Well, I'm going to test my memory here, 5 but I'm pretty certain that we had quite a few people 6 coming through for demonstrations of the system. This is 7 one of the earliest virtual reality systems. And it 8 was -- made quite a splash, if you will. 9 And there were demonstrations of different 10 applications that would be relevant to NASA's mission. 11 But of course, popular media became entranced by what it 12 had potential to do. So folks like Jaron Lanier, who I 13 don't remember how to spell his name, I know he'd come 14 through the lab and various people would come and... it 15 was a new thing at that time. 16 BY MR. HENRY: 17 Q Sure. 18 But you also used it yourself, right? 19 MR. ELLIOTT: Objection; relevancy, scope. 20 THE WITNESS: I used -- 21 MR. ELLIOTT: Calls (indecipherable utterance) for 22 speculation. 23 THE STENOGRAPHIC REPORTER: What was that, 24 Mr. Elliott? 25 MR. ELLIOTT: Also objection, calls for speculation.	47 1 So, again, it was a system that was demonstrated 2 to many people. I was one of the people that tried it 3 out. I was very interested, of course, in the audio 4 portion of the system. And we were all part of the same 5 team, in the same group. 6 BY MR. HENRY: 7 Q And you could point at and move virtual objects 8 with this system? 9 MR. ELLIOTT: Objection to form, outside the scope, 10 and not relevant. 11 THE WITNESS: Could I -- I'm sorry. State your 12 question again? 13 BY MR. HENRY: 14 Q Sure. 15 Would this system, the VIEW system and the 16 Convolvotron system, could you point at and move virtual 17 objects? 18 MR. ELLIOTT: Objection to form, scope, and 19 irrelevant. 20 THE WITNESS: Yes. At various points in its 21 development, you could select things from a menu, I 22 recall, and interact with it. And I believe you could 23 interact with virtual objects. 24 BY MR. HENRY: 25 Q Now, could you also point at and move sound
46 1 THE STENOGRAPHIC REPORTER: Thank you. 2 THE WITNESS: I used primarily the Convolvotron, 3 because my work was in psychoacoustics. So I was using it 4 for psychoacoustic studies. And then I think some of my 5 earlier work might have fed into the larger virtual 6 reality system as far as, oh, here's something Begault 7 developed. And now let's try it as part of the full 8 system. 9 But I wasn't engineering the visual component, 10 let's say, of the system. 11 BY MR. HENRY: 12 Q Yeah, that's totally fine. I wasn't asking if 13 you were engineering the visual component. I just want to 14 know if you actually used the system, like did you wear 15 the data glove and wear the HMD and then try out the VIEW 16 and Convolvotron system? 17 MR. ELLIOTT: Objection to scope, relevancy, and calls 18 for speculation. 19 THE WITNESS: I'll repeat my prior answer. I used the 20 Convolvotron in my own studies, and I was one of many 21 people who used the system in terms of trying out 22 demonstrations of it. I might have even participated in a 23 study that a different researcher was doing, you know, as 24 a subject, that used some parts or components of the VIEW 25 system.	48 1 sources? 2 MR. ELLIOTT: Objection to form, outside the scope and 3 irrelevant. 4 THE WITNESS: That, I don't recall specifically. It 5 might have come up at some point. I don't really recall 6 anything where sound sources were moved by let's say in 7 the virtual environment using one's hand. 8 BY MR. HENRY: 9 Q Do you recall them being moved by any other 10 process? 11 MR. ELLIOTT: Objection to form, outside the scope, 12 irrelevant, and calls for speculation. 13 THE WITNESS: The Convolvotron allowed you to create 14 sound trajectories or to move sounds so you could play 15 sounds in different locations. So in that sense, you 16 could move them. 17 BY MR. HENRY: 18 Q What were some of the processes that the 19 Convolvotron used to facilitate that movement? 20 MR. ELLIOTT: Objection to form, outside the scope, 21 and irrelevant. 22 THE WITNESS: Well, to be a little more specific here, 23 I mean, you could move your head, and sound sources would 24 maintain their same virtual position, unlike with a normal 25 set of headphones where the sounds would move with your

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49 1 head. So the sounds would maintain their position. But 2 if you wanted to move the sounds, what I recall was that 3 that was a matter of (indecipherable utterance) 4 interacting with the computer display. 5 THE STENOGRAPHIC REPORTER: I'm sorry. Matter of 6 what? 7 THE WITNESS: Moving the sounds with a computer 8 display. 9 THE STENOGRAPHIC REPORTER: Thank you. 10 BY MR. HENRY: 11 Q How did the Convolvotron maintain sound sources 12 in the same virtual position when a user's head was 13 (indecipherable utterance) moving? 14 MR. ELLIOTT: Objection to form -- 15 THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, 16 your sound really isn't that good on my end for some 17 reason. I can hear everyone really great, but I'm not 18 hearing your -- like this one question, you trailed off 19 for some reason. Your audio is trailing off. 20 MR. ELLIOTT: Chris, I think you're turning your head, 21 and that's what's causing it to trail off. I don't know 22 if Chris is watching the screen, but I do hear your voice 23 trail off as you like turn your head as you finish your 24 question. 25 THE TECHNICIAN: Mr. Henry, we can try doing something	51 1 tracker on VIEW and Convolvotron system. 2 THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, 3 what was the what tracker? 4 MR. HENRY: Polhemus again, P-o-l-h-e-m-u-s. 5 MR. ELLIOTT: And objection to form, calls for 6 speculation, outside the scope and irrelevant. 7 THE WITNESS: Where was the Polhemus tracker? That is 8 a system of devices. Do you want me to describe where 9 each of the devices were located? 10 BY MR. HENRY: 11 Q Please, that would help me. Go ahead. 12 A Sure. 13 MR. ELLIOTT: Objection to form, calls for 14 speculation, irrelevant, and outside the scope. 15 THE WITNESS: There was a transmitter that in the VIEW 16 system was mounted to the top of the headband of a 17 headset. For the audio transformations to the 18 Convolvotron. And then there was a receiver that was 19 mounted I believe on a pole. It was kind of an arbitrary 20 location, and sometimes it would be mounted to the 21 ceiling. And then those were wired to the actual box that 22 would take the coordinates of the transmitter and the 23 receiver and transmit them to the computer. And I don't 24 know exactly where that was located, but I believe 25 proximate to the computer.
50 1 in Zoom if you want to go off record real quick. 2 THE WITNESS: I'm going to take a two-minute break. 3 I'll be right back. 4 MR. HENRY: Yeah, that's fine. Let's go off the 5 record. 6 THE VIDEOGRAPHER: The time is 10:09. We're going off 7 the record. 8 (Recess taken.) 9 THE VIDEOGRAPHER: The time is 10:21. We are back on 10 the record. 11 BY MR. HENRY: 12 Q All right. Dr. Begault, how did the Convolvotron 13 maintain sound sources in the same virtual position when a 14 user's head was moving? 15 MR. ELLIOTT: Objection to form. Objection to form, 16 scope, and irrelevant. 17 THE WITNESS: Basically, it was a matter of analyzing 18 head position relative to the intended virtual source 19 position, and then selecting or interpolating between the 20 appropriate HRTFs. 21 BY MR. HENRY: 22 Q And when you say HRTFs, you mean head-related 23 transfer functions? 24 A That's correct. 25 Q Where was the (indecipherable utterance) Polhemus	52 1 BY MR. HENRY: 2 Q And the transmitter on the top of the headband, 3 did that track head movement or did something else track 4 head movement? 5 MR. ELLIOTT: Objection to form, outside the scope, 6 irrelevant. Compound. Just to be clear, we're talking 7 about the first versions of the Convolvotron, in the 1980s 8 using a Polhemus tracker device. So if that's what we're 9 referring to now, you have to remind me your question. 10 BY MR. HENRY: 11 Q Sure. 12 Was it the transmitter on the top of the headband 13 that tracked head movement or was it something else? 14 MR. ELLIOTT: Objection to form. Outside the scope, 15 irrelevant. Calls for speculation. 16 THE WITNESS: It was not just the transmitter. It was 17 also the receiver and the interface box. 18 BY MR. HENRY: 19 Q Working as unit, the components that you 20 testified about to before? 21 MR. ELLIOTT: Objection to form and irrelevant. 22 THE WITNESS: Yes. Correct. That's how that system 23 works. 24 BY MR. HENRY: 25 Q Did you say, Dr. Begault -- actually, strike

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53 1 that. 2 Dr. Begault, at what period of time did you work 3 on the AMES Spatial Audio Display? 4 MR. ELLIOTT: Objection to form and irrelevant. 5 THE WITNESS: This would be approximate, but I believe 6 I came up with the concept in 1990. And I believe -- I'd 7 have to refer to my CV to give you an exact year, but I 8 think our prototype was ready by '92 or '93. It's been a 9 while. 10 BY MR. HENRY: 11 Q When did you stop doing work that was related to 12 the AMES Spatial Audio Display? 13 MR. ELLIOTT: Objection to form and irrelevant. 14 THE WITNESS: That's a difficult -- the way you phrase 15 the question is difficult to answer specifically. Because 16 much of my work is related to what the Ames Spatial 17 Auditory Display was designed for. But if you mean -- why 18 don't you clarify what you mean in your question. 19 BY MR. HENRY: 20 Q I would imagine at some point you -- well, 21 actually, are you still working for NASA? 22 A Yes. 23 Q Are you still working on that project? 24 A The Ames Spatial Auditory Display specifically? 25 Q Yes?	55 1 And, Court Reporter, you don't need to transcribe 2 that, other than noise. 3 But maybe some other people have their 4 microphones open that shouldn't. I don't know. But there 5 was some garbling in there. So just as a heads up. 6 BY MR. HENRY: 7 Q For the purposes of a clean record, Dr. Begault, 8 I'm going to ask this again. 9 You weren't doing any specific development work 10 on the AMES Spatial Audio Display past around 1995; is 11 that fair? 12 MR. ELLIOTT: Objection to form and irrelevant. 13 THE WITNESS: That's my best estimate. 14 BY MR. HENRY: 15 Q Dr. Begault, did you write your May 3rd, 2023, 16 declaration? 17 A I wrote it interactively with counsel. 18 Q Which counsel? 19 A I'm not sure which counsel were actually 20 involved, but I will state that I was communicating with 21 Patrick Dunn and Kyle Elliott about it. 22 Q Anyone else? 23 A I don't recall. 24 Q And what do you mean by you wrote it 25 interactively with counsel?
54 1 A That was a hardware prototype. So I stopped 2 working on that. Let's put it this way. I demonstrated 3 the prototype. I wrote a paper about it. There was a 4 patent that was related to it, and so I probably stopped 5 working, other than doing demonstrations, I know we did a 6 number of demonstrations with the device through the 7 mid-90s, but I wasn't really doing any additional 8 development on that specific device past, I don't know, 9 1995 or something. 10 BY MR. HENRY: 11 Q So you weren't doing any specific development 12 work on the AMES Spatial Audio Display past around 1995; 13 is that fair? 14 MR. ELLIOTT: Objection to form and irrelevant. 15 THE WITNESS: First part of your question was garbled. 16 You'll have to repeat it. 17 BY MR. HENRY: 18 Q Sure. 19 So you weren't doing any specific development 20 work on the AMES Spatial Audio Display past around 1995; 21 is that fair? 22 MR. ELLIOTT: Same objection. 23 THE WITNESS: Yes. And by the way, the audio is 24 getting more garbled. So I could hear you say the word 25 specific, but it sounded like (indicating.)	56 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: The substance of the arguments I wrote, 3 and I would say that the formatting and the outline and 4 some of the references that were addressed in the errata 5 came from counsel -- were provided by counsel. 6 But let me follow up and says the references. 7 BY MR. HENRY: 8 Q I'm sorry. I'm not following. What are you 9 referring to when you say the references? 10 A The errata addresses specific sections or 11 references to specific quotes in the materials in the 12 patents. 13 Q And those were provided by counsel? 14 A Yes. I asked for examples of these processor 15 claims that I was asked to address. 16 Q And in response to that request, counsel provided 17 the citations presented in the errata? 18 A Presented in the declaration and corrected in the 19 errata. 20 MR. ELLIOTT: Objection to form. 21 BY MR. HENRY: 22 Q Did the AMES Spatial Audio Display use 3D audio? 23 MR. ELLIOTT: Objection to form, outside the scope, 24 and irrelevant. 25 THE WITNESS: Yes.

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57 1 BY MR. HENRY: 2 Q What in your view is 3D audio? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: Three-dimensional audio presentation. 5 BY MR. HENRY: 6 Q How, if at all, is that different from binaural 7 sound or binaural audio? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: There are similarities and differences. 10 We could go into those if you like. 11 BY MR. HENRY: 12 Q Sure. 13 How does binaural audio differ from 3D audio in 14 your view? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: Binaural audio has been a term of art, 17 so to speak, in the research community for many, many 18 years going back decades. And so one can find references 19 to binaural recording technique, for instance, where a 20 dummy head might be used to capture spatial audio cues 21 from the perspective of a dummy head. 22 3D audio was a term that came about, I think, in 23 the 1980s, late 1980s. I don't know exactly who invented 24 that term, but generally speaking, without being 25 restrictive about the overlap between the two terms or	59 1 speculation. Also irrelevant. 2 THE WITNESS: No. 3 BY MR. HENRY: 4 Q At that time, in the 1990s were there 5 publications that you were aware of discussing using 6 digital signal processors to process head-related transfer 7 functions to generate binaural audio? 8 MR. ELLIOTT: Objection to form, irrelevant. 9 THE WITNESS: There were many. 10 BY MR. HENRY: 11 Q Were there also many references at that time 12 discussing using convolution processes to process 13 head-related transfer functions with digital signal 14 processors for binaural audio? 15 MR. ELLIOTT: Objection to form and irrelevant. 16 THE WITNESS: Yes. 17 BY MR. HENRY: 18 Q What is convolution, Dr. Begault? 19 A Convolution is a mathematical operation by which 20 the frequency domain of two signals can be multiplied. 21 Q You recall mentioning convolution in your May 3rd 22 declaration? 23 A I do. 24 Q Is there only one convolution process, 25 Dr. Begault, or are there many different convolution
58 1 excluding one thing from the other because of course there 2 are similarities, 3D audio is kind of a term that came 3 about when virtual reality became known to the public. It 4 became a kind of way of capturing the concept of 5 manipulating binaural sound, if you will, with a computer. 6 BY MR. HENRY: 7 Q Did the AMES Spatial Audio Display use binaural 8 audio? 9 MR. ELLIOTT: Objection to form and irrelevant. 10 THE WITNESS: In a sense, yes. That's the overlap 11 with 3D audio, if you will, in that it used head-related 12 transfer functions for its processing. 13 BY MR. HENRY: 14 Q Did it use a digital signal processor for that 15 head-related transfer function processing? 16 MR. ELLIOTT: Objection to form. And irrelevant. 17 THE WITNESS: Yes. 18 BY MR. HENRY: 19 Q Were you the only one in the industry using a 20 digital signal processor to process head-related transfer 21 functions -- (simultaneous cross-talk) -- 22 MR. ELLIOTT: Objection; form -- 23 BY MR. HENRY: 24 Q -- in the 1990s? 25 MR. ELLIOTT: Objection to form, calls for	60 1 processes? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: Literally speaking, I guess there's an 4 infinite number of convolution processes. 5 BY MR. HENRY: 6 Q Why do you say that, Dr. Begault? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: I say infinite because any number of an 9 infinite number of things can be convolved with another. 10 BY MR. HENRY: 11 Q Sure, I think you're referring to inputs to a 12 convolution process. 13 What I'm asking is, is there just one convolution 14 process known to you into which such -- 15 MR. ELLIOTT: Objection to form. 16 BY MR. HENRY: 17 Q -- or are there more than one convolution 18 process? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: I'm aware of the basic convolution 21 process. 22 THE STENOGRAPHIC REPORTER: I just want to let you 23 know, Mr. Henry, I didn't hear your full question because 24 there was some talking over one another with the objection 25 so I wasn't able to hear the full question.

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61 1 MR. HENRY: Thank you. I'll repeat it. 2 BY MR. HENRY: 3 Q Dr. Begault, is there just one convolution 4 process or are there more than one convolution processes? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I'm familiar with one convolution 7 process. 8 BY MR. HENRY: 9 Q And -- 10 A And if you mean the literal definition of 11 convolution in the time domain. 12 Q I'm sorry. I think -- is it in the time domain 13 or in the frequency domain that convolution is used? 14 A In the time domain. 15 Q And in the frequency domain, you just use the 16 matrix multiplication process; is that right? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: I don't understand your question. 19 BY MR. HENRY: 20 Q Sure. 21 Well, what do you use in the frequency domain if 22 you don't use convolution to render 3D audio? 23 A We use convolution in the time domain in order to 24 multiply signals in the frequency domain. So in my use of 25 the word convolution in 3D audio, we're performing that	63 1 familiar with that? 2 A I am familiar with that. Do you want me to 3 define it? 4 Q Please? 5 A Infinite impulse response. 6 Q And what does the acronym F, as in fox, I, as in 7 indigo, R, as in Roger, stand for? 8 A Finite impulse response. 9 Q And what do you use infinite impulse responses 10 for? 11 A Well, they can be used for the same purpose as an 12 FIR filter. IIR filters can be used to filter a sound 13 just as an FIR can be used to filter sound. And, in fact, 14 you can use an IIR filter to approximate the transfer 15 function of an HRTF. 16 So in a way, these are two approaches in terms of 17 digital signal processing to create a spectral 18 modification, and both can be used -- I'll just follow up 19 with that. And both can be used in spatial audio 20 processing. 21 Q Can you perform convolution processes with IIR 22 filters for spatial audio? 23 A No. I don't believe it's referred to in that way 24 as a convolution operation. It's a feedback system for 25 developing a filter. So one could design IIR filters that
62 1 operation in the time domain in order to impart the 2 frequency domain transfer function of a head-related 3 transfer function. 4 Q But isn't convolution using head-related impulse 5 responses and not head-related transfer functions? 6 A That is correct. One is using head-related 7 impulse responses or transformed head-related impulse 8 responses to convolve in order to get the frequency domain 9 equivalent. 10 Q So the convolution process is used with 11 head-related impulse responses, right? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: Either head-related impulse responses or 14 some approximation of it. 15 BY MR. HENRY: 16 Q But you don't actually use convolution on 17 head-related transfer functions, do you? 18 A Well, people will use the phrase convolve with a 19 head-related transfer function and what they really mean 20 is that the operation is happening in the time domain in 21 order to filter something with a head-related transfer 22 function. But technically speaking, convolution is used 23 is a time domain operation that's used to multiply two 24 spectra. 25 Q What does the acronym IIR stand for, are you	64 1 are using feedback, whereas the convolution operation is 2 more towards feed-forward operation. 3 Q Can you perform convolution processes with FIR 4 filters for spatial audio? 5 A That is what is typically done. 6 Q Can you describe what the one convolution process 7 that you said you're familiar with entails? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Sure. So we have a sequence of numbers 10 that represents, let's say, a digital filter. And we have 11 another sequence of numbers that represents an input 12 signal that has been digitized. So these are both in the 13 digital domain. So I'm familiar with it. And what we're 14 doing is we are multiplying the two arrays, shifting one 15 of the arrays relative to the other one, and then summing 16 the output and then shifting again and summing the output. 17 BY MR. HENRY: 18 Q And what types of digital filters can be used in 19 that process? 20 A Band pass filters. Low pass filters. High pass 21 filters. Filters that represent head-related transfer 22 functions. 23 Q Any others? 24 A Reverberation. 25 Q Any others?

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65 1 A Arbitrary filters. 2 Q Any others? 3 A I think I've exhausted the list. If I think of 4 any others later, I'll tell you. 5 Q What's an arbitrary filter? 6 A Well, it's to contrast what I was describing as a 7 band-pass filter, a low-pass filter, or a high-pass 8 filter. So an arbitrary filter means that its frequency 9 response can be, quote/unquote, arbitrarily designed to 10 have a particular characteristic. 11 Q I think you mentioned reverberation filter. What 12 would that be? 13 A What that would be, it's -- maybe I didn't say 14 reverberation filter. I meant that the FIR filter could 15 be used to simulate reverberation. That's what I meant to 16 say. 17 Q What is a biquad configuration of a filter? 18 A A biquad -- a biquad filter in digital signal 19 processing has both a feed forward and a feedback 20 component. 21 Q Are those used in convolution processes? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: More properly stated, it could be used 24 in a filtering process. 25	67 1 addressed the feed forward portion of a biquad filter also 2 which has a feedback portion as a convolution process. I 3 guess you could, but I'm not entirely sure about that. 4 BY MR. HENRY: 5 Q What I'm trying to understand, Dr. Begault, and 6 just help me out because I'm not an audio expert. But I 7 thought you testified that you have a sequence of numbers 8 that you're going to use in convolution that represents a 9 digital filter, and then you have a sequence of numbers 10 that represent the input. And then those two things are 11 convolved in order to render spatial audio signal. Is 12 that not the case? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: If I know what you're referring to with 15 my example of two sequence of numbers where I was doing a 16 shift and a feed forward operation, I would call that 17 convolution. It's not the only way to render a spatial 18 audio filter, though. 19 BY MR. HENRY: 20 Q Sure. 21 But what I just mentioned, where you have the 22 numbers that represent the filter, and the numbers for 23 your input and you're doing a feed forward process for 24 convolution, which of the filters that we discussed can be 25 used in that process?
66 1 BY MR. HENRY: 2 Q Will you help me understand that qualification? 3 I'm just... what is the relationship between the filters 4 that we've gone through and the convolution process? Are 5 they used in that convolution process or am I not 6 capturing that correctly? Just trying to understand. 7 MR. ELLIOTT: Objection to form -- sorry, objection to 8 form. 9 THE WITNESS: My understanding is the convolution 10 process applies to a feed forward operation but not to a 11 feedback operation. 12 BY MR. HENRY: 13 Q So then what filters of the filters that we 14 mentioned could be used in the convolution process? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I can't answer your question the way you 17 phrased it. What filters can be used? 18 BY MR. HENRY: 19 Q Sure. We've covered the FIR filter, and we 20 mentioned the biquad configuration of a filter, and an IIR 21 filter. Are any of those used in convolution processes? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: My understanding is that the feed 24 forward operation of the FIR portion of a filter 25 represents convolution. I don't know if it's properly	68 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: You could design a filter using FIR 3 techniques of any type. 4 BY MR. HENRY: 5 Q So any FIR filter could be used? 6 A No. Wait a minute. That's twisting my words in 7 some weird way. 8 Q I -- 9 A You said you could use -- let me clarify. 10 Q Sure, please. 11 A You could use an FIR filter to design just about 12 any type of filter. 13 Q And then would you use that resulting filter for 14 your convolution? 15 A No. The filter is the convolution. 16 Q Okay. 17 A That's where I'm getting mixed up with your 18 question. 19 Q Is the filter the kernel you use for the 20 convolution process? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: I would reverse those words. The 23 convolution process is what I might use in some 24 circumstances to create a digital filter. 25

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69 1 BY MR. HENRY: 2 Q Can you describe for me how you would use HRTFs 3 in a convolution process? 4 A I would use them possibly, not exclusively. 5 By -- and, again, there's many ways to represent a 6 head-related transfer function. But one way of doing it 7 would be using the convolution process that we just 8 described. 9 Q So if you wanted to convolve an audio signal with 10 a HRTF, how would you do that? 11 A I have already answered that question for you. 12 You could do it via a feedforward FIR filter. 13 Q How else could you do it? 14 A You could do it with any of the other types of 15 filters that I mentioned. Could represent the frequency 16 domain characteristics. 17 Q Dr. Begault, do you understand that the parties 18 have disputes in this case about the terms electronic 19 call, electronic phone call, and telephone call? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: I addressed those topics within my 22 declaration. So that's the limits of my understanding of 23 that dispute. 24 BY MR. HENRY: 25 Q But the terms electronic call, electronic phone	71 1 time you spent reviewing that. 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: No more than -- 4 Sorry. 5 If we are indeed talking about a document that's 6 approximately 130 pages, I think I put less than five 7 hours into it. 8 BY MR. HENRY: 9 Q Dr. Begault, what is an electronic call? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: An electronic call is a communication 12 between two parties. 13 BY MR. HENRY: 14 Q What is an electronic phone call? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: An electronic phone call is a 17 communication between two parties that is facilitated by 18 electronic means. 19 BY MR. HENRY: 20 Q Any electronic means? 21 A Yes. I'm excluding semaphore, smoke signals, and 22 acoustic communication. But any means involving 23 electrical communication. 24 Q What is a telephone call? 25 MR. ELLIOTT: Objection to form.
70 1 call, and telephone call are terms that you addressed in 2 your May 3rd, 2023, declaration, right? 3 A That is correct. 4 Q Dr. Begault, before we talk about those terms, 5 how much time did you spend reviewing Dr. McMullen's 6 declaration? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: I don't recall. 9 BY MR. HENRY: 10 Q Give me your best guess, Dr. Begault. 11 A Is her declaration the one that she had authored, 12 as opposed to the... sorry. I sometimes don't know the 13 legal terms for these documents. There were two documents 14 that I mentioned earlier, that I had reviewed briefly. 15 One was a document provided by defense that might have 16 quoted Dr. McMullen. I'm not certain about that. 17 And then there's a much longer document by 18 Dr. McMullen. I think I spent a few hours on the longer 19 document of approximately 130 pages of Dr. McMullen's. 20 But I didn't spend a lot of time looking at that one. I 21 was mostly looking at the one with the 30 pages. 22 Q I was referring to the declaration from 23 Dr. McMullen, just like you submitted a declaration in 24 this case. With respect to the declaration from 25 Dr. McMullen, please give me your best guess on how much	72 1 THE WITNESS: Same answer. 2 BY MR. HENRY: 3 Q That answer being, a communication between two 4 parties that is facilitated by electronic means? 5 A Yes. 6 Q Any electronic means? 7 A Yes. 8 Q Do you draw any distinction between the terms 9 electronic call on the one hand and electronic phone call 10 and telephone call on the other? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: I draw no distinctions between those 13 terms. 14 BY MR. HENRY: 15 Q Even though the latter terms recite phone and 16 telephone? 17 A I'm sorry. The latter terms recite what? 18 Q Phone and telephone. 19 A I think the question you originally asked was are 20 those equivalent, and I said yes. 21 Q And I'm asking you, that's your opinion despite 22 the fact that electronic call does not recite phone or 23 telephone, and the other terms do. 24 MR. ELLIOTT: Objection; form. 25 THE WITNESS: Correct -- oh, correct.

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73 1 BY MR. HENRY: 2 Q In your May 3rd, 2023 declaration, did you set 3 out any legal understandings that govern the formation of 4 your opinions? 5 A Well, I'm not an attorney. So... I don't 6 understand what you mean by legal. If you mean that I put 7 it in a legal declaration, then I set out my understanding 8 in my declaration. 9 Q Did you write in your declaration any rules 10 governing claim interpretation or legal understandings of 11 any other applicable rules for claim construction? 12 A I know I gave you my understanding as an expert 13 or as a person skilled in the art regarding these issues. 14 And as far as -- yes, so that's what I offered. To the 15 degree that they might be legal tests, I'm not exactly 16 sure. But it seems that the interpretation of a person 17 skilled in the art, such as myself, matters legally. 18 Q I'm actually asking you if you set forth -- out 19 in your declaration sort of the rules that a court would 20 apply or that -- that the court will apply in interpreting 21 these claims. 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: I know I defined -- no, I didn't define 24 any rules, no. I did not use the word rules or I did not 25 think about this in terms of rules.	75 1 BY MR. HENRY: 2 Q Dr. Begault, what patents do these terms appear 3 in? 4 A I don't recall. 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I don't recall which ones exactly. 7 BY MR. HENRY: 8 Q As we have established, Dr. Begault, we're 9 conducting this deposition over Zoom, right? 10 A I hope that's what this is. 11 Q Is this Zoom meeting an electronic call? 12 A Yes. 13 Q Is it an electronic phone call? 14 A Yes. 15 Q Is it a telephone call? 16 A Yes. 17 Q Do you believe that the computers we're using for 18 this Zoom deposition are phones? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: I do. The word tele means distant. 21 Phone means sound. And so we are communicating sound over 22 a distance. 23 BY MR. HENRY: 24 Q So my computer is a phone? 25 MR. ELLIOTT: Objection to form.
74 1 BY MR. HENRY: 2 Q If you -- if it's your opinion that electronic 3 call, electronic phone call, and telephone call all mean 4 the same thing, then isn't your opinion rendering 5 meaningless the terms phone and telephone? 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: No. 8 BY MR. HENRY: 9 Q If not, how is your interpretation of the terms 10 electronic phone call and telephone call any different 11 from your interpretation of the term electronic call? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: There's three different ways of saying 14 the same thing, a communication between two parties 15 facilitated electronically. 16 BY MR. HENRY: 17 Q And since you're telling me that they all mean 18 the same thing, aren't you telling me that the terms phone 19 and telephone have no impact on the interpretation of 20 those terms? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: It seems like a hypothetical that's hard 23 to answer because, I mean, we have to read these terms 24 within the context of the patent. They seem to be 25 referring to the same thing, when I read them.	76 1 THE WITNESS: It's exactly equivalent to the use of a 2 phone. If you mean by a phone, a landline with a piece of 3 plastic encasing it, that goes over a landline 4 communication or you're referring to a handheld device 5 that's using radio communication, et cetera, it's 6 basically the functionality of the three terms involves 7 communications between two parties using electronic means. 8 BY MR. HENRY: 9 Q Is my computer a phone? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Your computer is being used to transmit 12 sound. So when you use a computer to transmit sound 13 between two or more parties electronically, then you're 14 using a computer as a phone in our sort of old-fashion way 15 of thinking of a phone as a landline device. But it has 16 the exact same functionality as a phone. 17 So in essence, it is a phone. 18 BY MR. HENRY: 19 Q Is your computer a phone? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: Can you hear my voice? 22 BY MR. HENRY: 23 Q Please answer the question. 24 A Sorry for the rhetorical answer. Yes, I'm using 25 it as a phone.

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77 1 Q If you and I were talking over walkie-talkies, 2 would we be using a telephone? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: We would be communicating sound over a 5 distance. So telephone, yes. We would be using a 6 walkie-talkie as a telephone. 7 BY MR. HENRY: 8 Q So is a walkie-talkie a telephone? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: You can use a walkie-talkie as a 11 telephone form of communication. You can also use a 12 walkie-talkie as a hammer. But people use it for voice 13 communication between two parties. 14 BY MR. HENRY: 15 Q Is it a phone? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: I have to give you the same answer. If 18 you beam by a telephone or a phone, I'd have to know what 19 you mean exactly by a phone. I've given you my definition 20 of what a phone is. A phone is a device that enables 21 electronic communication between two parties because it 22 uses the word sound. 23 And if we talk about telephone, we're talking 24 about transmitting sound between a distance, which phone 25 implies.	79 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: The train's radio communication can be 3 one component of the train is a telephone communication 4 system, just as my computer has one component to it. 5 Which allows us to communicate via voice and video. 6 BY MR. HENRY: 7 Q If we were members of the coast guard on boats 8 communicating over our radios, would we be making a 9 telephone call? 10 MR. ELLIOTT: Objection to form, argumentative. 11 THE WITNESS: Yeah. That would be a form, would be 12 called a radio telephone perhaps in the coast guard or a 13 ship-to-shore phone is another word that is sometimes used 14 to refer to the specific hardware. But, again, my use of 15 the word phone has to do with the idea of sound 16 communicated between two or more parties electronically. 17 BY MR. HENRY: 18 Q So would the boat radios be making telephone 19 calls? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: It would be the equivalent of a 22 telephone call, yes. Exactly the -- it's another way of 23 referring to it. The term of art might be radio 24 communication over a radiofrequency. But, of course, 25 that's now much more ambiguous distinction since cellular
78 1 BY MR. HENRY: 2 Q So applying your definition, Dr. Begault, is a 3 walkie-talkie a phone? 4 A Yes, we are using it that way. If on the, other 5 hand, we wanted to point to a specific piece of hardware, 6 like a Western Electric telephone that was used by Ma Bell 7 in the 1960s, then you could say, well, that's a phone. 8 And that implementation in that specific form of hardware 9 is a phone. 10 Q Dr. Begault, if we were conductors on trains 11 communicating through the consoles of our trains, would we 12 be using telephones? 13 MR. ELLIOTT: Objection to form, asked and answered. 14 Argumentative. 15 THE WITNESS: Yes. You would be -- that would be a 16 form of phone. I think they're even referred to as 17 phones. 18 BY MR. HENRY: 19 Q Would that make the trains telephones in your 20 view? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: No. The communication system itself is 23 the phone. 24 BY MR. HENRY: 25 Q The train's radio is a telephone?	80 1 telephones are using radio communication as well. 2 BY MR. HENRY: 3 Q What if we were airplane pilots communicating 4 over radios, would we be making telephone calls then? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: In a sense, yes, by the definition I've 7 given you of what a phone call is. 8 BY MR. HENRY: 9 Q Can you identify for me any type of electronic 10 voice communication that is not, in your view, a telephone 11 call? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: I'm trying to think if sound weren't 14 involved. So if we were communicating by video phone, and 15 we were both deaf, and so we might use hand signals. Then 16 I'd have to remove the audio component there and say that 17 we were just having a video phone call. 18 But I was using the word phone to apply to sound. 19 So, no, it's hard for me to think of any electronic 20 communication between two persons that couldn't be 21 referred to as an electronic call or as an electronic 22 phone call or a telephone call that would be absolutely 23 clear that these mean the same thing. 24 BY MR. HENRY: 25 Q So sitting here right now, can you identify for

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81 1 me any electronic communication between two people that 2 you believe would not qualify as a telephone call? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: I'm not certain if telegraph would 5 necessarily qualify if there was no sound involved. But, 6 no, I think -- that essentially translates into a 7 communication. But sound's not involved in that one. I 8 gave you another example of a video phone call, but where 9 two people have the sound turned off. And so they were 10 communicating by hand signals. 11 So would that be a video call without a video 12 telephone call, although the system was capable of it if 13 the sound were turned on or if both people were able to 14 use audio and speech to communicate? Then, yes, then it 15 becomes a phone call or telephone call and an electronic 16 call. 17 BY MR. HENRY: 18 Q Dr. Begault, sitting here right now, can you 19 identify for me any electronic voice communication between 20 two people that, in your view, would not be a telephone 21 call? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: No. 24 MR. HENRY: Why don't we take a ten-minute break, 25 please. Let's go off the record.	83 1 THE WITNESS: Yes. 2 BY MR. HENRY: 3 Q Is the moon a distance from Muir Beach? 4 MR. ELLIOTT: Objection to form, argumentative. 5 THE WITNESS: Yes. 6 BY MR. HENRY: 7 Q Is Mars a distance from Muir Beach? 8 MR. ELLIOTT: Objection to form, argumentative. 9 THE WITNESS: Yeah. 10 MR. ELLIOTT: Badgering the witness. 11 THE WITNESS: Yes. 12 BY MR. HENRY: 13 Q If I used an air horn in Boston right now, would 14 the sound of that air horn be a distance from you in Muir 15 Beach? 16 MR. ELLIOTT: Objection to form, argumentative, 17 badgering the witness. 18 THE WITNESS: Hypothetically, all things are at a 19 distance from me. 20 BY MR. HENRY: 21 Q So if I used an air horn in Boston right now, 22 would the sound of that air horn be a distance from you in 23 Muir Beach? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: I just gave you an answer. All things,
82 1 THE WITNESS: Sure. See you in ten. 2 MR. ELLIOTT: Okay. 3 THE VIDEOGRAPHER: The time is 11:13. We're going off 4 the record. 5 (Recess taken.) 6 THE VIDEOGRAPHER: The time is 11:26. We're back on 7 the record. 8 BY MR. HENRY: 9 Q Dr. Begault, you said you were in Muir Beach, 10 California today, right? 11 A That's correct. 12 Q And did you say you were in your home office or a 13 building? 14 A Home office, home office, yes. 15 Q Okay. Dr. Begault, is Boston, where I am, a 16 distance from Muir Beach? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Yes. 19 BY MR. HENRY: 20 Q Is Paris, France a distance from Muir Beach? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: Yes. 23 BY MR. HENRY: 24 Q Is Tokyo, Japan a distance from Muir Beach? 25 MR. ELLIOTT: Objection to form, argumentative.	84 1 hypothetically, are a distance from me. And you can 2 include air horns in Boston. 3 BY MR. HENRY: 4 Q Could we also include air horns on the moon if I 5 could use an air horn on the moon? 6 MR. ELLIOTT: Objection to form, argumentative, and 7 badgering the witness. 8 THE WITNESS: Well, I did answer that. I said all 9 things are essentially at a distance from me. 10 BY MR. HENRY: 11 Q So any sound anywhere in the galaxy would be a 12 distance from you? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: The only types of sounds that I think of 15 as not being distant from myself would be sounds that we 16 refer to in the literature as inside the head 17 localization. So there is a phenomenon that is sometimes 18 experienced where sound is not externalized. So all 19 sounds are external to me when you talk about physical 20 sounds. 21 It is possible that sounds can sound inside of 22 your head, though or be localized inside of your head. 23 It's not even clear if your own physical sounds like 24 breathing are located inside your head or inside your 25 body. But outside -- but those are the sounds that are

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85 1 located where I am, as part of my physical corporal being. 2 Everything else is external. 3 BY MR. HENRY: 4 Q So then would you agree that any sound that's 5 external to your inside the head hearing is a distance 6 from you? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: With the exclusion of sounds generated 9 by my own body. Certain sounds, I guess I should say too 10 because if I snap my fingers outside of my head, that 11 sound -- I generated that sound with my body, but it is 12 located outside of me. The sound source is outside of me. 13 I guess what I'm referring to are sound sources that are 14 inside of me. Like my lungs, my own voice. 15 BY MR. HENRY: 16 Q Dr. Begault, putting aside sounds from inside 17 your corporal body and sounds that you hear inside the 18 head as you've described, would you agree that all other 19 sounds are a distance from you? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: That's more or less the essence of my 22 answer that I gave you earlier, that all sounds or all 23 things are external to me. 24 BY MR. HENRY: 25 Q Dr. Begault, is a sound in Tokyo, Japan right now	87 1 ergonomically. Maybe 20 inches. 2 BY MR. HENRY: 3 Q Is that proximate to you? 4 A If we define proximate for a computer as the 5 distance that we would want that computer to be, in order 6 to reasonably see visual objects on that computer, yes. 7 If we define proximate in that way. 8 Q Dr. Begault, what does proximate to mean to you? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: It would depend on what we're talking 11 about. 12 BY MR. HENRY: 13 Q Okay. Is the back wall of your home office 14 proximate to you? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I would need to qualify that somehow. I 17 don't know what that would mean. 18 BY MR. HENRY: 19 Q Is the chair you're sitting on proximate to you? 20 A Again, I've never used the word proximate in 21 connection with a chair. 22 Q Is it proximate to you? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: It's in proximity to me. 25
86 1 a distance from you? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: I think you asked that earlier. And I 4 think the answer was yes. 5 BY MR. HENRY: 6 Q Is the answer yes? 7 A A sound in Tokyo would be at a distance from me. 8 Q And would a sound on Mars be a distance from you? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: Yes. 11 BY MR. HENRY: 12 Q Dr. Begault, is your computer proximate to you 13 right now? 14 A How do you define proximate? 15 Q Well, Dr. Begault, you recall opining about the 16 term proximate, right? 17 A Right, I used the term proximate to refer to a 18 normal conversational distance. 19 Q Let me ask you this, Dr. Begault, is your 20 computer proximate to you? 21 A It can be made -- 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: Okay. In terms of the physical object, 24 it's within about... oh, I don't know how many inches. 25 I'd have to estimate. It's whatever was recommended	88 1 BY MR. HENRY: 2 Q Is the chair you're sitting on proximate to you? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: The idea of a chair being proximate to 5 me seems strange and difficult for me to answer. I could 6 say that I'm sitting on it. I could say that it's not at 7 a far distance from me. So if I'm sitting on it, I guess 8 by that definition, it's in a proximate relationship to 9 me. 10 BY MR. HENRY: 11 Q Is there a coffee cup next to you, Dr. Begault? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: No. 14 BY MR. HENRY: 15 Q What's the brown and blue cylinder next to you in 16 your home office? 17 A It's a water cup. 18 Q Dr. Begault, is the water cup next to you, 19 proximate to you? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: It's in a proximate location to me 22 because it's not inside of me. 23 BY MR. HENRY: 24 Q Is anything that is not inside of you proximate 25 to you?

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89 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: No. I wouldn't say... it would depend 3 on the particular context. Maybe for a cup, for instance, 4 you might define proximate as something that I could 5 physically grab. So like, you know, I can grab my water 6 cup now, and I can take a drink from it. (Indicating.) 7 If the cup were so far away as I could not grab 8 it, then I would maybe say, oh, that's not really 9 proximate to me. I'd like to move my cup so it is more 10 proximate to me. 11 BY MR. HENRY: 12 Q So do you define proximate to as being within a 13 distance that you can grab it? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: No. Only for the case of the water cup 16 as we sit here and explore hypothetical applications of 17 the term proximate. I have a specific meaning for 18 proximate, for -- in my declaration. 19 BY MR. HENRY: 20 Q What if there was coffee in the cup, Dr. Begault, 21 would your answer change? 22 MR. ELLIOTT: Objection to form, argumentative, 23 badgering the witness. 24 THE WITNESS: It's the cup itself, not the contents of 25 the cup.	91 1 could grab it with my hand. It's not -- somebody else 2 might use a different criteria and say, well, it's 3 proximate if I can see it. 4 Maybe with a house example that you gave, 5 proximate might have to do with a completely different 6 kind of criteria, whether or not I can see it or not. If 7 my neighbor was far, far away, and I could not see the 8 house, then I might use that as my criteria. But these 9 are hypotheticals and odd examples when we're talking 10 about these different kinds of visual objects because it's 11 not typically used. 12 I don't think of a chair in terms of proximate. 13 I would say it's in proximity to me. But I don't think of 14 it, is it proximate. 15 BY MR. HENRY: 16 Q When would your chair stop being in proximity to 17 you if it were to gradually increase its distance from 18 you? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: Well, it depends on the criteria you 21 would use. 22 BY MR. HENRY: 23 Q Dr. Begault, do you believe proximate is a 24 subjective term? 25 A Not when applied to speech communications.
90 1 BY MR. HENRY: 2 Q Is there a house next to yours, Dr. Begault? 3 MR. ELLIOTT: Objection to form 4 THE WITNESS: Yes. 5 BY MR. HENRY: 6 Q Is that house proximate to you? 7 MR. ELLIOTT: Objection to form 8 THE WITNESS: Well, it would depend on what we might 9 define as proximate. That might be a subjective term. 10 Some people might think that the house was too close, and 11 that would be a proximate house, versus somebody who might 12 say, oh, maybe that's not proximate to. 13 Somebody else might use the criteria of, can I 14 see that house next to me. So it would depend on, in your 15 hypothetical, what criteria I would use for that specific 16 hypothetical, like seeing houses or finding coffee cups. 17 You would adopt a kind of criteria. 18 BY MR. HENRY: 19 Q Based on what, Dr. Begault? 20 A Well, on the cup -- 21 MR. ELLIOTT: Objection to form 22 THE WITNESS: -- we discuss -- 23 Sorry. I'm going to slow down my answers a bit. 24 So in relationship to the cup, I use the 25 proximate to explore the idea of proximate meaning that I	92 1 Q In speech communications, what does it mean, 2 Dr. Begault? 3 A Proximate -- 4 MR. ELLIOTT: Objection to form 5 THE WITNESS: Well, proximate to me means that 6 communication -- wait, can you restate your question? I 7 want to make sure I answer it exactly. 8 BY MR. HENRY: 9 Q Sure. 10 I asked you, do you believe proximate is a 11 subjective term. And you answered not when applied to 12 speech communications. Do you recall that? 13 A Yes. 14 Q Okay. All right. Then I asked you, in speech 15 communication, what does it mean. 16 A Proximate means at a distance at which speech 17 intelligibility between two talkers can be maintained 18 without necessitating the use of shouting or a megaphone 19 or something of that sort. In other words, it has to do 20 with the normal distances or the distance range, I should 21 say, at which face-to-face communications occur. 22 Q What criteria do you apply to determine whether 23 someone is speaking normally versus shouting? 24 A I use the criteria of -- well, two kinds of 25 criteria. One would be vocal effort. And then that vocal

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93 1 effort could be objectively measured using a sound 2 pressure level meter and so that we could measure vocal 3 effort in terms of average speech levels and know when 4 someone is communicating in a voice level that's 5 intelligible. 6 Q And what vocal effort levels or sound pressure 7 levels do you identify as where speech changes from normal 8 speech to shouting? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: Normal -- 11 I apologize. 12 Normal speech levels are roughly about 13 58 decibels A-weighted at a distance of about a meter. It 14 drops to maybe 52 decibels at 2 meters. At such levels, 15 those are the levels that we typically communicate with 16 one another at. One might raise one's voice a little bit 17 as the distance increases. By the time we get to a 18 shouted level, I believe we're getting into the high 60s 19 in terms of decibel levels. I'd have to check some 20 references on that. But that's my recollection or higher. 21 BY MR. HENRY: 22 Q What do you call the level of speech that would 23 be below normal speech level on your -- with these 24 standards you just mentioned? 25 A Oh, maybe 52, 53. You're starting to get into a	95 1 perhaps. I don't know. It's -- I don't know of levels 2 that are measured for that in the literature. 3 BY MR. HENRY: 4 Q Do you know what asserted patent uses the term 5 away from and proximate to? 6 A I don't recall which patent uses that phrase. 7 Q Do you know if any of the asserted patents 8 discuss decibel levels at which one might characterize 9 voices as normal or shouting or quiet? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: I don't know of any patents. Although, 12 I haven't reviewed them all carefully, but I don't recall 13 seeing anything where a specific decibel level was 14 mentioned. 15 BY MR. HENRY: 16 Q Do you recall having seen anything in any of the 17 asserted patents where they actually talk about a normal 18 conversational level? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: I know from the patents that there is a 21 discussion of speech communications, and I believe there 22 is reference to distances that seem equivalent to 23 proximate talkers. 24 BY MR. HENRY: 25 Q What distances are those, Dr. Begault?
94 1 quiet voice there. 2 Q And then below that, you get to a whisper or what 3 would you call it at an even lower decibel level? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: At a fixed distance, it becomes a lower 6 decibel level. I don't get your question. 7 BY MR. HENRY: 8 Q Oh, my question was, we sort of went shouting, 9 normal, quiet level. Is there something below quiet level 10 in your view? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: I guess there's gradations within each 13 of these categories I'm giving you. There's a lot of 14 literature where people were asked to speak or shout at 15 different levels, and then that's used as the scientific 16 basis for evaluating speech communication. 17 BY MR. HENRY: 18 Q So I'm asking, so is there a gradation below what 19 you refer to as quiet level? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: No. I mean, I don't know of anything 22 that's in the literature that goes below quiet speech. As 23 we get quieter and quieter, you know, if one is -- well, 24 it's difficult to produce articulate speech very quietly. 25 And then, yes, you are getting into inarticulate speech	96 1 A In the range of 1 to 3 meters, I believe. 2 Somewhere in there. 3 Q Is that how you define proximate, 1 to 3 meters? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: I haven't thought about how to define it 6 exactly, but what I think about it, if a normal voice as 7 58 decibels at a meter and goes down to about 52 decibels 8 at 2 meters, and that's at a normal conversation. And 9 that's typically what's used -- well, I'm sorry, that's 10 typically what's measured, right, in normal speech 11 communications, then those would be the levels, if you 12 will, that would be equivalent to a proximate talker in 13 the real world -- or in reality, right? 14 BY MR. HENRY: 15 Q Do you know if the asserted patents discuss those 16 levels at all that you just mentioned? 17 A I don't know one way or the other at this point. 18 I know that they discuss speech communication in a range 19 of 1 to 3 meters. I think there's also discussion of 20 people farther away, like for instance, in another room or 21 something of that sort. I don't recall exactly. But 22 there is a -- there are what appears to be proximate 23 conditions for another talker based on my definition here, 24 having to do with normal speech levels. 25 And then there are distant sounds beyond a

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97 1 proximate distance. 2 BY MR. HENRY: 3 Q What's your definition for proximate distance? 4 A My definition for proximate distance would be 5 normal speech levels, the levels at which those -- normal 6 speech level would be intelligible. 7 Q I'm sorry. I think you said my definition for 8 proximate distance would be normal speech levels, the 9 levels at which those normal speech level would be 10 intelligible. I'm not -- 11 A Right, as a function of distance -- 12 Q So -- 13 A So speech changes its level as a function of 14 distance to the receiver, between a source and a receiver. 15 And I would say that you are still proximate to the degree 16 that a normal talker -- I'm sorry, a talker speaking in a 17 normal level of voice or a virtual talker speaking at a 18 normal level of voice would be intelligible, that 19 equivalent distance. And that equivalent distance is 20 roughly between 1 and 3 meters, if I recall. 21 Q Do you know if any of the asserted patents 22 discuss or mention intelligibility as a demarcation of 23 when something is proximate? 24 MR. ELLIOTT: Objection to form 25 THE WITNESS: I don't recall the word demarcation	99 1 THE WITNESS: I don't remember the specific word 2 intelligibility. 3 BY MR. HENRY: 4 Q Now, Dr. Begault, is the water cup next to you 5 away from you? 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: Yes. It is not inside of me. 8 BY MR. HENRY: 9 Q Is the house next to your house away from you? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Yes, it is not inside of me. 12 BY MR. HENRY: 13 Q Is that your definition of when something is away 14 from you, that it's not inside of you? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I think 20 minutes ago to half an hour 17 ago, I gave you a definition -- or not a definition. I 18 said a statement that all things are essentially outside 19 of me except for physical sounds that occur from within 20 inside my body or certain audio sounds that I might hear 21 inside of my head. 22 BY MR. HENRY: 23 Q And when we were having that discussion earlier, 24 we were talking about sounds being a distance from you, 25 and now I was asking you about things that are away from
98 1 appearing in any of the patents. 2 BY MR. HENRY: 3 Q Do you recall the asserted patents in any other 4 way referring to intelligibility as a way to judge whether 5 a sound is proximate to a listener? 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: I would have to review the patents to 8 give you an accurate answer to that. 9 BY MR. HENRY: 10 Q So without doing that and sitting here right now, 11 you can't remember any of the asserted patents discussing 12 intelligibility as a way to determine whether something is 13 proximate to something else? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: I don't recall exactly where I believe I 16 saw something along those lines, having to do with 17 intelligible speech. And maybe the word intelligible 18 wasn't used, but it did use the word speech communication 19 which would infer somebody talking at a proximate distance 20 equivalent to a level for a normal speaker, which is in 21 that range of 1 to 3 meters. So that's what I recall. 22 BY MR. HENRY: 23 Q Do you remember any of the asserted patents even 24 mentioning intelligibility? 25 MR. ELLIOTT: Objection to form.	100 1 you. Do you distinguish between those at all? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: I guess it depends on what we're talking 4 about and the context away and distant. And I don't know. 5 It could mean different things in different contexts. 6 You'll have to be more specific. 7 BY MR. HENRY: 8 Q Sure. 9 Is the house next to your house away from you? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Well, in discussing houses, I think we 12 decided that that was a -- we didn't decide. I should say 13 I stated that the judgment of a house being away from me 14 might be subjective in terms of distance. Right? 15 So it's clearly away from me because it's not 16 inside my body. So it is away from me at some distance. 17 BY MR. HENRY: 18 Q When is a sound away from you? 19 A When it is externalized. 20 Q If there's a distance of five feet between you 21 and a sound, is that sound away from you? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: A sound that is 5 feet away from me, is 24 that away from me? Is that what you said? So your 25 question -- you answered your own question, right? Is the

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101 1 sound away from me away from me. 2 BY MR. HENRY: 3 Q I can repeat the question. 4 A Or phrase it differently. 5 Q I'll ask it again. 6 If there's a distance of 5 feet between you and a 7 sound, is that sound away from you? 8 A Oh, I apologize. I didn't hear -- 9 MR. ELLIOTT: Objection to form. 10 BY MR. HENRY: 11 Q I don't mind repeating questions, Dr. Begault. 12 Go ahead. 13 A Well, and I apologize for mishearing. Yes, that 14 sound is away from me. 15 Q If there is a distance of 5 feet between you and 16 a sound, is that sound proximate to you? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: It depends on what kind of sound we're 19 talking about. If we're talking about, you know, dropping 20 a pin on a desk, then that might be not very proximate to 21 me. Because I was trying to hear the sound of the pin 22 dropping on the desk. 23 If it's a talker, of somebody speaking at a 24 normal tone of voice, 5 feet might be proximate. 25	103 1 A Depends how quiet we're talking about -- sorry. 2 I can understand most talkers at 5 feet distance. 3 Q At a certain decibel level a talker at 5 feet, in 4 your view, would cease to be proximate to you? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: Hard to imagine unless the person were 7 doing something unusual to make their speech incredibly 8 quiet, like maybe put their hand over their mouth or 9 something of that sort. 10 BY MR. HENRY: 11 Q But that would do it in your view, right? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: That's a hypothetical. I'd have to 14 really think about that. I'm not even sure. I mean, I'd 15 probably -- you still would hear something at that 16 distance. But clearly the levels that we can hear at 5 17 feet from a vocal apparatus from a human are pretty wide, 18 right? We can hear a fair amount of speech at that level. 19 It's as that distance increases, that the speech 20 will become less intelligible. 21 BY MR. HENRY: 22 Q Would a speaker who shouted at 5 feet away from 23 you be proximate to you? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Yes. They would be proximate.
102 1 BY MR. HENRY: 2 Q Why do you draw the distinction between the pin 3 and the talker? 4 A Because speech intelligibility is a well-studied 5 subject where -- and speech communication as well between 6 people, where distance for normal speech communication is 7 well-understood. I draw the distinction because of the 8 pin dropping, it's a very, very tiny sound. And to hear 9 that sound, let's assume that it's 20 decibels or 10 something like that, peak, you'd have to be very close to 11 that sound to be able to hear it. 12 So it might be, quote/unquote, unintelligible at 13 that 5-foot range. 14 Q And your view that the speaker sound at 5 feet 15 would be proximate to you, is that also dependent on the 16 intelligibility of that sound? 17 A The 5-foot distance corresponds to intelligible 18 speech or intelligible talker, to a normal hearing 19 listener speaking at a normal tone of voice. 20 Q So would the quiet tone of voice we discussed 21 earlier at that same distance be proximate to you? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: It could be. 24 BY MR. HENRY: 25 Q It's not necessarily?	104 1 BY MR. HENRY: 2 Q If there were a distance of 10 feet between you 3 and a sound, would that sound be away from you? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: What kind of sound are we talking about? 6 BY MR. HENRY: 7 Q Does it matter? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Yes. 10 BY MR. HENRY: 11 Q Why? 12 A If you are 10 feet away -- was that the distance 13 you would use, 10 feet? Can you say yes or no? 14 Q I can say it. It was 10 feet. 15 But let me ask you this question again, 16 Dr. Begault. 17 A Okay. I just want to answer you accurately. 18 Q If there were a distance of 10 feet between you 19 and a sound, would that sound be away from you? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: I restricted my answers to talking about 22 speech. If it were a trombone blasting away at, you know, 23 triple forte, then 10 feet might seem too close. Right? 24 Because the trombone sound would be very intelligible not 25 only at 10 feet but maybe even 20 feet or 30 feet.

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105 1 Whereas speech at 10 feet or maybe a quiet 2 talker, you might start to lose certain consonants due to 3 the reduction in level. So it depends really on the type 4 of sound. 5 BY MR. HENRY: 6 Q So are you using intelligibility as a measurement 7 or criteria for a sound being away from you in addition to 8 using it as criteria for determining when sound is 9 proximate to you? 10 MR. ELLIOTT: Objection; form. 11 THE WITNESS: No. You've mixed up the criteria. 12 BY MR. HENRY: 13 Q My question was about whether the sound would be 14 away from you if there was a distance of 10 feet between 15 you and a sound. Would it be? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: Again, anything that is not inside of my 18 body or inside of my head is technically away from me. 19 BY MR. HENRY: 20 Q And so if there was a sound that was at a 21 distance from you of 20 feet, would that sound be away 22 from you? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: Yes. Yes. Anything, again, that is not 25 inside my body or inside of my head is technically at a	107 1 you? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: I think we are getting past 3 -- the 4 3-meter approximation I was making. It could be. It 5 might not be. I think we're getting towards the edge of 6 that. I think the example I used in my declaration was 7 something around 20 feet being the edge. I said a long 8 distance of 20 feet or more. 9 BY MR. HENRY: 10 Q So we were just talking about speech sound at 11 15 feet, and you said it might be proximate or it might 12 not be proximate. When would it be and when would it not 13 be? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: Well -- so I would say you're getting at 16 the edge of proximate, and it kind of depends on the 17 context. You can be 15 feet away from somebody in a 18 conference room, for instance, and having intelligible 19 speech communication because the background sound is low. 20 So that might qualify as proximate to -- or at the edge of 21 it because a person could speak in a normal tone of voice. 22 And for most talkers, would be intelligible at 15 feet 23 because we would have the absence of other sounds in the 24 background. 25 But in most everyday conversation, people use
106 1 distance or away from me. 2 BY MR. HENRY: 3 Q And if there were a distance between you and a 4 sound of 30 feet, would that sound be away from you? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: Yes. 7 BY MR. HENRY: 8 Q Now, if there were a distance of 10 feet between 9 you and a sound, would that sound be proximate to you? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: It depends on the type of sound. We 12 went through that exercise discussing the pin drop versus 13 speech. 14 BY MR. HENRY: 15 Q If there were a speech sound, at a distance of 10 16 feet from you, would that speech sound be proximate to 17 you? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: That might be around -- yeah, we're 20 getting close to the limit, but yeah, I would still 21 consider a speech sound at 10 feet, that would probably be 22 proximate, or we're within the range of 3 meters. 23 BY MR. HENRY: 24 Q If there were a speech sound at a distance of 25 15 feet from you, would that speech sound be proximate to	108 1 visual cues as well as audio cues to understand speech. 2 We're all doing some form of lip reading, and so when you 3 get out to about 15 feet or so, it's harder to see the 4 details in people's faces as they talk. So there's a 5 diminution of, intelligibility I would think, at that 6 range. 7 BY MR. HENRY: 8 Q So -- 9 A So it's a gray area, I would say, to follow up on 10 this. But I've been using an example. I gave a far 11 distance of 20 feet in my declaration. 12 Q So if there were a distance of 20 feet between 13 you and a speech sound, would that sound be proximate to 14 you? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I think that's where I would draw the 17 line. I would say at 20 feet, you are no longer proximate 18 to somebody, from a speech communication standpoint. I'd 19 have to look -- yeah. 20 BY MR. HENRY: 21 Q Okay. Were you finished? 22 A Yeah, I'm finished. 23 Q Okay. And, Dr. Begault, you draw that line 24 because that's the line at which intelligibility drops 25 below the level of normal speech in your view?

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109 1 A Under certain background sound conditions. 2 Q So you draw that line because that's the line at 3 which intelligibility drops below the level of normal 4 speech under certain background conditions; is that fair? 5 MR. ELLIOTT: Objection; form. 6 THE WITNESS: I use 20 feet because that's about the 7 distance at which normal speech you might start getting a 8 reduction in intelligibility under specific background 9 conditions -- background noise conditions, I should say. 10 BY MR. HENRY: 11 Q What background noise conditions are those? 12 A I'm not sure. There are -- 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: I'm not sure exactly which ones, but I 15 think those correspond to normal background levels in 16 rooms. So it wouldn't apply to let's say, a noisy day 17 outdoors with lots of wind in the trees, the wind at 18 30 miles an hour, and so the background noise increases. 19 Or let's say you're near a freeway, busy freeway, 20 then that proximate point would need to be closer because 21 speech intelligibility would be degraded. You'd need to 22 be closer to somebody with a large -- with a high 23 background noise level. 24 BY MR. HENRY: 25 Q So if you were out in your backyard under windy	111 1 to a listener? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: Generally speaking, yes. 4 BY MR. HENRY: 5 Q Dr. Begault, what is a spatial acoustic image? 6 A Well, that's a phrase that I don't think I use 7 typically. So I could speculate as what is meant by that. 8 Did a specific person make that phrase? Or did I? Or 9 somebody else? I can give you my best guess as to what it 10 means. 11 Q Sure, you did use it. 12 I won't hide the ball from you, Dr. Begault. I 13 asked because you used it in paragraph 11 of your 14 declaration. If you want to go ahead and -- 15 A Sure. 16 Q -- look at paragraph 11 of Begault Exhibit 1. 17 A Sure, sure, I did use it. Okay. Well a spatial 18 acoustic image means the virtual position of a sound 19 object. 20 Q And what's a sound object? 21 A That would be the virtual representation of a 22 talker. 23 Q Acoustically or visually? 24 A I'm talking acoustically. 25 Q So that's not -- you're not actually talking
110 1 conditions, then, a speech sound at 20 feet from you might 2 not be proximate to you, because of those conditions; is 3 that fair? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: Speech intelligibility might be degraded 6 at that level of background noise. 7 BY MR. HENRY: 8 Q And then in your view, that would affect whether 9 the speech sound is proximate to you or not proximate to 10 you? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: Well, this is a highly specialized 13 situation you're describing where we're kind of out at the 14 limits here. Again, I said there's a kind of a gray area. 15 But in normal speech communications, let's say if you and 16 I were speaking to one another over a conference table, we 17 would probably be at a different -- at a distance, I'm 18 sorry, of 2 to 3 meters approximately so that we wouldn't 19 need to raise our voices to be heard and that we could 20 make eye contact and also use visual cues, lip reading and 21 other things to augment speech intelligibility. 22 BY MR. HENRY: 23 Q And those factors that you just mentioned are 24 factors that in your view go into determining when a 25 speech sound is proximate to a listener or not proximate	112 1 about -- when you say spatial acoustic image, you're 2 actually talking about an audio source, not necessarily a 3 visual image, right? 4 A Correct. Acoustic modifies image. 5 Q Okay. In your experience are acoustic images and 6 visual images often tied together in virtual reality 7 settings? 8 A Not always. 9 Q Under what circumstances would they not be? 10 A Well, the acoustic image can have a different 11 position from the talker. So you could see something 12 visually, and the sound can come from somewhere else. 13 I've done experiments like that. 14 Q To test what? 15 A I'm sorry, to test what? 16 Q Mm-hmm 17 A Oh. So there was a device that I developed once, 18 so that you would hear your voice -- well, basically, I 19 would shift the sound of your voice from inside your head, 20 to outside your head because I would put microphones in my 21 ears. And so you would wear a pair of headphones and hear 22 my microphone, and so my voice becomes internalized in 23 your head. And then you hear your (indecipherable 24 utterance) voice outside of your head. We humorously 25 refer to this as to --

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113 1 THE STENOGRAPHIC REPORTER: I'm sorry. Doctor, you 2 cut off for me. Hello? 3 THE WITNESS: The court reporter is having a problem. 4 MR. HENRY: Yeah, why don't we go off the record and 5 fix that. 6 THE WITNESS: Yes, then I'll continue my example. 7 THE VIDEOGRAPHER: The time is 12:14. We're going off 8 the record. 9 (Recess taken.) 10 THE VIDEOGRAPHER: The time is 12:46. We are back on 11 the record. 12 BY MR. HENRY: 13 Q All right, Dr. Begault. Before we took a break, 14 you were describing an example experiment you did. If 15 you'd like to continue, I'd like to give you the 16 opportunity to finish your explanation of that experiment. 17 A If you'd like, I was basically giving you an 18 example where -- maybe you could restate your question. 19 You were asking for an example of something. And so... if 20 you could just restate that, yeah. 21 Q No worries. We can come at it a different way 22 too. I'm just wondering if -- can we agree that most 23 sounds in virtual reality are (indecipherable utterance) 24 connected to visual events? 25 MR. ELLIOTT: Objection to form.	115 1 reality applications are somehow connected to visual 2 events? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: No, not necessarily. 5 BY MR. HENRY: 6 Q What is monaural sound, Dr. Begault? 7 A Monaural is usually a term used in audio 8 reproduction to refer to a single channel of recorded 9 audio information. 10 Q What is stereo sound? 11 A Same answer, but two channels of information. 12 Q Do you draw any distinction between monaural 13 sound and binaural sound? 14 A Between monaural and binaural? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: Yes, I do draw a distinction. 17 BY MR. HENRY: 18 Q What distinction do you draw between monaural 19 sound and binaural sound? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: Again, I'm focusing my answers here on 22 the way that something is recorded, not necessarily 23 reproduction method. But usually monaural sound involves 24 one channel of recorded sound, and usually binaural 25 sound -- no, binaural sound always involves two channels
114 1 MR. HENRY: Sorry. Somebody's got an open mic, and 2 we're getting echoes. 3 THE STENOGRAPHIC REPORTER: Mr. Henry, can you repeat 4 your question, and then I'll mute myself. 5 MR. HENRY: Sure. 6 BY MR. HENRY: 7 Q Dr. Begault would you agree that most sounds in 8 virtual reality applications are connected to visual 9 events? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: And now Kyle has an echo, but I think I 12 can understand his objection sufficiently. It's like you 13 might have a speaker on and -- I don't know. Something's 14 feedbacking. 15 In any event, let's get to your question. No, 16 there are -- there's not necessarily a connection between 17 sounds and visual objects in virtual reality, if I stated 18 your question correctly. There's not necessarily a 19 connection for most. I don't know how I would quantify 20 most versus -- and times, but I can imagine many 21 situations where there are many sounds involved in virtual 22 reality that are not connected to a specific visual 23 object. 24 BY MR. HENRY: 25 Q Would you agree that most sounds in virtual	116 1 of sound recorded typically either through the ears of a 2 dummy head or using some sort of 3D audio technique. 3 BY MR. HENRY: 4 Q Do you draw any distinction between stereo sound 5 and binaural sound? 6 A Yes, I do. 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: Yes, I do. 9 BY MR. HENRY: 10 Q What distinction do you draw between stereo sound 11 and binaural sound? 12 A Stereo sound can include recording techniques 13 that is two microphones, for instance, arranged in 14 coincident pairs or two microphones spread apart without 15 any reference to the anatomy of the head or the outer ear. 16 Binaural sound usually includes some anatomical feature of 17 the human head. 18 Q I'd like to talk a little bit about head 19 related -- a little bit more about head-related transfer 20 functions, Dr. Begault. Okay? 21 A Yes. 22 Q And if you look at your declaration, which is 23 Exhibit 1, in paragraph 13. 24 A Yes. 25 Q Okay. And you have a subparagraph there of 1 --

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117 1 well you have three subparagraphs, 1, 2 and 3. Do you see 2 that? 3 A I do. 4 Q Okay. In the first subparagraph of paragraph 13 5 in your declaration, you wrote, Many factors other than 6 HRTFs are responsible for how sound reaches the ears of a 7 listener, such as room acoustics, head movement, intensity 8 of the sound source, et cetera. 9 Do you see that? 10 A I do. 11 Q So can we agree that in processing sound with 12 HRTFs to generate binaural sound, there are many factors 13 other than HRTFs that must be considered? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: Repeat the question? 16 BY MR. HENRY: 17 Q Sure. 18 Can we agree that in processing sound with HRTFs 19 to generate binaural sound, there are many factors other 20 than HRTFs that must be considered? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: It's very vague the way you put that. I 23 mean, one could imagine a situation where we didn't 24 consider anything else but HRTFs. 25	119 1 A Well, in this paragraph, what I'm addressing is 2 defendant's claim construction. And defendant's claim 3 construction added this phrase about how sound reaches the 4 listener. And I was making a counterargument to that, 5 that a head-related transfer function is not defined as 6 how sound reaches a listener because many things can 7 affect a sound as it reaches the listener, for example, 8 the things I have mentioned here. 9 But that's not a definition of a head-related 10 transfer function. 11 Q Okay. What I'm asking you, Dr. Begault, is how 12 do room acoustics then affect how sound reaches the 13 listener? 14 A There can be the addition of reverberation. 15 Q What else? 16 A There could be attenuation. 17 Q What else? 18 A Those are two things I think of. And I don't 19 know if that's what was meant in defendant's claim 20 construction or not. I'm just giving you some examples of 21 two ways of the way sound can be affected by how it 22 reaches a listener. 23 Q Sure, and, Dr. Begault, I'm asking about this 24 because you wrote room acoustics, that's not in 25 defendant's construction. So I want to know what you
118 1 BY MR. HENRY: 2 Q Typically -- 3 A Like it's -- but you might consider other 4 factors. 5 Q I thought you were done. 6 A Sorry. 7 Q Sure. Typically in your work in (indecipherable 8 utterance) audio, do you consider more than just HRTFs 9 when you're working the process -- 10 THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, 11 there was talking over one another, and I have to take 12 some seconds to unmute myself for the audio. So I didn't 13 hear. Can you restart your question? 14 MR. HENRY: That's fine, totally fine. 15 BY MR. HENRY: 16 Q Let's start again. 17 Typically in your work, Dr. Begault, in the 18 industry when you're working to render spatialized audio, 19 do you consider more than just HRTFs? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: From the processing standpoint, it 22 depends. 23 BY MR. HENRY: 24 Q Okay. When -- in paragraph 13 when you refer to 25 room acoustics, what did you mean?	120 1 meant by that term. 2 A Well, okay. So I meant reverberation, and in 3 primarily, but I could have been more specific and said 4 things such as defraction, absorption, things of that 5 sort, reflection. I could have gone into greater detail 6 on the characteristics of room acoustics if you will. 7 Q Okay. And all those factors that you just 8 mentioned affect how sound reaches a listener's ear? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: It -- it can. 11 BY MR. HENRY: 12 Q Okay. How does head movement affect how sound 13 reaches a listener's ears? 14 A Head movement can change the orientation of a 15 sound source to a listener. 16 Q And how would that affect how the sound actually 17 reaches the ears of a listener? 18 A It would change the spectrum and time of arrival 19 of the sound to the two ears. 20 Q What's attenuation? 21 A It's a fancy way of saying a reduction in sound 22 pressure level. 23 Q You use the term gain. What does that mean? 24 A That's a simplified way of saying an increase in 25 sound pressure level.

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121 1 Q Is it different than intensity, sound pressure 2 level? 3 A From a lay standpoint, people would 4 interchangeably use the word intensity, and sometimes I've 5 even used the word intensity to mean volume or sound 6 pressure level. But there's a technical term. There's a 7 technical definition of intensity that has to do with 8 particle velocity of a sound, which I'm not really 9 considering. So if I used the word intensity, I probably 10 should have just used sound pressure level or gain. 11 Q But when you are speaking in those terms, you're 12 talking about the volume of sound. Is that fair? 13 A In a lay way, you could say volume as far as when 14 we adjust what's called a volume knob on our receiver or 15 car radio. 16 Q What's an ILD? 17 A Interaural level difference. 18 BY MR. HENRY: 19 Q And for the court reporter, that's inter 20 a-u-r-a-l, right? 21 A Yes. 22 Q And what is an ILD? 23 A An interaural, a-u-r-a-l, level difference. 24 Q Right. What does it mean? 25 A Oh, the difference in level at the two ears.	123 1 intelligibility is enhanced by lip reading. 2 BY MR. HENRY: 3 Q What's the ventriloquism effect, have you heard 4 of that? 5 A Oh, yes. 6 Q What is it? 7 A The ventriloquism effect is where sound emanates 8 from one location, and it's perceived to be at another 9 location. 10 Q Is it like a ventriloquist dummy, where the 11 ventriloquist is behind the dummy? 12 A I wouldn't know specifically, but I think they 13 are referred to as ventriloquists, where the idea is to 14 throw one's voice. I think in the back of comic books 15 from the 1950s or something, there used to be ads for 16 throw your voice. But really what it is is it's a 17 decoupling of visual stimuli from audio stimuli. And 18 sometimes you can shift the audio stimulus to correspond 19 with the visual stimulus. 20 Q And you said you would shift it to correspond 21 with the visual stimulus, but I think you mentioned sort 22 of injecting some incongruity there. Am I not following 23 correctly? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: I didn't use the word incongruity.
122 1 Q What's an ITD? 2 A Interaural time difference. 3 Q And what does that mean? 4 A Simply the difference in time of arrival of a 5 signal in two ears. 6 Q Any environmental factors affect how sound 7 reaches the ears of a listener? 8 A Room acoustics. 9 Q Any other types of environmental factors besides 10 room acoustics? 11 A Sure, I guess you could say background noise 12 might influence the way a sound reaches a listener. Under 13 certain conditions maybe even temperature could affect how 14 sound reaches a listener. 15 Q What about familiarity with a sound. Does that 16 have an effect on how sound is perceived by a listener? 17 A Well, that's different than how it reaches the 18 listener. Now you're talking about perception. So, yeah, 19 you can – familiarity will affect the way somebody 20 perceives a sound. 21 Q And what about associated visual cues? How does 22 that affect how listeners might perceive sound? 23 A I gave you an example – 24 MR. ELLIOTT: Objection; form. 25 THE WITNESS: I gave you an example earlier how speech	124 1 BY MR. HENRY: 2 Q No, I know. But you mentioned you could put them 3 in different locations. 4 A One might be able to. I mean, I did speak 5 earlier that not in all cases, is there a corresponding 6 visual and auditory cue that are collocated. One can 7 manipulate those things independently. 8 Q Okay. And you talked just a moment ago talked 9 about decoupling visual and audio stimuli, right? 10 A Yes. 11 Q And is that what the ventriloquism effect refers 12 to? 13 A I don't know exactly how it's used in all cases, 14 but when I've referred to it in the past, I've referred to 15 the decoupling of an auditory stimulus to a visual 16 stimulus. So, for instance, you could be watching a music 17 video, for instance, and the loud speaker might be several 18 feet away from the performers on the screen or on your 19 home television, for instance. But one tends to localize 20 the sound to correspond to the visual image. 21 Q How long has the ventriloquism effect been 22 studied in the industry? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: In which industry? I wouldn't know the 25 answer to that question.

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125 1 BY MR. HENRY: 2 Q When did you first learn of the ventriloquism 3 effect? 4 A Oh, I don't recall. I know I mentioned it in my 5 book in 1994 which I probably wrote in 1992. 6 Q Why would you decouple audio and visual stimuli? 7 A I don't know of a specific reason, other than you 8 may want to increase speech intelligibility or sound 9 quality, or sometimes they call it the user experience. 10 You might want to enhance that somehow by having a 11 different location for the audio stimuli or the visual 12 stimuli. So, for instance, in film sound, oftentimes 13 sounds are generated from locations other than the visual 14 stimuli because obviously you can't have the two 15 corresponding to one another, unless you had a loud 16 speaker following the person behind the screen. 17 And so often those are decoupled for the purpose 18 of increasing either speech intelligibility or for an 19 emotional effect or for some other enhancement of the user 20 experience. 21 Q You mentioned HRTFs being recorded for the use of 22 dummy heads earlier. Do you remember that? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: Not specifically, but I don't think we 25 talked about HRTF measurement.	127 1 And then an analytic impulse is sounded from the 2 loud speaker and then a measurement is made at the ears of 3 the dummy head, et cetera, for different locations of 4 where the sounds are. 5 BY MR. HENRY: 6 Q And you mentioned the HRTFs being collected 7 through use of a sound source located at 1 to 2 meters or 8 sometimes farther away. Is there any particular distance 9 that's typically used or usually used? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Yes. Ideally, you want to get out to at 12 least a wavelength of interest from the dummy head when 13 you make these measurements. 14 BY MR. HENRY: 15 Q And what distance would correspond to a 16 wavelength of interest? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Depends on your -- 19 Sorry. 20 Depends on your application, but in most 21 applications, you would want to be out to something -- if 22 we're talking about speech, you might want to be -- let's 23 see, just doing a calculation in my head. 24 So I think if you get out to about two and a half 25 feet from the dummy head, you're capturing most
126 1 BY MR. HENRY: 2 Q Do you remember -- either way, do you know that 3 HRTFs are measured with dummy heads? 4 A They can be. I've done it myself. 5 Q Okay. Are you familiar with KEMAR, K-E-M-A-R? 6 A Yes. 7 Q What is KEMAR? 8 A It is a dummy head that was originally developed 9 by Knowles, K-n-o-w-l-e-s Electronics. And I believe now 10 is distributed by GRAS, g-r-a-s-s, Acoustics. 11 Q Was the KEMAR dummy used to develop a database of 12 HRTFs? 13 A Yes. It's been used many times to develop HRTFs 14 databases. It has interchangeable ears. So there's many 15 varieties of KEMAR HRTFs, and the KEMAR itself has gone 16 through several phases of modification. 17 Q And how are the measurements taken around a KEMAR 18 dummy to collect HRTFs? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: Well, I'll tell you a typical way that 21 it's done, is that an anechoic chamber is used, and the 22 dummy head is located centrally. And then a sound source 23 is located 1 to 2 meters away from that dummy head, 24 sometimes farther away depending on the side of the 25 anechoic chamber.	128 1 frequencies of speech. 2 BY MR. HENRY: 3 Q Do you know if measurements have been made with a 4 KEMAR dummy at a distance of 1.4 meters to create a 5 database? 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: It would -- sure. I believe that maybe 8 that has occurred. I don't recall the exact measurement 9 distances. People are frequently constrained by the size 10 of their anechoic room when they do these kinds of 11 measurements. 12 BY MR. HENRY: 13 Q But you could measure HRTFs at different 14 distances; is that fair? 15 A Well, you can measure all kinds of crazy things, 16 but you definitely want to be able to have a planer wave 17 form for the distance that you're measuring so that you're 18 avoiding the effects of what we would call a near field 19 measurement where you're closer than a wavelength of 20 interest, and therefore, some different things occur that 21 aren't translatable over to the use of the HRTF in most 22 applications. 23 Q Do you dispute that HRTFs could be collected with 24 a KEMAR dummy head at a spherical -- with a -- strike 25 that.

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129 1 Do you dispute that you could collect HRTFs with 2 a KEMAR dummy head at a radial distance of 1 meter around 3 that dummy head? 4 A You can collect the measurements at any distance 5 you want. 6 Q Are you familiar with the CIPIC database? 7 A Yes, I am. 8 Q And that's C-I-P-I-C, CIPIC, right? 9 A I believe that's the correct acronym, yeah. 10 Q Do you know what it stands for? 11 A I used to know. I'm sorry, I don't remember. 12 Q Center for Image Processing and Integrative 13 Computing. Does that ring a bell? 14 A Yeah, is that the UC Davis database? 15 Q It is. 16 A Yes, so those were collected fairly near field. 17 Q Do you know the distance at which those HRTFs 18 were measured? 19 A I don't recall. 20 Q Would you be surprised to learn that they were 21 measured at a radial distance of 1 meter? 22 A Not at all. Because most of the effects of HRTFs 23 that people are concerned with have to do with where the 24 acoustical effects of the pinnae are most influential. 25 Q And where are the acoustical effects of the	131 1 influential. 2 Q So my question for you is so then how does that 3 relate to your lack of surprise in the CIPIC database 4 having collected HRTFs at 1 meter? 5 A Well, because 1 meter is so much longer 6 wavelength than 6 kilohertz. 7 Q Okay. Are you aware of people using near field 8 HRTFs? 9 A It is a term that has been used or explored. For 10 instance, I know that it is used in the patents as a kind 11 of category, and I've heard it used with relationship to 12 Dolby Atmos, where there isn't a precise definition. 13 THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. You 14 said Dolby at most? 15 THE WITNESS: A-t-m-o-s. Dolby, like the movie 16 theatre, and then Atmos, A-t-m-o-s. 17 THE STENOGRAPHIC REPORTER: And then you said where 18 there is not a precise definition or where there is a 19 precise definition? 20 THE WITNESS: Where there is not a precise definition. 21 THE STENOGRAPHIC REPORTER: Thank you. 22 THE WITNESS: You're welcome. 23 BY MR. HENRY: 24 Q What would constitute -- sorry. Were you 25 talking? I got some feedback. Strike that.
130 1 pinnae most influential? 2 A Six kilohertz and above. 3 THE STENOGRAPHIC REPORTER: I'm sorry. You said 4 pinna? 5 THE WITNESS: P-i-n-n-a-e. 6 THE STENOGRAPHIC REPORTER: Thank you. 7 THE WITNESS: Did I say that right? P-i-n-n-a-e, 8 that's two, and one is a p-i-n-n-a. 9 THE STENOGRAPHIC REPORTER: Thank you. 10 BY MR. HENRY: 11 Q How does that -- how does that correspond to the 12 distance at which HRTFs were measured? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: I don't understand your question. 15 BY MR. HENRY: 16 Q Sure. I asked you would you be surprised to 17 learn that the CIPIC database collected HRTFs at 1 meter, 18 and you said not at all because most of the effects of 19 HRTFs that people are concerned with have to do with where 20 the acoustical effects of the pinnae are most influential. 21 Do you remember that? 22 A Yeah, I do. 23 Q And then I basically asked you where is that, and 24 you said 6 kilohertz and above. Right? 25 A Yes. That's where the pinnae is most	132 1 What would constitute a near field HRTF in your 2 view? 3 A Well, my answer to that would depend on the 4 frequency of interest. 5 Q Why? 6 A Because it has to do with the sound source that's 7 being used as either radiating a plane wave or a spherical 8 wave. 9 Q How would that change the meaning that you would 10 have strived to near field HRTF? 11 A At the point at which the sound source is no 12 longer producing a plane wave and becomes spherical, the 13 HRTF would modify from being a -- from being constant 14 across different farther distances, except for a gain 15 term, as I described in my declaration. 16 So when you get very close to the device you're 17 measuring, and the sound source that you're using is no 18 longer producing a plane wave, then there can be certain 19 distortions or changes in the... particularly, the low 20 frequencies and maybe the time domain of some of the 21 measurements. 22 But that's one -- that's my definition, and I 23 don't know if that's necessarily the definition that's 24 used in the patents. I believe the definition in the 25 patents is more categorical.

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133 1 Q Is it your opinion that all 3D audio systems use 2 HRTFs that are only measured at one distance? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: I can't answer a question that has the 5 superlative all in it. But I can tell you that most HRTFs 6 are measured at one distance, and then those HRTFs are 7 scaled. There could be exceptions. Maybe somebody was 8 doing some experiments trying to find this effective on 9 low frequencies for very close distances. There could be 10 some experimental data that way. 11 I can tell you from experience that it doesn't 12 make a lot of difference in many applications. I've 13 heard -- well, some of the literature's reported it as 14 being a very weak effect. 15 BY MR. HENRY: 16 Q You said that most HRTFs are measured at one 17 distance. What is that distance? 18 A Usually, the distance of the wavelength of 19 interest and where the sound source is capable of putting 20 out a plane wave. 21 Q Is it 1 meter, is it 1.5 meters, is it 2 meters? 22 What distance? 23 A Depends -- 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: I didn't hear your objection.	135 1 BY MR. HENRY: 2 Q That's what I was getting at. It's not a 3 constant distance for HRTFs across all 3D audio systems, 4 fair? 5 A That's fair. 6 Q Okay. In your own patents, you've described 7 processing sound with HRTFs, right? 8 A Correct. 9 Q Including in patents from before 2014, right? 10 A That is correct. All of my patents, I believe, 11 are from before 2014. 12 Q And you've also disclosed in your own patents 13 from before 2014 processing sound to move virtual sound 14 images to different locations, right? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: That's correct. 17 MR. ELLIOTT: And relevancy. 18 THE WITNESS: Yes. That's correct. I have described 19 that in at least one of my patents. 20 BY MR. HENRY: 21 Q And you've also described in your own patents 22 from before 2014, generating binaural sound through 23 digital signal processors processing HRTFs, right? 24 MR. ELLIOTT: Objection to form and irrelevant. 25 THE WITNESS: That is correct.
134 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: Oh, form. 3 It depends on the wavelength of interest and 4 depends on the sound source that you're using. 5 THE STENOGRAPHIC REPORTER: Doctor, you said is 6 capable of putting out. Did you say a plane wave? 7 THE WITNESS: Yes. P-l-a-n-e wave. 8 BY MR. HENRY: 9 Q So you're not saying that all systems use HRTFs 10 that were measured at the same distance, and then used for 11 example, just HRTFs measured at 1 meter and then those are 12 used in every single 3D audio system, right? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: Many -- I could think of -- strike that. 15 I know that some 3D audio systems allow you to 16 switch between different HRTF measured sets that have been 17 measured at different distances. I know of HRTFs sets, 18 where only the high frequencies were measured and then the 19 low frequencies were synthesized at a later time or 20 otherwise assumed through an equalization process to have 21 a constant frequency response so that the main interest 22 was to capture the effects of the head shadow and the 23 pinna. But it's not a constant distance that is used in 24 all systems. 25	136 1 BY MR. HENRY: 2 Q I'd like to look at your declaration again, which 3 is Begault Exhibit 1. Okay? 4 A Yes. 5 Q Okay. And specifically, why don't you look at 6 paragraph 8, please. 7 A Okay. 8 Q Okay. The second sentence of paragraph 8 from 9 your declaration reads, These three terms are used 10 interchangeably in the specifications to describe the use 11 of any type of medium to enable communication between two 12 or more locations. Right? 13 A Yes, that's what it says. 14 Q Okay. After that sentence, you did not cite to 15 any disclosures from any of the asserted patents, right? 16 A If you are saying that I didn't point out 17 specifically where these interchangeable usages occur, I 18 didn't cite them, no. 19 Q And do you know what specifications you're 20 referring to in that sentence? 21 A I recall seeing some specifications that were 22 like that. But I don't recall which ones. 23 Q Looking at paragraphs 9 to 11 now, those relate 24 to the term away from and proximate to, right? 25 A Yes, sir.

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137 1 Q Okay. Looking at paragraph 10, in the last 2 sentence, are you there? 3 A Yes. 4 Q Okay. The last sentence of paragraph 10 of your 5 declaration reads, There are a plethora of examples in the 6 specifications where proximate to indicates two people 7 having a conversation in the same room. Do you see that? 8 A I do. 9 Q In your view, what qualifies as a plethora? 10 A Many. 11 Q How many examples would there have to be to 12 qualify as a plethora? 13 A I can't put a number on it. I think I saw it at 14 least twice, if not more. 15 Q It's your declaration. Is that the best you can 16 give me for what a plethora means? 17 MR. ELLIOTT: Objection; argumentative. 18 THE WITNESS: At this point that's the best I can give 19 you. 20 BY MR. HENRY: 21 Q Okay. And at the end of the sentence, you did 22 not cite to any of the asserted patents; is that correct? 23 A If what you're saying is did I give any specific 24 references to -- I'm sorry, if I -- if what you're saying 25 is did I give any citations to specific examples, I did	139 1 the functions were cited in the asserted claims of the 2 asserted patents can be found in the asserted patents? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: Same answer from the standpoint that 5 known audio DSP structures within the art is referring to 6 functional recitations in the patent. And so those can be 7 viewed as kind of descriptors, if you will, to functional 8 recitations of algorithmic steps. 9 BY MR. HENRY: 10 Q Are you saying that you analyzed the asserted 11 patents and found known audio DSP structures within the 12 art and common industry programming techniques and 13 software libraries for audio processing in the asserted 14 patents? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I -- I found references to processes. 17 And these processes, to me as a PHOSITA immediately 18 suggested certain algorithmic techniques that one would 19 use. 20 BY MR. HENRY: 21 Q And I'm asking you if in any of the paragraphs of 22 your declaration other than paragraph 16, did you identify 23 any algorithmic techniques from the asserted patents? 24 MR. ELLIOTT: Objection; form. 25 THE WITNESS: Paragraph 15.
138 1 not provide that. 2 Q I'd like to look at paragraph 16, and then we'll 3 circle back to some others. Let me know when you're 4 there. 5 A Yes. 6 Q Okay. Paragraph 16 in your declaration is the 7 only paragraph in which you offer any opinion regarding 8 algorithmic support for functions recited in the asserted 9 claims of the asserted patents, right? 10 A No, that's not true. 11 Q Okay. In what other paragraph did you identify 12 algorithmic support for the functions that are cited in 13 the asserted claims of the asserted patents? 14 A In the paragraph above it, I refer to common 15 industry programming techniques or software libraries for 16 audio processing. 17 Q And is it your testimony now that those are 18 disclosed in the asserted patents? 19 A In my declaration I was saying that the citations 20 that I give above, such as process sound to generate 21 binaural sound, et cetera, are known audio DSP structures 22 understood by a POSITA -- or I'm sorry, PHOSITA. 23 Q All right. And we're going to talk about that. 24 But I'm asking you if you identify or you opined in any 25 other paragraph besides 16, where algorithmic support for	140 1 BY MR. HENRY: 2 Q What is it in paragraph 15 that you believe 3 identifies algorithmic support or functions recited in the 4 asserted claims that appears in the asserted patents? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: Again, it's the recited functions that 7 define the structure, such as providing binaural sound to 8 a PHOSITA, that points me to my toolbox of techniques by 9 which a signal processing and algorithmic kinds of 10 structures would exist. 11 BY MR. HENRY: 12 Q Are you referring to just the recited functions 13 themselves in the claims there? 14 A I don't know if that's all I'm referring to. I'm 15 referring kind of holistically to reading these patents. 16 Q Well, what I'm asking you, Dr. Begault, is if in 17 your declaration, anywhere, you actually identified 18 algorithmic disclosure for the functions recited in the 19 asserted patents that appears in the asserted patents 20 other than what you state in paragraph 16? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: Again, I have found the processor terms 23 in paragraph 15, to indicate to me the equivalent of what 24 I discuss in 16. So there we're talking about convolution 25 operations, is what is typically used.

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141 1 BY MR. HENRY: 2 Q I'll ask again, Dr. Begault, because that wasn't 3 responsive to my question. 4 In your declaration is there anywhere where you 5 actually identified algorithmic disclosure for the 6 functions recited in the asserted patents that appears in 7 the asserted patents other than what you point to in 8 paragraph 16 of your declaration? 9 MR. ELLIOTT: Objection, argumentative and form, 10 including argumentative. 11 THE WITNESS: I have to give you the same answer, that 12 in paragraph 15 I feel that the processor terms that are 13 given here are indicative of algorithmic structures. 14 BY MR. HENRY: 15 Q What do you mean by they're indicative of 16 algorithmic structures, Dr. Begault? 17 A As a solid example, process sound to – process 18 sound to generate binaural sound is indicative to me as a 19 PHOSITA for certain algorithmic procedures by which that 20 sound might be rendered. 21 Q What algorithmic procedures, Dr. Begault? 22 A Well, we mentioned convolution in 16. We've 23 discussed that – excuse me. The literature commonly 24 available as of the disclosure date, is well-known to a 25 POSITA as a way to implement these algorithmic structures	143 1 paragraph 16, do you cite any disclosures from any of the 2 asserted patents? 3 A In paragraph 16? 4 Q That's right. 5 A You can see that there's an absence of any 6 citation. 7 Q Okay. And in paragraph 15, you have some 8 citations to the asserted patents, and here I'm including 9 the citations that you corrected via errata served today. 10 Okay. 11 A Correct. 12 Q Okay. Outside of the citations that you provided 13 in paragraph 15 as corrected by your errata, did you in 14 any place in your declaration, other than paragraph 15, 15 cite any other disclosures from the asserted patents? 16 A Give me a second here. 17 Well, I believe paragraph 14 could be seen in 18 that view because we're talking about DSP transformation 19 involving HRTF filtering. So there we're talking about 20 hardware structures that might be used. 21 Q Sorry, Dr. Begault. I -- is it your testimony 22 that paragraph 14 has citations to any disclosures from 23 the asserted patents? That's my question. 24 A Oh, I understand. 25 So let's see. 14. I don't have specific
142 1 that we're discussing, like processing sound to generate 2 binaural sound. 3 THE STENOGRAPHIC REPORTER: I'm sorry. It sounded 4 like you're saying POSITA with a P and then PHOSITA with 5 an F. Which one is it? 6 THE WITNESS: So I apologize. The word that is used 7 in the declaration is P-H-O-S-I-T-A, and I've been 8 pronouncing it POSITA, because in a prior case I was 9 involved with, that's what it was called. And then 10 another case I was involved in, it was called a POSA. I 11 might in the future just start calling it a person of 12 skill in the art, and with everybody's understanding that 13 I also mean what a PHOSITA, P-H-O-S-I-T-A, is. 14 Is that acceptable to you, Mr. Henry? 15 BY MR. HENRY: 16 Q I know what you're talking about. So I'm fine. 17 A Okay. 18 Is that acceptable to you, Kyle. 19 MR. ELLIOTT: Yes. 20 THE WITNESS: Good. Okay. So I will try to say 21 person of skill in the art. And if I slip, and I say 22 PHOSITA, or et cetera, et cetera, Court Reporter, you'll 23 know I'm spelling that P-H-O-S-I-T-A. 24 BY MR. HENRY: 25 Q Dr. Begault, let me ask you this. In	144 1 citations. 2 Q Do you have any citations to the asserted patents 3 in any paragraph in your declaration other than 4 paragraph 15? 5 A One moment. 6 I think paragraph 15 and 16 are the main ones 7 within the topic area you're asking me about. 8 Q Well, we already covered that paragraph 16 9 doesn't have citations in it, Dr. Begault. So I'm going 10 to ask you again. 11 Does -- do you anywhere in your declaration other 12 than paragraph 15, cite any disclosures from any of the 13 asserted patents? 14 A Not specifically. 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: Oh, sorry. 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Sorry. You want to restate your 19 objection? I'm sorry. 20 MR. ELLIOTT: No, you can go forward and answer. 21 THE WITNESS: Paragraph 15 is the only place where you 22 will find specific references to a particular line number 23 and column number, et cetera. 24 BY MR. HENRY: 25 Q Okay. Dr. Begault, let's -- we're going to put

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145 1 another document into the chat now. 2 A Okay. 3 Q And this is going to be Begault Exhibit 3. 4 (Whereupon Deposition Exhibit 3 was 5 marked for identification.) 6 BY MR. HENRY: 7 Q And the file name for this one, the PDF file 8 name, is US 9226090. 9 A I am waiting for it to arrive. 10 Q Yeah, and once it's circulated, just let me know 11 when you've had a chance to download it locally so you 12 have it and can open it and view it. 13 A Still not seeing it. 14 Oh, it has arrived. Okay. I have Exhibit 3 15 open. 16 Q Great. Dr. Begault, what is the document that's 17 been designated Begault Exhibit 3? 18 A It is United States Patent 9,226,090 B, as in 19 boy, 1. 20 Q If I refer to it as the '090 Patent, will you 21 know what I'm talking about? 22 A As per our earlier agreement. 23 Q Do you know which claims of this patent are 24 asserted in this case? 25 A Oh, off the top of my head, I don't remember the	147 1 THE WITNESS: Okay. Three minutes. I'll be right 2 back. 3 MR. HENRY: Well, let's take ten. So we'll be -- 4 MR. ELLIOTT: Ten? Ten, wow. Okay. 5 MR. HENRY: Or five, whatever. I don't care. Ten is 6 fine. We'll be back in ten. 7 THE VIDEOGRAPHER: The time is 1341. We're going off 8 the record. 9 (Recess taken.) 10 THE VIDEOGRAPHER: The time is 1358. We are back on 11 the record. 12 BY MR. HENRY: 13 Q Okay. Dr. Begault, let's look at claim 15 of the 14 '090 Patent, which is Exhibit 3. 15 A Very good. I am there. 16 Q Okay. This is one of the claims about which you 17 opined in your declaration, right? 18 A That is correct. 19 Q I'd like to look at the last limitation of the 20 claim which begins with the language, A processor that 21 executes the instructions. Do you see that limitation? 22 A I do. 23 Q And that limitation, the last limitation of claim 24 15 recites, a processor that executes the instructions to 25 adjust the binaural voice of the second person during the
146 1 specific numbers. 2 Q Remember any of them? 3 A I don't remember any specific numbers. 4 Q Do you know what claim terms about which you 5 opined in your May 3rd, 2023, declaration are recited in 6 the claims of the '090 Patent? 7 A If I looked at my declaration, then I would be 8 able to recall that. May I? 9 Q Sure. 10 A Okay. I'm going to give you a five-minute 11 warning for a bathroom break. But in the meantime, the 12 '090, you asked me which... the specifications or claims? 13 Q Which terms that you offered opinions about are 14 recited in the claims of the '090 Patent? 15 A Adjust the binaural voice, and yeah, that's it. 16 Q Why don't we look at claim 15, Dr. Begault. 17 THE STENOGRAPHIC REPORTER: Doctor, you said adjust or 18 just the binaural voice. 19 THE WITNESS: Adjust. 20 THE STENOGRAPHIC REPORTER: Thank you, that's what I 21 thought. 22 THE WITNESS: I'm going to take a three-minute break. 23 Can we do that? 24 MR. HENRY: Sure, we can go off the record. No 25 problem.	148 1 electronic phone call in order to position the sound 2 localization point of the binaural voice to a location 3 that is away from and proximate to the first person, 4 wherein the second localization point represents an origin 5 of the binaural voice of the second person to the first 6 person. Right? 7 A Except where you said second localization point, 8 you meant to say sound localization point, but otherwise, 9 you're correct. 10 Q All right. Thanks. 11 And when you read this term, do you understand 12 the term to mean that there is a processor that's 13 programmed in some way to achieve or perform the function 14 that's recited in the rest of this limitation? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I see a statement that says a processor 17 that executes the instructions. 18 BY MR. HENRY: 19 Q So then perform or achieve the function that's 20 recited after that, right? 21 A Yes, that's correct. 22 Q Okay. And do I understand correctly that in your 23 view, a person of skill in the art would have known how to 24 implement the system or method performing the processing 25 recited in the last limitation of claim 15 because a

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149 1 person of skill would have been able to resort to known 2 audio DSP structures within the art and common industry 3 programming techniques or software libraries for audio 4 processing? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I believe you more or less read my 7 declaration literally. And so, yes, that is my 8 assertion. 9 BY MR. HENRY: 10 Q And is it your opinion that a person of skill 11 would have known how to do that before 2014? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: Yes, it would my opinion somebody might 14 know that before 2014. 15 BY MR. HENRY: 16 Q What software libraries were available before 17 2014 that a skilled artisan could have used to adjust the 18 binaural voice of a person during an electronic phone call 19 to position an SLP to a location that's away from and 20 proximate to a listener? 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: Well, an earlier version would have 23 been -- or I'm sorry. An early example would have been 24 the Convolvotron, 1987 or '88. 25	151 1 you referring Max, M-a-x? 2 A M-a-x. It's a software program that allows 3 real-time signal processing. 4 Q And I'm sorry. Could you identify any others 5 that could be used before 2014 to perform a -- recite a 6 function of claim 15? 7 MR. ELLIOTT: Objection -- 8 THE WITNESS: Go ahead, Kyle. 9 MR. ELLIOTT: Objection to form. 10 You can go ahead. 11 THE WITNESS: Well, again, if we're talking about a 12 processor that executes instructions to adjust the 13 position of a binaural voice to a new location, I believe 14 there were several software libraries out there, that 15 would allow you to do that. 16 BY MR. HENRY: 17 Q Can you identify one? 18 A Sure, so another one is called Slab, S-I-a-b, and 19 that was a software distributed by NASA at one point. It 20 was basically a software version of a Convolvotron. And I 21 think the gaming industry probably had many solutions 22 prior to 2014, for doing this kind of manipulation that's 23 outlined here. 24 I don't know if specific software libraries -- I 25 can't remember the name of it, but there was projects for
150 1 BY MR. HENRY: 2 Q Okay. Do you know of another example? 3 A I can think of different hardware that existed 4 that could be configured to accomplish this same task, 5 yes. 6 Q Like what? 7 A Well, different spatial audio processors. There 8 was one made by Roland, for instance. That Roland, I 9 think it's called an S360. There were a number of 10 convolution engines out there, for instance, or 11 processors, and by the time you get to -- what dates 12 you're talking about? Prior to 2014? Yeah, by -- after 13 20 -- I don't know the exact date, but as one progresses 14 from the 1990s up to 2014, there's multiple hardware, 15 software processes to accomplish these things. 16 Q And you mentioned the Convolvotron and the S360 17 by Roland. Was -- can you identify any others? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: Well, you could have used, for instance, 20 Max/MSP by Cycling '74, which is a software-based system. 21 BY MR. HENRY: 22 Q And -- 23 A And -- 24 Q Oh, sorry. I was asking for clarification. You 25 said Max, are you referring to computer, M-a-c-s, or are	152 1 implementing 3D audio into software libraries at that time 2 too for program mers. And, again, the name is escaping 3 me, but there were a number of projects that had been 4 going on for more than ten years for sure. 5 Q For more than ten years before 2014? 6 A Yeah, I think they -- yeah, could be a 20-year 7 legacy. I'm not sure of the exact date. And it was for 8 doing things like implementing 3D audio processing, as 9 part of game developer kits or software. But I can't 10 recall the exact names of them or the efforts. 11 Q Do you know of Unity? 12 A I've heard of it. I never had a personal 13 experience with Unity. 14 Q Can you identify by name any of the solutions 15 from the gaming industry from prior to 2014 that you 16 believe could do the kind of SLP manipulation that's 17 recited in 15? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: Again, not by name. I'm not super 20 familiar with the world of gaming. But there was -- I 21 might have even given a talk to this group. I don't 22 recall. But something along the lines of standardizing 3D 23 audio manipulation and presentation and processing in 24 standard software libraries if I'm recalling correctly. 25 That's as specific as I can give you.

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153 1 BY MR. HENRY: 2 Q You don't recall the group that you gave a talk 3 to? 4 A No. I can't even recall if I actually gave a 5 talk to that group or if I was just invited to go, even if 6 I did go. I just heard a lot about it, and there was a 7 lot of interest in the time. And I know that that was... 8 oh, maybe at least 15 years ago. 9 And I think it's evolved, and it might still 10 exist. 11 Q What audio DSP structures from before 2014 are 12 you aware of that could accomplish or perform the function 13 recited in the limitation of claim 15 that we're talking 14 about? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: Well, the same. 17 BY MR. HENRY: 18 Q Do they all use DSPs for their spatialized audio 19 processing? 20 A Some might use software DSP based on the native 21 CPU. Some might use an external DSP. Some of the earlier 22 versions I know did. 23 Q Do you distinguish between a digital signal 24 processor and digital signal processing? 25 MR. ELLIOTT: Objection to form.	155 1 instructions, how would a person of ordinary skill in the 2 art know if something is a processor as that term is used 3 in this claim versus not being a processor as claimed in 4 claim 15? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: Can you rephrase your question? It 7 seemed oddly put. 8 BY MR. HENRY: 9 Q Sure. Yeah, no worries. I'm trying to -- I'll 10 come at it a different way. 11 To determine -- if you're looking at a system 12 with a processor and you want to try to figure out if it's 13 practicing what's recited in this limitation, in your 14 view, do you have to assess how that processor is 15 implemented? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: Again, I'm a little fuzzy on what you 18 are asking. So, yeah, I'm sorry. I kind of lost you. 19 BY MR. HENRY: 20 Q No problem. 21 A I mean, we were talking about a processor -- 22 Q Yeah, we'll try another one. 23 If you just look at a processor -- you just look 24 at any processor? 25 A Yes.
154 1 THE WITNESS: I don't know if I necessarily would in 2 the terms that you used. One's a noun and one's a verb, I 3 think. 4 BY MR. HENRY: 5 Q Now, you can look, I'm going to ask you about 6 paragraph 15 of your declaration, which talks about all 7 the processor terms, not just the limitation that we're 8 looking at in the '090 Patent. 9 A Sure. 10 Q Okay. Is it fair to say that you believe that 11 persons of skill in the art would have known before 2014 12 how to use audio DSP structures or common industry 13 programming techniques or software libraries for audio 14 processing to implement systems performing all of the 15 functions recited in the processor terms that you address 16 in paragraph 15 of your declaration? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Yes, as stated in my declaration. 19 BY MR. HENRY: 20 Q If you look back at the -- and sorry to jump, but 21 if you look back at paragraph 15 of -- strike that. 22 Looking at claim 15 of the '090 Patent. 23 A Yes. 24 Q If you're looking at that limitation we were 25 discussing, that begins, The processor that executes the	156 1 Q You don't yet look at how it is -- what it's 2 programmed to perform. Can you make a determination of 3 whether or not that processor meets the limitation of 4 claim 15 that we're talking about? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: So I look at a processor, and what don't 7 I know about the processor in your assumption, your 8 hypothetical? 9 BY MR. HENRY: 10 Q You don't know what it's yet programmed to 11 perform or do. 12 A So... if I'm looking -- oh. So is your 13 question -- can I rephrase it? Is your question if I look 14 at a, quote/unquote, processor, how do I know it can 15 perform the actions shown here? 16 Q It's -- it's a little different. I'm saying if 17 someone gives you a system and you determine that the 18 system uses a processor, right, are you with me? 19 A So far. 20 Q Okay. How would you determine if the processor 21 then after that, is capable -- not capable, actually 22 executes the instructions to adjust the binaural voice as 23 recited in this claim? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Well, you would know from examining

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157 1 software. You would -- and I guess, you're adding the 2 limitation that we can't actually test it with a signal. 3 BY MR. HENRY: 4 Q No, you could. I'm just asking you if you would 5 have to look at what the processor is programmed to do in 6 order to determine if the processor you're evaluating 7 executes the instructions to adjust the binaural voice as 8 recited in claim 15? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: I would know the result of the 11 processor, if I tested it with a signal. If I were 12 looking at the software for that processor, then I would 13 know how it was doing it. And I would have a reasonable 14 expectation of what it's output might be. 15 BY MR. HENRY: 16 Q If you just bought an off-the-shelf processor 17 without any programming, would it execute instructions to 18 adjust the binaural voice as claimed in claim 15 of the 19 '090 Patent? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: Well, processors usually execute 22 instructions. Right? So the execution of those 23 instructions are informing the processor, for instance, 24 where to place (indecipherable utterance) a sound. And so 25 this limitation here calls out --	159 1 If your processor, let's say, were a computer, 2 and you were writing an algorithm to take advantage of a 3 built-in library that did signal processing for you, then 4 that would be another way to accomplish the goal. So it 5 kind of, it's a very general -- when you say a processor, 6 we could be talking about many different things. 7 BY MR. HENRY: 8 Q Sure. The examples that you give, you referred 9 to devices that were designed to adjust SLPs as recited 10 here and then software libraries that were designed to 11 have that capability, right? 12 A Well, that's true. But you could also have 13 something that's very generic that is basically a sound 14 processing library, or even a digital signal processing 15 library for which a PHOSITA would come and say, Okay, I 16 want to manipulate the actions through instructions of 17 this particular processor to accomplish the goal that I 18 want to do. 19 Q And then how would they go about affecting that 20 manipulation? 21 A By executing instructions. 22 Q Would they have to write and develop the software 23 having the correct instructions? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Maybe and maybe not. Depends if it was
158 1 THE STENOGRAPHIC REPORTER: I'm sorry. Doctor, I 2 didn't understand what you said. You said the processor, 3 for instance, where to place what? 4 THE WITNESS: Let's start again. 5 THE STENOGRAPHIC REPORTER: Okay. You said so the 6 execution of those instructions are informing the 7 processor, for instance, where to. And it sounded like 8 you said place. But I couldn't understand what you said. 9 THE WITNESS: Place is right. Where to place the 10 sound localization point to a different position. 11 THE STENOGRAPHIC REPORTER: Thank you. 12 BY MR. HENRY: 13 Q Okay. We agree processors can execute 14 instructions. I think that's pretty straightforward. 15 What I'm asking is, if you just bought a 16 processor, an off-the-shelf processor, right, would it be 17 able to adjust the binaural voice of a second person 18 during an electronic phone call to position an SLP to a 19 different location without any programming? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: So some of the examples I gave you 22 earlier, would adjust the position of a binaural sound 23 because the design of the device was specifically to 24 accomplish that. So it could be through the turning of a 25 knob or writing an instruction.	160 1 the extent of the libraries that are available. 2 BY MR. HENRY: 3 Q Because some libraries already might have the 4 design to adjust an SLP as recited? 5 A It is true that some sound developer programs -- 6 or should I say sound developer environments allow 7 manipulation of the spatial attributes of sound. 8 Q Through their programs -- through their 9 programming, right? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Well, programming can mean a lot of 12 different things. It could mean a series of instructions 13 to move the sound. And it's a very high level like that. 14 It could be of the level of you need to design the 15 convolution algorithms, but there are available filtering 16 methods by which to do that. 17 BY MR. HENRY: 18 Q Do you write code, Dr. Begault? 19 A I am a total hack. I don't write in anything 20 that a coder would consider viable. But I do process 21 sound using Max MSP, for instance. So I do binaural and 22 3D audio experiments using that program. What else have I 23 programmed lately? 24 And then I have specialized software written for 25 me for my psychoacoustic experiments where I interact with

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161 1 it on a programming level to make certain stimuli occur. 2 THE STENOGRAPHIC REPORTER: Sorry. What was your 3 original question? Was it do you code or something? It 4 was garbled, your question -- 5 MR. HENRY: Do you write code, I think was my 6 question. 7 THE STENOGRAPHIC REPORTER: Thank you. 8 MR. HENRY: Yeah, no worries. 9 THE WITNESS: That was why you question, do you write 10 code. 11 BY MR. HENRY: 12 Q Thank you, Dr. Begault. 13 A Yeah. Now I've forgotten where we are. 14 Q That's okay. I'll pick up. 15 The specialized software that you mentioned being 16 written for psychoacoustic experiments, who writes that, 17 you or a colleague or someone else? 18 A Oh, no. They will -- I'll have somebody else, 19 like a hired programmer, write the structure, if you will. 20 And then I'm given hooks into that structure so that I can 21 then manipulate things like the spatial location of 22 sounds. 23 Q And were you working on those types of 24 applications before 2014? 25 A Well, for instance, we discussed the Ames Spatial	163 1 BY MR. HENRY: 2 Q Oh, that wasn't exactly my question. My question 3 is, the one that I asked you, would you say that any 4 computer device that performed this function would 5 constitute the processor that executes the instructions 6 recited in this claim? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: I'm not sure how to exactly answer that. 9 It seems to me that any computing device that could 10 constitute a processor that could execute instructions 11 would be valid to enable what is stated in this particular 12 limitation. 13 BY MR. HENRY: 14 Q Can you think of a computing device that would 15 perform the function recited in this limitation and yet 16 still not be a claim 15 processor? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: So are you asking can I think of a 19 processor that could accomplish what is put out -- or I'm 20 sorry, stated in this limitation that couldn't do what the 21 -- wait. I lost you completely on that. 22 BY MR. HENRY: 23 Q No worries. I'm happy to repeat it. Can you 24 think of a computing device that performs the function 25 recited in the last limitation of claim 15 of the '090
162 1 Auditory Display, and there I had to work with assembly 2 code to ask the program to do the convolution that I 3 needed to perform to do the spatial rendering with that 4 particular device. 5 Q Now, Dr. Begault, if you look at the limitation 6 we're discussing in claim 15, which is the fourth 7 limitation again. Okay? 8 A I'm with you. 9 Q Okay. Now, would you say that any computer 10 device that performs the function of this limitation 11 adjusting the binaural voice of a second person during an 12 electronic phone call in order to position an SLP with a 13 binaural voice to a location that is away from and 14 proximate to the first person, would constitute the 15 processor that's recited by this claim? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: So what was -- the first part of your 18 question was... would any what? 19 BY MR. HENRY: 20 Q Computer device that performs the function of 21 this last limitation constitute the processor required by 22 this claim? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: So if your question is, is a computer 25 device, could it be used as a processor, then, yes.	164 1 Patent, that doesn't qualify as the processor recited by 2 this claim? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: I can't think of anything like that. I 5 could think of a processor is engendering a computing 6 device. 7 BY MR. HENRY: 8 Q Dr. Begault, I'd like to look at column -- strike 9 that. 10 Dr. Begault, looking still at claim 15 of the 11 '090 Patent, do you see in the fourth line of the claim in 12 the first limitation where the claim recites binaural 13 voice. 14 A Okay. So 15 and then we're talking about a 15 second wearable electronic device, that paragraph? That 16 limitation? 17 Q Yeah. 18 A Okay. I'm with you. 19 Q Do you see the claim language, Binaural voice? 20 A Yes. 21 Q Okay. And now, I want to just go look at claim 22 1, which is a couple pages up. 23 A Okay. I'm with you. 24 Q All right. In the first limitation of claim 1, 25 do you see where the claim recites, Binaural sound?

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165 1 A I do. 2 Q Do you draw any distinction between the terms 3 binaural sound and binaural voice? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: In one sense, no, you don't need to make 6 a distinction between those things because many sounds are 7 referred to as voices. 8 BY MR. HENRY: 9 Q Yeah, didn't really ask you if you have to draw 10 it. I'm asking you if when you read those terms, do you 11 understand that there is any distinction between them or 12 not? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: Well, the distinction is the word sound 15 and voice between what you just pointed out there. 16 BY MR. HENRY: 17 Q Yeah, in your mind, are those two things 18 different or equivalent? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: They're not -- they are not necessarily 21 different, but we are talking about a second person in 22 Number 15. So that seems to be addressing as binaural 23 voice in that particular example, a speech of a person in 24 that particular example. 25 But the terms themselves might mean other things	167 1 translating that language into the -- a synthetic voice 2 that then would be heard by the listening person. 3 And so that listening person is hearing synthetic 4 speech. 5 Q Dr. Begault, I just wanted to know if -- and I'm 6 not asking you if these things necessarily mean the same 7 thing or not. Just sort of how you responded last time. 8 In your view, are the terms binaural sound and 9 binaural voice equivalent? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: Well, I address binaural voice in my 12 declaration. And there, I said that voice could refer to 13 many different types of sound, not necessarily actual 14 speech, but synthetic speech, speech-like sounds, auditory 15 icons, signals, any number of types of sounds that convey 16 meaning. 17 BY MR. HENRY: 18 Q Are the terms binaural sound and binaural voice 19 equivalent in your view? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: They can be, as I said. 22 BY MR. HENRY: 23 Q Are they always? 24 MR. ELLIOTT: Same objection. 25 THE WITNESS: It depends on the context.
166 1 that when it says binaural voice, it does not necessarily 2 mean a person in all context. But in this context, it 3 seems to be a speech context. 4 BY MR. HENRY: 5 Q Sure, and you can look at claim 1 and read it if 6 you want. And then I believe that you'll see, and that 7 we'll be able to agree that it also discusses a first and 8 second person talking. But go ahead and review it and let 9 me know if that's fair. 10 A Well, looking at the first limitation, it says, 11 Capturing binaural sound. So that might be speech. It 12 might be something other than speech. 13 Q You also see that first limitation talks about a 14 talking person and a listening person, right? 15 A Where does it say that? 16 Q In claim 1. 17 The first limitation recites, Capturing with an 18 electronic earphone located at a head of a talking person, 19 binaural sound that will be provided to a listening person 20 during a telephone call. You see that, right? 21 A Oh, I do. But it doesn't necessarily mean that 22 it's just transmitting the binaural speech of that talking 23 person. It could be transmitting something else. It 24 could be, for instance, that talking person speaking in a 25 foreign language, and then a speak recognition system	168 1 BY MR. HENRY: 2 Q Sitting here today, can you identify for me any 3 binaural sound that in your view is not a binaural voice? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: Not necessarily. 6 BY MR. HENRY: 7 Q Because I don't know what you mean by that 8 qualification necessarily, which you keep injecting, I'm 9 just going to give you the opportunity now. 10 If you are able to identify any binaural sound 11 that in your view is not a binaural voice, I ask you to do 12 that now. 13 A A sound that is an unintentional noncommunicative 14 sound, such as, let's say, electronic noise that 15 inadvertently went into a system, I wouldn't think of that 16 as a binaural voice. I would think of that as a binaural 17 distortion. That would be a type of binaural sound 18 because it's not communicating. 19 Whereas when we use the term binaural voice, 20 we're talking about the communication using sound, and 21 that infers some sort of vocabulary, either in terms of 22 auditory icons, of speech or synthetic speech. So I gave 23 you an example where there is a sound that's inadvertent 24 and is like a form of distortion or noise. 25 Q Beyond that example, can you identify for me any

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169 1 other binaural sound that in your view, would not be a 2 binaural voice? 3 A Any sound that is not a form of communication – 4 or intentional communication, I should say. 5 Q What is an intentional communication? 6 A A communication where there's an intention for a 7 sound to be heard by another party. 8 Q So any sound that is not an inadvertent noise 9 that you characterize as a distortion is in your view a 10 binaural voice? 11 MR. ELLIOTT: Objection to form 12 THE WITNESS: As I said, the word voice can confer 13 many forms of aural communication. If aural communication 14 is not involved, in other words, a message being 15 transmitted from one place to another, then it could be 16 thought of as a form of noise or distortion or inadvertent 17 type of signal. So I'll use that as my categorization for 18 something that is not a binaural voice. 19 BY MR. HENRY: 20 Q A message, a binaural message? Isn't that a 21 binaural voice? 22 A No, that's not what I said. 23 Q Okay. 24 A I said that a binaural voice means a communicated 25 message, aural – well, acoustic message.	171 1 THE WITNESS: H-u-m, hum. 2 BY MR. HENRY: 3 Q What is a 60-cycle hum, Dr. Begault? 4 A That is the bleed through of an American-based 5 alternating current system into an audio system. So if 6 you go home and turn up your audio system really loud, you 7 might here (indicating.) And that could be accentuated by 8 things like dimmer lights and things of that sort. And 9 I'm sure you've encountered in Zoom, inadvertent noises 10 and stuff that have come in. If Zoom had a binaural 11 capability, then some of those sounds, those noises might 12 be placed in 3D audio space. 13 Those, I would not consider a binaural voice 14 because those sounds are not an intentional communication 15 from one party to another. 16 Q Does Zoom have binaural capabilities? 17 A I don't think so. I've never heard of it. 18 Q Does it capture binaural sound or voice? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: Not that I'm aware of. 21 BY MR. HENRY: 22 Q Why not? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: I can't -- I don't know the operations 25 or motivations or engineering staff of Zoom
170 1 Q In trying to understand the distinction you're 2 drawing between things that could be binaural sounds but 3 not binaural voices, is it just any binaural sound that 4 has meaning, is what you would call binaural voice? 5 A Meaning in the context of communication. 6 Q So any binaural sound with meaning in the context 7 of communication is a binaural voice in your view? 8 A People skilled in the art, POSA, have understood 9 that 3D audio and binaural rendering of different types of 10 sound, speech or nonspeech, or hybrids of the two are 11 effective means of communication and have been frequently 12 implemented as such. I don't rule out the possibility 13 that a binaural sound such as an inadvertent noise that is 14 heard spatially couldn't occur. 15 But if that occurred, I'm disqualifying it as a 16 binaural voice because voice infers communication. 17 Q Can you give me an example of a binaural sound 18 that would be an inadvertent noise? 19 A Sure. 20 Q That wouldn't be binaural voice? 21 A Sure. 60-cycle (indecipherable utterance) hum. 22 THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. Could 23 you repeat that? 24 THE WITNESS: 60-cycle hum. 25 THE STENOGRAPHIC REPORTER: H-u-m, hum?	172 1 BY MR. HENRY: 2 Q Why is it that you believe that Zoom does not 3 capture binaural sound or binaural voice? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: Only through direct experience using a 6 single microphone and listening to monaural sound over my 7 headset. I could be mistaken. There could be something 8 out there that does something beyond my own experience. 9 As I say, I do not follow product development on the part 10 of Zoom. 11 BY MR. HENRY: 12 Q Yeah, and that's fine. I'm not asking you about 13 Zoom's product lines beyond what we're using today. 14 Let's just then talk about today. Why is it that 15 what we're using today, in your view, doesn't capture 16 binaural sound or binaural voice? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: It doesn't capture that because it's 19 using a single channel communication. 20 BY MR. HENRY: 21 Q All right. We're going to put another exhibit in 22 the chat, Dr. Begault. And this one is going to be the 23 file name US9282196. 24 (Whereupon Deposition Exhibit 4 was 25 marked for identification.)

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173 1 BY MR. HENRY: 2 Q And this will be Begault Exhibit 4. 3 A I'll let you know when I see it. 4 Q Thank you. 5 THE TECHNICIAN: It's uploading now. 6 THE WITNESS: Okay. There it is. 7 Okay. I have the Exhibit Number 4 up and ready 8 to discuss. 9 BY MR. HENRY: 10 Q Dr. Begault, what do you recognize Begault 11 Exhibit 4 to be? 12 A United States Patent 9,282,196-B1. 13 Q Do you know which claims from the '196 Patent are 14 asserted in this case? 15 A I don't know off the top of my head, which claims 16 are being asserted in this particular matter. 17 Q Let's look at claim 1 of the '196 Patent. 18 A Did you intend to give me a yellow highlighted 19 version? 20 Q I did not. 21 A I'm happy to use it. 22 Q Yeah, I think it's fine. These aren't even my 23 highlights. But if it doesn't bother you, we'll just keep 24 going if that's all right. 25 A That's fine by me.	175 1 Q What, in your view, is a handheld portable 2 electronic device? 3 A Obvious meaning. I suppose an example might be a 4 cellular telephone. What do they call those these days? 5 Not the thing with the giant antenna, but an iPhone, for 6 instance, or an Android. 7 Q So you would agree that a smartphone is a 8 handheld portable electronic device? 9 A That was the word I was looking for, yes, a 10 smartphone. 11 Q Do you see before handheld portable electronic 12 device the, limitation, cites providing through an 13 electronic earphone, do you see that language? 14 A I do. 15 Q And it goes on to say that you provide through an 16 electronic earphone binaural sound to the user during the 17 voice exchange? 18 A Yes, I do. 19 Q How long have people of skill in the industry 20 been providing binaural sound to listeners through 21 earphones? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: Oh, I don't know the first date of that. 24 But, of course, stereo, by the development of any 25 headphone system that could monitor two microphones, would
174 1 Q All right. Looking at claim 1. 2 A Yes. 3 Q You see that the preamble of claim 1 reads, A 4 method executed by one or more electronic devices in an 5 electronic system that move a sound localization point, 6 SLP, of a voice of a computer program during a voice 7 exchange between the computer program and a user, the 8 method comprising? 9 A I see that. 10 Q What do you understand a voice exchange to be? 11 A I would -- voice communication. 12 Q Does an exchange require voice communication 13 between two parties? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: If the party could constitute a computer 16 or any device capable of recognizing speech or sound and 17 another device capable of recognizing speech or sound. 18 BY MR. HENRY: 19 Q And the preamble here talks about a voice of a 20 computer program, and a user on the other side, right? 21 A It does. I presume the user is human. 22 Q All right. In the next limitation, do you see 23 the language, Handheld portable electronic device? 24 A Stand by. 25 Yes.	176 1 be the origin of that. 2 BY MR. HENRY: 3 Q Were people in the industry providing binaural 4 sound to listeners through earphones before 2014? 5 A Yes. 6 Q I want to look at claim 15. 7 A Yes. 8 Q And this is one of the claims that you opined 9 about in your declaration, right? 10 A Let me confirm that. 11 Q Sure? 12 A Yes. 13 Q And it's one of the -- the last limitation is one 14 of the processor terms that you addressed, right? 15 A That's correct, yes. 16 Q Okay. And when you read this last limitation, do 17 you understand the term to mean that there's a processor 18 that's programmed to achieve the functions that are 19 recited in the rest of this limitation? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: I read that there's a processor that's 22 executing instructions. 23 BY MR. HENRY: 24 Q Okay. 25 A And it accomplishes the things that are listed

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177 1 after that phrase. 2 Q And those things are receiving a command, moving 3 the SLP in response to a command, and providing binaural 4 sound at the second location for an SLP? 5 MR. ELLIOTT: Objection to form 6 THE WITNESS: More or less. 7 BY MR. HENRY: 8 Q And I'll -- do I understand correctly that in 9 your view, a person of skill would have known how to 10 implement a system or method performing each of the 11 functions recited in the last limitation of claim 15 of 12 the '196 Patent before 2014 because a person of skill 13 would have been able to resort to known audio DSP 14 structures within the art and common industry programming 15 techniques or software libraries for audio processing? 16 MR. ELLIOTT: Objection; form 17 THE WITNESS: I believe you paraphrased my declaration 18 correctly. 19 BY MR. HENRY: 20 Q And do you agree then, that people in your view, 21 people of skill would have been able to use known audio 22 DSP structures and common industry programming techniques 23 or software libraries to perform the functions recited in 24 the last limitation of claim 15 before 2014? 25 MR. ELLIOTT: Objection to form	179 1 THE WITNESS: Sorry -- right, yes. 2 BY MR. HENRY: 3 Q Can you think of a computing device that would 4 perform the functions of the last limitation of claim 15 5 of the '196 Patent but not be a processor as recited in 6 this claim? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: No, I can't think of something that 9 wouldn't be a processor necessarily. 10 BY MR. HENRY: 11 Q Let's look at claim 19 of the '196 Patent. 12 A Yes. 13 Q Okay. You offer an opinion about this claim as 14 well in your declaration, right? 15 A Let me confirm that. 16 Yes. 17 Q Is it fair to say that in your view, before 2014, 18 a person of skill in the art would have known how to 19 implement a system or method performing the functions 20 recited in claim 19 by resorting to known audio DSP 21 structures within the art and common industry programming 22 techniques or software libraries for audio processing? 23 MR. ELLIOTT: Objection to form. 24 THE WITNESS: Yes. 25
178 1 THE WITNESS: Yes, I think that would have been 2 possible. 3 BY MR. HENRY: 4 Q What software libraries or audio DSP structures 5 were available before 2014 to persons of skill in the art 6 to achieve or perform the functions recited in the last 7 limitation of claim 15 of the '196 Patent? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Looking only at the limitation of a 10 processor that executes instructions; is that correct? 11 BY MR. HENRY: 12 Q Yeah. The last limitation of claim 15 is the one 13 we're discussing. 14 A Right. Right. Right. So let me take a quick 15 look here. 16 So -- let's see here. So I gave an answer 17 previously, regarding available software and hardware 18 systems that could be configured to accomplish very 19 similar tasks earlier in my deposition here. And so I 20 would just restate those things. 21 Q In your view, those would be able to accomplish 22 or perform the functions recited in claim 15 of the '196 23 Patent as well? 24 A Yes. 25 MR. ELLIOTT: Objection to form.	180 1 BY MR. HENRY: 2 Q What audio DSP structures within the art and 3 software libraries were available before 2015 that a 4 person of skill could have used to perform the functions 5 recited in claim 19 of the '196 Patent? 6 A What comes to mind immediately are programs that 7 perform something called auralization, which is the 8 simulation of room acoustic cues. And those room acoustic 9 cues are based on basically spatializing audio 10 reflections. And so an example, I believe, was 11 CATT-Acoustic, C-a-t-t, Acoustic had those capabilities. 12 Q Does any other example come to mind? 13 A That's the first one that comes to mind. But I 14 think there were other examples as well. 15 Q Can you identify any others today? 16 A I believe that some of the examples I gave you 17 earlier, such as Slab or maybe even the Convolvotron. I'm 18 not sure in later implementations as 3D audio, you know, 19 was maturing, these capabilities became featured more and 20 more. 21 Q You address auralization in your 1994 textbook, 22 right? 23 A I did, yes. 24 Q And I said 1994 because you said that earlier, 25 but I have a version of your textbook with a copyright

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181 1 date of 2000. Was it a republication? 2 A Yes. After the original publisher gave up the 3 copyright, I decided to republish it as a NASA Technical 4 Memorandum, give away the text. It's more or less the 5 same. I think I corrected a few typos, and a lot of the 6 pictures and things like that came out much worse. So... 7 I recommend the book. Go to the book. It's -- I think 8 you could still get a copy for a dollar on Amazon. And 9 then I think you can get one for \$100 too. 10 Q All right. I'll buy the former. 11 A Yes, you should. 12 Q Dr. Begault, was that -- was your textbook 13 publicly available before 2014? 14 A Yes. 15 Q Okay. All right. Let's... 16 A Technically speaking, it wasn't a textbook. It 17 was a reference book, because a textbook, I expect to have 18 exercises or be designed around a curriculum. So just for 19 that little academic clarification. 20 Q I'm happy to call it a reference book. Your 21 reference book was publicly available before 2014? 22 A Yes, it was. 23 THE STENOGRAPHIC REPORTER: Counsel, if this is a good 24 breaking point, can we take a ten-minute break? 25 MR. HENRY: Happy to go off the record. That's fine.	183 1 but... 2 A Okay. All right. I am on Exhibit 5. 3 Q And what do you recognize Exhibit 5 to be? 4 A United States Patent 9,674,628 B1. 5 Q Do you know which claims of the '628 Patent are 6 asserted in this case? 7 A I don't know exactly which claims are asserted, 8 no. 9 Q Let's look at claim 9, the '628 Patent, please. 10 Let me know when you're there. 11 A Okay. Almost. All right. I am at claim 9. 12 Q And this is a claim that you offered an opinion 13 on in your May 3rd, 2023, declaration, right? 14 A Yes. 15 Q Now, let's look at the first limitation after the 16 preamble, do you see the limitation that begins, 17 Processing during the telephone call? 18 A I see it. 19 Q Now, that's one of the processor terms that you 20 address in your declaration, right? 21 A That is true. 22 Q Okay. Now, look at claim 16 as well, from the 23 '628 Patent. 24 A I'm sorry. Claim what? 25 Q 16.
182 1 THE VIDEOGRAPHER: The time is 2:57. We're going off 2 the record. 3 (Recess taken.) 4 THE VIDEOGRAPHER: The time is 1510. We are back on 5 the record. 6 THE WITNESS: Test, 2, 3, can you hear me? 7 BY MR. HENRY: 8 Q Oh, sorry, test, 2, 3. I didn't know what you 9 said. Yes, I can hear you. 10 A Oh, sorry. 11 Q All right. We're going to circulate another 12 document now. It's going to be Exhibit 5. The file 13 name of Begault Exhibit 5, the file name for this one is 14 _US9674628. 15 (Whereupon Deposition Exhibit 5 was 16 marked for identification.) 17 BY MR. HENRY: 18 Q Dr. Begault, let me know when you have it open 19 and available to you. 20 THE TECHNICIAN: Should be in the chat right now. 21 THE WITNESS: I have the document open. I assume I 22 can close the other document? 23 BY MR. HENRY: 24 Q You can leave them all open. In case we go back, 25 it's just quicker. I don't have a preference, though,	184 1 It starts at the bottom of column 45 -- 2 A Oh, I see it, a nontransitory. Yes, I see it 3 now. 4 Q And do you see the second limitation of that 5 claim, Similarly cites processing during the telephone 6 call, and then it continues? 7 A Yes. 8 Q That's another processor term that you addressed 9 in your declaration, right? 10 A That is true, yes. 11 Q Okay. Now, do I understand correctly from your 12 declaration that in your view, before 2014, persons of 13 skill in the art would have known how to implement systems 14 performing the functions recited in the limitations of 15 claim 9 and claim 16 that we just reviewed because a 16 person of skill would have been able to resort to known 17 audio DSP audio structures within the art and common 18 industry programming techniques or software libraries for 19 audio processing? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: I believe you have essentially 22 paraphrased my declaration. 23 BY MR. HENRY: 24 Q Do you believe that persons of skill in the art 25 would have known how to implement a system performing the

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185 1 functions recited in the limitations of claim 9 and 16 of 2 the '628 Patent before 2014 based on known audio DSP 3 structures within the art and common industry programming 4 techniques and software libraries? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I believe that they would, particularly 7 with the limitations that we're discussing that begin with 8 the word processing. 9 BY MR. HENRY: 10 Q What software libraries or audio DSP structures 11 were available before 2014 to allow persons of skill in 12 the art to implement systems that were able to perform 13 those functions? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: I would give you the same answer I gave 16 you regarding the other processor terms that we discussed 17 with relationship to the two other patents we discussed 18 earlier. Which I do not have the numbers handy. I think 19 it was '090, and I don't remember the other one. 20 BY MR. HENRY: 21 Q '196, right? 22 A Yes, that's right. 23 Q Okay. Looking at claim 9, in the first 24 limitation again. 25 A Yes.	187 1 THE WITNESS: No. I would state that computing 2 devices are processors or could be implemented as 3 processors. 4 BY MR. HENRY: 5 Q All right. We're going to circulate another 6 document, Dr. Begault. This one's going to be Begault 7 Exhibit 6. 8 (Whereupon Deposition Exhibit 6 was 9 marked for identification.) 10 BY MR. HENRY: 11 Q And it is _US10917737. 12 THE TECHNICIAN: Stand by, please. (Indicating.) 13 Uploading now. 14 THE WITNESS: Okay. Okay. I have it. 15 BY MR. HENRY: 16 Q Dr. Begault, what do you recognize Begault 17 Exhibit 6 to be? 18 A United States Patent 10,917,737 B2. 19 Q Do you know which claims of the '737 Patent are 20 asserted in this case? 21 A I don't know exactly. 22 Q Let's look at claim 1, please. Let me know when 23 you're there. 24 A I will do that. I am at claim 1. 25 Q Great. Do you see the first limitation recites,
186 1 Q Can you think of a computing device that would 2 perform the function of processing a voice of a calling 3 party with HRTFs so the voice of the calling party 4 localizes to the called party as binaural sound and SLP 5 that is 1 meter to 2 meters away from the called party and 6 yet still not be a processor as recited by claim 9? 7 MR. ELLIOTT: Objection to form. 8 THE WITNESS: I'm sorry. I think that a processor 9 would be involved to cause this effect that's called out 10 here in this to occur. And I can't think of a -- well, 11 wait. What was your question? Sorry. 12 BY MR. HENRY: 13 Q Can you think of a computing device that would 14 perform the recited function but not be a processor as 15 claim 9 recites? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: I can't think of one off the top of my 18 head, no. 19 BY MR. HENRY: 20 Q Looking at the second limitation of claim 16, my 21 question is similar. With respect to that limitation, can 22 you think of a computing device that would perform the 23 function recited in that limitation but not be a 24 processor? 25 MR. ELLIOTT: Objection to form.	188 1 Tracking with a wearable electronic device, WED, worn on a 2 head of a user, movement of a handheld portable electronic 3 device, HPED, held in the hand of the user, and continues 4 from there? 5 A I see that. 6 Q What's your understanding of what a wearable 7 electronic device, WED, is? 8 MR. ELLIOTT: Objection to form. Beyond the scope. 9 THE WITNESS: Well, I suppose I would give you the 10 obvious statement here, it's a device worn on the head of 11 a user. That's my understanding. I just -- I would have 12 to paraphrase that. I wouldn't know. 13 BY MR. HENRY: 14 Q Totally fine. 15 What's the -- would a head-mounted display be a 16 wearable electronic device worn on the head of a user in 17 your view? 18 A Yes, it's an example of one. 19 Q Would handheld controllers be an example of 20 handheld portable electronic devices? 21 A Yes. 22 Q Before 2014, were people using head-mounted 23 displays to track handheld controllers? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Restate your question?

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189 1 BY MR. HENRY: 2 Q Sure. 3 Before 2014, were people using head-mounted 4 displays to track handheld controllers? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I don't believe people use head-mounted 7 displays to track the handheld controller. That's the 8 first time I've heard of that. 9 BY MR. HENRY: 10 Q What did they use? 11 A For what? 12 Q Tracking handheld controllers. 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: Well, it would be some sort of device 15 with a transmitter and a receiver. Could have been 16 optical. Could have been magnetic. Something to track 17 the hand. And it probably would be interfaced to some 18 sort of processor or computer. 19 BY MR. HENRY: 20 Q And were those types of units used in conjunction 21 with and on head-mounted displays before 2014? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: I would agree with in conjunction with. 24 I wouldn't agree with the other part of your phrase, on, I 25 think was the word.	191 1 ever aware of the head tracking device -- I'm sorry, the 2 head-mounted device tracking the hand. 3 THE STENOGRAPHIC REPORTER: Doctor, I do have a 4 question. A couple answers ago, did you say I would or I 5 wouldn't agree with in conjunction with? I wouldn't or 6 would agree with the other part of your phrase, on, I 7 think is the word? It's a bit hard to hear and 8 distinguish if you're saying would or wouldn't. So I just 9 wanted to clarify that. 10 THE WITNESS: Well, let me give you what I think it 11 was. I think it was would not, but then could you read 12 back the paragraph before that for me, and then we could 13 hear it in context. 14 THE STENOGRAPHIC REPORTER: Yes. 15 (Record read.) 16 THE WITNESS: Oh, no, what I said was I would agree 17 with the term in conjunction with. I would not agree with 18 the word on. 19 THE STENOGRAPHIC REPORTER: Perfect, thank you so 20 much. 21 BY MR. HENRY: 22 Q Dr. Begault, you talked about the Polhemus device 23 on the Convolvotron being on the headband of that device, 24 right? 25 A That's correct.
190 1 BY MR. HENRY: 2 Q You're not aware of any head-mounted display for 3 virtual reality, for example, that could track with its 4 components handheld controllers before 2014? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I'm not aware of the head track -- or 7 sorry, the head-mounted display itself tracking the hand 8 controller. 9 BY MR. HENRY: 10 Q What component of a virtual reality apparatus 11 that a human can wear on their head do you believe is a 12 head-mounted display? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: A stereo visual display. 15 BY MR. HENRY: 16 Q Are you talking about just the lenses of an HMD 17 or more than that? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: That's an example. 20 BY MR. HENRY: 21 Q You know that there were head-worn virtual 22 reality devices that were capable of tracking handheld 23 controllers before 2014, right? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: No, I disagreed with that. I wasn't	192 1 Q And that, headband presumably, would be worn on a 2 user's head, right? 3 A Yes. Connected to the headphone strap. 4 Q And that device was used for tracking gestures of 5 a data glove, right? 6 A No. The Polhemus transmitter on the head was 7 used to track the position of the head. A separate 8 Polhemus transmitter is used on the glove. 9 Q So -- 10 A So the head tracker -- the head tracking -- I'm 11 sorry. The head-mounted device is independent as a unit 12 from the data glove in that system. 13 Q Are you aware that there were handheld 14 controllers that could communicate via infrared or 15 trackers in head-worn virtual reality apparatuses before 16 2014? 17 A I was aware of optical tracking systems in 18 general. 19 Q And were you aware that optical tracking systems 20 were used in virtual reality apparatuses to track handheld 21 controllers before 2014? 22 MR. ELLIOTT: Objection to form. 23 THE WITNESS: Yes. 24 BY MR. HENRY: 25 Q And were you aware that that tracking was

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193 1 facilitated by a head-worn virtual reality apparatus? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: My understanding is that the optical 4 systems for handheld controllers are separate streams of 5 information from the tracking of the head. So there might 6 be a central processing unit that takes in the information 7 from the two devices, but where I'm having difficulty is 8 that the head-mounted display is not in itself 9 communicating with the hand or vice versa. 10 They're communicating with the computer. 11 BY MR. HENRY: 12 Q Fair. But you're aware of head-worn virtual 13 reality apparatuses that had, for example, a camera on 14 them to sense handheld controller movement before 2014, 15 right? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: I'm not aware specifically of where the 18 cameras were in optical systems to track hand position. 19 My impression was that they were located -- what was the 20 name of that system? I can't remember the name of the 21 system that I'm thinking about. But typically the 22 handheld controller was sensed at a distance from the 23 person, not from their head, is my understanding. 24 BY MR. HENRY: 25 Q What do you mean by that, the sensor for the	195 1 THE WITNESS: I think that's the same question, and I 2 will give you the same answer. 3 BY MR. HENRY: 4 Q Which is? 5 A No. 6 Q Look at... actually, what methods of tracking 7 handheld controllers were known to people in the industry 8 before 2014? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: I can think of optical and magnetic. 11 BY MR. HENRY: 12 Q What actions could people perform with handheld 13 controllers in virtual reality environments before 2014? 14 MR. ELLIOTT: Objection to form. 15 THE WITNESS: I believe that one could perform 16 pointing, gestures, maybe gaming. 17 BY MR. HENRY: 18 Q Before 2014, was it known that people in virtual 19 reality environments could point their handheld 20 controllers at virtual objects to select them? 21 MR. ELLIOTT: Objection to form, speculation. 22 THE WITNESS: Yes. 23 BY MR. HENRY: 24 Q Before 2014, was it known that people in virtual 25 reality environments could point their controllers at
194 1 handheld controllers was positioned elsewhere or the 2 sensor was positioned on the head? I'm not sure what you 3 mean. 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: If we are understanding each other, 6 which I'm not sure we are, my impression of the way that 7 the optical controllers worked was that there is a central 8 receiving point that would be receiving information from 9 some sort of transmission or light or magnetic field from 10 the head, that would be independent from the transmission 11 from a handheld device, and that those would be 12 assimilated at a central location away from a user, as 13 opposed to on their head. 14 BY MR. HENRY: 15 Q You're not aware of any systems existing before 16 2014 that would assimilate that information in the 17 head-mounted display? 18 MR. ELLIOTT: Objection to form. 19 THE WITNESS: Not in the head-mounted display itself. 20 I would think of it being assimilated in an external 21 processor. 22 BY MR. HENRY: 23 Q Are you aware of any head-mounted displays that 24 had internal processors for that assimilation before 2014? 25 MR. ELLIOTT: Objection to form.	196 1 virtual objects to select them and move them? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: Yes. 4 BY MR. HENRY: 5 Q Before 2014, was it known that people in virtual 6 reality environments could point their controllers at 7 virtual objects to select them to move them, and then a 8 virtual object's sound would move with it? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: I believe so, yes. 11 BY MR. HENRY: 12 Q Let's look at the fourth limitation of claim 1 of 13 the '737 Patent, please. Which begins, Processing by a 14 processor. 15 A So this is claim 1, and we are looking at the 16 fourth limitation; is that correct? 17 Q That's right. 18 A 1, 2, 3, 4, yes. Okay. 19 Q Okay. This is one of the processor terms that 20 you addressed in your declaration, right? 21 A That's correct. 22 Q Do you believe that before 2014 persons of skill 23 in the art would have known how to implement a system 24 performing the function recited in that limitation of 25 claim 1 by resorting to known audio DSP structures within

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197 1 the art and common industry programming techniques or 2 software libraries? 3 MR. ELLIOTT: Objection to form. 4 THE WITNESS: Yes. Oh, yes. 5 BY MR. HENRY: 6 Q And what software libraries or audio DSP 7 structures were available before 2014 that a person of 8 skill could have used to perform the function recited in 9 the fourth limitation of claim 1 of the '737 Patent? 10 A It would be my same answers as I gave you for the 11 prior patents that we've been discussing. 12 Q Looking at that fourth limitation of claim 1 of 13 the '737 Patent, can you think of a computing device that 14 would perform the function recited in that limitation and 15 yet not be a processor as recited in claim 1? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: No. I really can't, given my 18 understanding of what the processor is doing. 19 BY MR. HENRY: 20 Q Can you look at claim 14, please, of the '737 21 Patent? 22 A Yes. 23 Q Okay. And the second limitation of claim 14 is a 24 lengthy one. But I want to invite your attention to the 25 clause that begins, Includes a processor that processes.	199 1 A With similar wording, yes. 2 Q Can you think of a computing device that would 3 perform the following function recited in the language, 4 Includes a processor that processes sound with 5 head-related transfer functions, HRTFs, so sound 6 externally localizes as binaural sound that would do that 7 but not qualify as a processor as recited in claim 14 of 8 the '737 Patent? 9 MR. ELLIOTT: Objection to form. 10 THE WITNESS: No, I can't think of anything. 11 BY MR. HENRY: 12 Q We're going to circulate another exhibit now, 13 which will be Exhibit 7. And this one is going to be _ -- 14 the file name for this is _US11290836. 15 (Whereupon Deposition Exhibit 7 was 16 marked for identification.) 17 THE TECHNICIAN: Stand by, Counsel. (Indicating.) 18 Should be in the chat now. 19 THE WITNESS: Okay. All right. I am open to the 20 document, Exhibit 7. 21 BY MR. HENRY: 22 Q Dr. Begault, what do you recognize the document 23 that's been marked Begault Exhibit 7 to be? 24 A Patent -- United States Patent 11,290,836 B2. 25 Q Dr. Begault, do you know which claims of the '836
198 1 Do you see that? 2 A I do. 3 Q And that is the beginning of another term that 4 you addressed in your declaration as one of the processor 5 terms, right? 6 A Yes. That's true. 7 Q Now, did you believe that before 2014, persons of 8 skill in the art would have known how to implement the 9 system performing that function by resorting to known 10 audio DSP structures within the art and common industry 11 programming techniques at software libraries? 12 A Yes, I do. 13 Q Now, what audio DSP structures and software 14 libraries were available before 2014 that a person of 15 skill could have relied on to perform the function recited 16 in claim 14 of the '737 Patent? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Well, you were focusing on the part of 19 the clause that begins, Process of sound with head-related 20 transfer functions, which is what I addressed in my claim 21 terms. And so with that proviso, it would be the same 22 answer as I provided earlier. 23 BY MR. HENRY: 24 Q As you provided when I asked you that question 25 for the other patents?	200 1 Patent are asserted in this case? 2 A I do not know off the top of my head. 3 Q Let's look at claim 8 of the '836 Patent, please, 4 Dr. Begault. Let me know when you're there. 5 A I am there. 6 Q Okay. I'd like you to read the second limitation 7 of claim 8. It's a relatively lengthy one. And then my 8 question for you, which I'll give you now so you know, is 9 does that limitation recite two of the processor terms 10 that you addressed in your declaration? 11 A Okay. Stand by. 12 Yes. 13 Q The first is the term that begins, One or more 14 processors that process sound for the image to generate 15 binaural sound that has a sound localization point, SLP, 16 with a coordinate location that occurs at a far field 17 distance located behind the image and along a line of 18 sight from the user, right? 19 A I see that. 20 Q Okay. And the second processor term in the 21 second limitation of claim 8 that you addressed is wherein 22 the one or more processors include a digital signal 23 processor, DSP, that processes the sound for the image 24 with far-field head-related transfer functions, HRTFs, 25 right?

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201 1 A Yes, I see that. 2 Q Do you believe that before 2014, persons of skill 3 in the art would have known how to implement systems 4 performing the functions recited in those terms by 5 resorting to known audio DSP structures within the art and 6 common industry programming techniques and software 7 libraries? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Yes. 10 BY MR. HENRY: 11 Q And what known audio DSP structures and software 12 libraries were available to persons of skill before 2014 13 that, in your view, could have been used to perform the 14 functions recited in the claim terms in the second 15 limitation of claim 8 that you called the processor terms 16 of that claim? 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: I would state the same answer as I have 19 for the prior patents. 20 BY MR. HENRY: 21 Q Can you think of any computing devices that would 22 perform the functions recited in the processor terms in 23 the second limitation of claim 8 of the '836 Patent but 24 not be the processor or the digital signal processor 25 recited in that limitation?	203 1 A United States Patent 10,368,179 B1. 2 Q Dr. Begault, do you know what claims have been 3 asserted from the '179 Patent in this case? 4 A No, I don't know off the top of my head. 5 Q Let's look at claim 14, please, of the '179 6 Patent. 7 A I am at claim 14. 8 Q Now, I'd like to look at the third limitation 9 that begins with the word processing. Are you there? 10 A Yes. 11 Q Okay. And the third limitation of claim 14 12 reads, Processing by a digital signal processor, DSP, 13 sound with the HRTFs to generate binaural sound that 14 externally localizes in empty space in the virtual image 15 in the environment. Do you see that? 16 A I do. 17 Q Do you believe that before 2014, persons of skill 18 would have known how to implement systems performing the 19 function recited in that limitation by resorting to known 20 audio DSP structures within the art and common industry 21 programming techniques and software libraries? 22 A I do. 23 Q What known audio DSP structures and software 24 libraries could a person of skill have resorted to before 25 2014 to use to perform the function recited in the third
202 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: I want to make sure I understand. So 3 this refers to the use of a digital signal processor 4 that -- and it also refers to one or more processors. And 5 your question is, can I think of anything other than a 6 digital signal processor and other processors that would 7 accomplish these functions? 8 BY MR. HENRY: 9 Q No, my question for you is, can you think of any 10 computing device that would accomplish those functions 11 that would not constitute a digital signal processor as 12 recited in claim 8? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: I don't believe I can. 15 BY MR. HENRY: 16 Q We're going to put another exhibit in the chat 17 now, Dr. Begault. It's going to be Exhibit 8. And this 18 one is going to have the PDF file name _10368179. 19 (Whereupon Deposition Exhibit 8 was 20 marked for identification.) 21 THE TECHNICIAN: Stand by, please. (Indicating.) 22 THE WITNESS: Okay. I have it. 23 BY MR. HENRY: 24 Q Dr. Begault, what do you recognize the document 25 that's been marked Begault Exhibit 8 to be?	204 1 limitation of claim 14 of the '179 Patent? 2 MR. ELLIOTT: Objection to form. 3 THE WITNESS: Same answer as given for the other 4 patents for similar material. 5 BY MR. HENRY: 6 Q Can you think of any computing device that would 7 perform the function of processing sound with HRTFs to 8 generate binaural sound that externally localizes an empty 9 space from a virtual image in an environment that, in your 10 opinion, would not be a digital signal processor, DSP, as 11 recited by claim 14 of the '179 Patent? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: I believe your question was about a 14 computing device. Did I hear that correctly? So I could 15 think of how this might be implemented not with a physical 16 digital signal processor but by a CPU or an ASIC or some 17 other hardware solution. 18 BY MR. HENRY: 19 Q And would you consider a CPU or an ASIC 20 implementing the function recited in the third limitation 21 of claim 14 of the '179 Patent to not be a digital signal 22 processor as recited in claim 14? 23 A It would depend if we're talking about a physical 24 object or a software implementation. I mean, if we can -- 25 sometimes digital signal processor, or DSP, can refer to

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205 1 software algorithm or a software process. And sometimes 2 it can refer to a specific chip. 3 So that clarification applies to all of the 4 patents that we've discussed so far. 5 Q Can you think of any computing device -- strike 6 that. 7 Under what circumstances would a CPU or ASIC that 8 performs the recited function of claim 14 of the '179 9 Patent not be a digital signal processor in your view? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: I can't think of one off the top of my 12 head if I understand your question correctly. 13 BY MR. HENRY: 14 Q Can you think of any circumstances under which 15 any other computing device that performs the function 16 recited in that third limitation of claim 14 of the '179 17 Patent would not be a digital signal processor as recited 18 in claim 14? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: So let me paraphrase. Is your question, 21 can I think of a computing device that could not 22 accomplish digital signal processing? 23 BY MR. HENRY: 24 Q No, that's not my question. 25 We talked about CPUs and ASICs already. Now	207 1 THE WITNESS: I -- I've worked in, not properly in 2 industry, but worked for government in the area of alerts. 3 BY MR. HENRY: 4 Q And you've published papers on using spatialized 5 3D audio as alerts, right? 6 A This is correct. 7 Q Before 2014, right? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Yes. 10 BY MR. HENRY: 11 Q What types of alerts were known to people in the 12 industry that were spatialized audio alerts before 2014? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: What type of alerts? I think it was 15 fairly wide variety of different alerts. There were 16 auditory icons that were symbolic sounds that were 17 sometimes used. Plane tones. I experimented with caution 18 and warning alerts on aircraft. 19 BY MR. HENRY: 20 Q Were verbal instructions used as alerts before 21 2014? 22 A Yes. 23 Q Now, what about -- what about a situation where 24 you're walking into a virtual wall, were crashing sounds 25 used in that situation as a type of alert?
206 1 putting those aside, my question is can you think of any 2 other computing device that would perform the function of 3 the third limitation of claim 14 of the '179 Patent, but 4 that in your view, would not constitute a digital signal 5 processor as recited in claim 14? 6 A No, I can't think of one. 7 Q Do you see in -- still in claim 14, but the first 8 limitation after the preamble recites, Storing 9 head-related transfer functions, HRTFs, in memory? 10 A I see that. 11 Q Before 2014, were people of skill in the art 12 storing HRTFs in memory? 13 A Yes, they were. 14 Q Before 2014, were people of skill in the art 15 storing HRTFs in cache memory? 16 A I believe so. 17 Q Do you know if before 2014, head-mounted displays 18 had memory in them? 19 A I don't know. 20 Q I'd like to look at the last limitation of claim 21 14 now that begins with, Alerting. Are you there? 22 A I see it. 23 Q Okay. Your work in the industry before 2014, 24 involved work on alerts, in some circumstances, right? 25 MR. ELLIOTT: Objection to form.	208 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: I don't know if it would be technically 3 an alert. Maybe it was an alert. Maybe it could be some 4 sort of environment simulation not intended to alert. 5 When you say alert, I'm thinking specifically of alarms or 6 things meant to improve one's interaction with a computing 7 device. 8 BY MR. HENRY: 9 Q Fair enough. 10 But the crashing sound when people walked into 11 virtual walls as a form of feedback was known before 2014, 12 right? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: That sounds very familiar. 15 BY MR. HENRY: 16 Q You actually discuss that in your reference book, 17 right? 18 A I don't recall that example, but I'm sure I did. 19 Because I recall the example. 20 Q Was it known before 2014, that you could switch 21 the nature of sound being heard by a user as a form of 22 alert, for example, switching from monaural sound to 23 binaural sound or stereo sound? 24 MR. ELLIOTT: Objection to form, irrelevant. 25 THE WITNESS: There are systems prior to 2014, that

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209 1 could switch sounds from -- well, using different types of 2 spatial display, yes. 3 BY MR. HENRY: 4 Q And could those systems switch sounds from 5 binaural audio to stereo audio or monaural audio as a form 6 of alert? 7 MR. ELLIOTT: Objection to form 8 THE WITNESS: Yes. 9 BY MR. HENRY: 10 Q Are you familiar with chaperon systems or 11 redirected walking? 12 A No, not specifically. 13 Q Do you have any sense of what I mean when I ask 14 about chaperon systems? 15 MR. ELLIOTT: Objection to form 16 THE WITNESS: I could speculate. 17 BY MR. HENRY: 18 Q I mean systems that helped users stay within a 19 certain area in a virtual environment. Does that help? 20 A I was thinking about guidance systems for the 21 blind. There have been virtual audio systems used to help 22 blind folks or visually challenged folks navigate through 23 cityscapes for instance. 24 Q Interesting 25 In general environments?	211 1 speculation. 2 THE WITNESS: I'm sorry. What were these boundaries? 3 How were they -- 4 BY MR. HENRY: 5 Q The image of a fence, for example -- 6 A Oh, yes, I've heard of that. 7 Q And you heard of that before 2014? 8 A Yes. Yes. I've also heard about beacon systems 9 in virtual reality. 10 Q Those were known to you and others before 2014? 11 MR. ELLIOTT: Objection to form. 12 THE WITNESS: That's correct. 13 BY MR. HENRY: 14 Q Do you know what -- have you heard about -- have 15 you heard the term redirected walking before I asked you 16 that question? 17 A No. 18 Q We are going to put in the chat now, Begault 19 Exhibit 9, which is going to be _US 10448184 for the PDF 20 file name. 21 (Whereupon Deposition Exhibit 9 was 22 marked for identification.) 23 THE TECHNICIAN: Stand by. (Indicating.) 24 THE WITNESS: Okay. It arrived. Give me a moment to 25 open it.
210 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: If the person was completely unsighted, 3 then it would just be audio. 4 BY MR. HENRY: 5 Q All right. I didn't understand what you meant by 6 helping people navigate through a cityscape. 7 Was it actually an audio system to help you walk 8 through a city? 9 A Yes. There would be beacons. 10 Q In a real city, not in a virtual setting. Is 11 that what you're referring to? 12 MR. ELLIOTT: Objection to form, irrelevant. 13 THE WITNESS: Yeah, there have been systems like that 14 that have been tested. 15 BY MR. HENRY: 16 Q Have there been system that in which spatial 17 audio was used as a navigation aid in a virtual 18 environment before 2014? 19 A I'm pretty sure there was. 20 Q Even though your focus wasn't on digital elements 21 of virtual environments, were you familiar with any 22 systems that existed before 2014 where virtual boundaries, 23 images were presented to people to keep them within a set 24 virtual environment space? 25 MR. ELLIOTT: Objection to form. Calling for further	212 1 BY MR. HENRY: 2 Q Of course. 3 A Okay. It is open, Begault Exhibit 9. 4 Q And, Dr. Begault, what do you recognize Begault 5 Exhibit 9 to be? 6 A United States Patent 10,448,184 B1. 7 Q Dr. Begault, do you know which claims of the '184 8 Patent are asserted in this case? 9 A Not off the top of my head. 10 Q Let's look at claim 14, please, Dr. Begault. 11 A Okay. 12 Okay. I am there. 13 Q And I'd like to look at the third limitation of 14 that claim, which reads, Processing by a digital signal 15 processor, DSP, sound with the HRTFs to generate binaural 16 sound that externally localizes to the user at the virtual 17 image in the environment. Do you see that? 18 A I do. 19 MR. ELLIOTT: Pardon me, claim 7? 20 MR. HENRY: No. Claim 14. 21 MR. ELLIOTT: 14, thank you. 22 MR. HENRY: Sure. 23 BY MR. HENRY: 24 Q Dr. Begault, this third limitation of claim 14 of 25 the '184 Patent is one that you addressed in your

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213 1 declaration, right? 2 A That is correct. 3 Q It's one of the processor terms that you 4 addressed? 5 A It is. 6 Q And do you believe that before 2014, persons of 7 skill in the industry would have known how to implement a 8 system performing the function recited in the third 9 limitation of claim 14 of the '184 Patent by resorting to 10 known audio DSP structures and common industry programming 11 techniques and software libraries? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: I -- I do. 14 BY MR. HENRY: 15 Q What known audio DSP structures and software 16 libraries were available before 2014, that a person of 17 skill could use to perform the function recited in claim 18 14 of the '184 Patent? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: I'll refer to my same answer that I gave 21 for similar phrasing of these processor terms, with 22 relationship to the other patents that we discussed 23 earlier. 24 BY MR. HENRY: 25 Q Can you think of a computing device that would	215 1 involved, then per this limitation, the processing has to 2 involve digital signal processing. 3 BY MR. HENRY: 4 Q So if you are able, identify for me any computing 5 device that could perform the recited function in the 6 third limitation of claim 14 of the '184 Patent, but that 7 in your view, is not a digital signal processor. 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Well, it depends on our definition of 10 digital signal processor, if we want to talk about a CPU 11 doing an implementation of digital signal processing as 12 distinct from a digital signal processor, then there's an 13 example. But otherwise, if we're talking generically 14 about the idea of digital signal processing being done by 15 an ASIC, being done by software, being done by a 16 specialized chip, et cetera, et cetera, et cetera, these 17 different ways of accomplishing the processing could all 18 be used to accomplish the limitation as stated. 19 BY MR. HENRY: 20 Q Is there a way that a CPU can do an 21 implementation of digital signal processing that is 22 distinct from a digital signal processor in your view? 23 A They would be distinct in the way that they would 24 handle memory and probably in other ways too, maybe the 25 way that things are addressed as well.
214 1 perform the function recited in the third limitation of 2 claim 14, but that in your opinion, would not be a digital 3 signal processor as recited in claim 14? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: Again, the limitation says processing by 6 a digital signal processor. So by definition, this is 7 processing by a DSP. 8 BY MR. HENRY: 9 Q And can you think of any computing device, be it 10 CPU, ASIC or any other computing device, that would 11 perform the function recited in the third limitation of 12 claim 14 of the '184 Patent, but that in your view, would 13 not constitute a digital signal processor as recited by 14 that claim? 15 A No. That seems contradictory. I can't think of 16 something that isn't a digital signal processor that 17 functions as a digital signal processor. 18 Q So you can't identify for me any -- sitting here 19 today, any computing device that in your view, could 20 process sound with HRTFs to generate binaural sound that 21 externally localizes to a user at a virtual image in an 22 environment that, in your opinion, would not be a digital 23 signal processor? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Again, if digital signal processing is	216 1 Q CPUs are different than digital signal processors 2 in your view? 3 A Well, they can perform exactly the same function. 4 Q Are CPUs digital signal processors? 5 A The CPU can mimic a digital signal processor's 6 function. 7 Q Is a CPU a digital signal processor? 8 A That depends if you define a digital signal 9 processor as an external chip or if you consider a digital 10 signal processor an algorithm that sits in the CPU. 11 Q Well, I'm asking you, Dr. Begault, because you 12 remember, you opined on what a digital signal processor is 13 in this case, right? 14 A At what point? 15 Q In your declaration. 16 A Would you like to point me to what you're 17 referring to? 18 Q Sure. 19 You have a section on digital signal processor in 20 paragraph 14 of your declaration. 21 A Okay. Yes, I see it. 22 Q So we can agree that you've offered opinions on 23 what the term digital signal processor means in this case, 24 right? 25 A Yes. And paralleling what I gave you as an

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217 1 answer a couple minutes ago. 2 Q Okay. So based on -- applying your understanding 3 of what a digital signal processor is, do you draw any 4 distinction between CPUs and digital signal processors? 5 MR. ELLIOTT: Objection to form. 6 THE WITNESS: I draw distinction in the means of -- or 7 the way that the processing might be implemented, a 8 POSITA -- I'm sorry, a person of skill in the art would 9 know that different approach might be required to program 10 a digital signal processor that was a dedicated digital 11 signal processor as an external chip, for instance, than 12 they would to program a convolution process, let's say, on 13 a CPU. 14 There might be different approaches with the same 15 end result. 16 BY MR. HENRY: 17 Q Can we agree that CPUs are different than digital 18 signal processors? 19 A Well, not necessarily, because again, CPUs, 20 central processing unit, can have several threads designed 21 in the way that the architecture is designed, and various 22 threads can be assigned to work specifically to mimic what 23 a hardware DSP chip would do. 24 Q If we're looking at the third limitation of claim 25 14, Dr. Begault, are you with me?	219 1 perform the recited function of claim 14 of the '184 2 Patent, but that you would consider to not need a digital 3 signal processor? 4 MR. ELLIOTT: Objection to form. 5 THE WITNESS: All I can imagine is a computing device 6 that lack -- if I'm understanding your question correctly, 7 I could imagine hypothetically a computing device that 8 lacked the computational power to execute the signal 9 processing required by the limitation. 10 BY MR. HENRY: 11 Q But that device then would not be able to perform 12 that function, right? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: I gave you an answer there that I could 15 imagine hypothetically, a computing device that would be 16 incapable of performing the digital signal processing due 17 to, I suppose memory limitations or speed limitations of 18 that CPU, like an older -- very old computer. 19 BY MR. HENRY: 20 Q So can you identify for me any computing device 21 that is capable of performing the recited function in 22 claim 14 of the '184 Patent that you would believe is not 23 a digital signal processor as claim 14 recites? 24 MR. ELLIOTT: Objection to form. 25 THE WITNESS: Well, I answered you earlier. I can
218 1 A I'm with you. 2 Q Okay. Claim 14 of the '184 Patent, just to be 3 clear. Right? 4 A I'm looking at it at the top of column 48, yes. 5 Q If you had a CPU that processed sound with HRTFs 6 to generate binaural sound that externally localizes to 7 the user at the virtual image in the environment, in your 8 opinion, would that CPU be a digital signal processor, 9 DSP, as required by claim 14 of the '184 Patent? 10 MR. ELLIOTT: Objection to form. 11 THE WITNESS: It could be. It's possible to mimic 12 within a CPU the function of a hardware DSP. 13 BY MR. HENRY: 14 Q Well, I'm asking you if you had a CPU there that 15 performed that function in claim 14 of the '184 Patent 16 specifically, would you consider that to be a digital 17 signal processor, DSP? 18 MR. ELLIOTT: Objection to form, asked and answered, 19 argumentative, badgering the witness. 20 THE WITNESS: The CPU would have, as part of its 21 structure or the way that the CPU is comprised with its 22 various threads, a portion of it that would be a digital 23 signal processor. 24 BY MR. HENRY: 25 Q Can you identify any computing device that would	220 1 imagine a computing device that does not have the 2 capability to implement digital signal processing due to 3 lack of memory or speed. 4 BY MR. HENRY: 5 Q And I just asked you if there's any computing 6 device that has the capacity of performing this recited 7 function that you -- 8 A Oh, that was your -- oh, sorry. 9 Q Yeah, that was my question. 10 -- that you would consider to not be a digital 11 signal processor. 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: So read that question again? 14 BY MR. HENRY: 15 Q Sure. 16 Can you identify for me any computing device that 17 has the capacity to perform the recited function in claim 18 14 of the '184 Patent that you would consider to not be a 19 digital signal processor? 20 MR. ELLIOTT: Objection to form. 21 THE WITNESS: If it -- if there was a computing device 22 that had the capability but did not have the digital 23 signal processing implemented in it, that would be an 24 example. 25

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221 1 BY MR. HENRY: 2 Q Can you give me any other example of a computing 3 device that you believe wouldn't qualify as a digital 4 signal processor as recited in claim 14 of the '184 5 Patent? 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: No. I've given you some examples. 8 MR. HENRY: Let's take a break. Let's go off the 9 record. 10 MR. ELLIOTT: That's fine. 11 THE WITNESS: How long? 12 THE VIDEOGRAPHER: The time is 1614. We're going off 13 the record. 14 (Recess taken.) 15 THE VIDEOGRAPHER: The time is 1621. We are back on 16 the record. 17 BY MR. HENRY: 18 Q All right. Dr. Begault, we are going to 19 circulate another exhibit now. It will be Begault 20 Exhibit 10. 21 (Whereupon Deposition Exhibit 10 was 22 marked for identification.) 23 BY MR. HENRY: 24 Q And the file name for this one is 2023 04 12, 25 parentheses, 83-14 Exhibit 3.	223 1 for Virtual Reality and Multimedia, right? 2 A That's correct. 3 Q And this version of your book is dated 4 April 2000. Do you see that? 5 A Yes. 6 Q Okay. 7 A Where do you see April? Oh, down there at the 8 bottom. Yes, I see it. Yes. 9 Q And this was -- this book was publicly available 10 before 2014? 11 A It was available in 1994. 12 Q Well, not this 2000 version, right, but this 13 version was available before 2014, right? 14 A Oh, yes. The year 2000 was before the year 2014. 15 Q And your reference book was publicly available in 16 2000? 17 A And also available in 1994. 18 Q Thank you. 19 I'd like to scroll down to page 4, but it's PDF 20 17, if you want to navigate that way. 21 A Okay. Page -- with the subtitle, 22 Source-medium-receiver Model. 23 Q That's right. We're on the same page. 24 Now, Dr. Begault, in that section, do you see the 25 third sentence that reads, Note that spatial auditory
222 1 THE TECHNICIAN: Stand by, Counsel. (Indicating.) 2 It's uploading right now. 3 MR. HENRY: Thank you. 4 THE TECHNICIAN: And it should be ready now. 5 THE WITNESS: Okay. I have it. Give me a moment to 6 open it. 7 MR. ELLIOTT: It's not wanting to open for me. There 8 we go. 9 THE WITNESS: It's rather large. All right. 10 Exhibit 3, 243 pages. And this appears to be Exhibit 10 11 and a copy of my reference book in the NASA version from 12 April 2000. 13 BY MR. HENRY: 14 Q Now, so just for, because there's that -- there's 15 a cover page that says Exhibit 3 on this, right, which is 16 what you were referring to, Dr. Begault. 17 A Yes. It says Exhibit -- I'm sorry. 18 Q That's fine. 19 A It says Exhibit 3 on page 1. But on the bottom 20 right-hand corner, it says, Exhibit Begault-10. 21 Q That's right. This is Begault Exhibit 10. 22 And you see that this is a copy of your reference 23 book that we discussed earlier, right? 24 A That's correct. 25 Q Okay. And the title of that book is, 3-D sound	224 1 images are not confined to two-ear or binaural hearing. 2 One-ear hearing can provide spatial cues as proven by 3 experience with telephone conversations? 4 A I do. 5 Q Is it possible for a person using a telephone to 6 perceive sound as though it originates from a location 7 external to the person on the phone? 8 MR. ELLIOTT: Objection to form. 9 THE WITNESS: Restate your question, please, so I can 10 answer it accurately. 11 BY MR. HENRY: 12 Q Sure. 13 Is it possible for a person using a telephone to 14 perceive sound as though it originates from a location 15 external to a person on the phone? 16 MR. ELLIOTT: Objection to form. 17 THE WITNESS: So when you say a person on the phone, 18 you mean, as an example, I'm holding up a Western Electric 19 telephone handset to my ear, and I'm listening to somebody 20 talk to me. Okay. And then your question is, is it 21 possible to hear that person spatially that's 22 communicating to me over that phone handset? 23 BY MR. HENRY: 24 Q Sure. We can start there. 25 Is it possible?

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225 1 A Yeah. 2 Q Okay. 3 A The example I was thinking about here -- I'm 4 sorry. I'll just give you an example here. When I wrote 5 this, I was thinking about, for instance, you could hear 6 somebody in the background on a single-ear telephone, 7 old-fashioned telephone, and you could hear somebody 8 talking close to you. And so you would have a distance 9 cue that you could hear with one ear. 10 Q Got it. Thank you for that explanation. 11 Okay. You see in the same page on the last 12 paragraph, the paragraph that begins, While the source, 13 are you there? 14 A Yes. 15 Q Okay. And do you see the sentence that reads, 16 Natural spatial hearing seldom involves the single source, 17 whereas virtual spatial hearing with a 3-D sound system 18 involves the positioning of each of a number of sources 19 individually? 20 A Yes, I see that sentence. 21 Q What does it mean -- what did you mean when you 22 wrote, Virtual spatial hearing with a 3-D sound system 23 involves the positioning of each of a number of sources 24 individually? 25 A Well, I'll try to paraphrase that for you.	227 1 who's doing that, the designer of the environment? Who's 2 doing the positioning? 3 A Well -- 4 MR. ELLIOTT: Objection. 5 THE WITNESS: In the context of this sentence, it was 6 the -- it's the prescriptive aspect. What a sound 7 designer might do with a 3D audio system. You're doing 8 the positioning. It's a different matter about how I 9 would hear those positions. 10 BY MR. HENRY: 11 Q Understood. 12 So this was prescriptive and directed towards the 13 designer of the environment for the user's subsequent 14 listening. Is that fair? 15 A Yes. I was saying -- when I said it involves the 16 positioning, I was talking about the prescriptive portion 17 of the 3D audio system. When I talk about virtual spatial 18 hearing with the 3D audio system, that's talking about the 19 result. So I can prescribe, for instance, that I want you 20 to hear a sound in front of you. You may hear the sound 21 behind you because sound sources, as we hear them, can be 22 in different locations than the sound position we 23 prescribed. Which was one of my problems with defense's 24 claim construction for HRTF. 25 Q I understand.
226 1 That -- are you concerned with the second part of the 2 sentence, or how does it differ from the first part of the 3 sentence. 4 Q You can tell me what you meant by the sentence. 5 That's fine. I just want to know what you meant by that 6 sentence. 7 A Oh, well, I meant that if you use a 3-D sound 8 system, oftentimes a number of sound sources are 9 positioned to different locations. They don't have to be, 10 but virtual spatial hearing with a 3-D sound system 11 typically did involve or does involve in positioning a 12 number of sources. We might even just position a single 13 source, actually. 14 Q And whether you're positioning one source or 15 positioning multiple sources, who does that positioning? 16 A Well, that could be an algorithm. That could be 17 a person interacting with an algorithm. 18 Q Oh, I meant if this is -- maybe I was 19 misunderstanding, but this is sort of in virtual reality, 20 right? 21 A Well, I was speaking here about virtual spatial 22 hearing with a 3-D sound system. 23 Q Oh, so virtual environment. All right. So if 24 you're in a virtual environment and you're positioning 25 sound sources at one or more locations, is it the listener	228 1 So if there's a -- you can't guarantee that I 2 will not experience a reversal error, for example, right? 3 A Absolutely true -- 4 MR. ELLIOTT: Objection to form and irrelevant. 5 THE WITNESS: I probably can't guarantee anything for 6 you. 7 BY MR. HENRY: 8 Q Sure. Sure. 9 I didn't think that was a problematic question. 10 But -- strike that. 11 But what you're referring to in the sentence that 12 we're talking about is actually a, you know, prescription 13 of locations for sound sources, and then subsequently 14 whether a listener perceives them to be in those locations 15 is a different matter; is that fair? 16 A I think that's fair. 17 MR. ELLIOTT: Objection to form. 18 THE WITNESS: Sorry. 19 I believe that's fair. 20 BY MR. HENRY: 21 Q Thank you. 22 If you go to page 8 of your reference book, let 23 me know when you're there. 24 A I am there. 25 Q And I'd like to look at the paragraph that starts

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229 1 with, Virtual reality and multimedia systems and then has 2 the enumerated 1, 2, 3, just to orient you. Okay? 3 A Yes. 4 Q Okay. And you see where you wrote, A hardware 5 component definition of a virtual reality system usually 6 involves the following elements, and then you listed the 7 three subparagraphs? 8 A Yes. 9 Q Okay. Some of the elements that you identified 10 as being usually involved in a virtual reality system in 11 your reference book included head-mounted displays, 12 headphones, and force feedback devices, right? 13 A That is -- 14 MR. ELLIOTT: Objection -- objection to form, scope, 15 irrelevant. 16 THE WITNESS: That is what I wrote. 17 BY MR. HENRY: 18 Q And at the time you wrote that, did virtual 19 reality systems usually involve those elements? 20 MR. ELLIOTT: Objection to form, scope, irrelevant. 21 THE WITNESS: They were typically defined that way. 22 Some were more successful than others at actually 23 implementing all these things. 24 BY MR. HENRY: 25 Q Okay. And you also wrote in your reference book	231 1 MR. HENRY: It's actually pitch, if that didn't come 2 through with a P. 3 THE STENOGRAPHIC REPORTER: Thank you. 4 THE WITNESS: And those kind of rolls taste terrible. 5 BY MR. HENRY: 6 Q All right. What is a sixth-degree-of-freedom 7 trackball? 8 MR. ELLIOTT: Objection to form, irrelevant. 9 THE WITNESS: It's been a long time since I've thought 10 about this six-degree-of-freedom trackball. I know that I 11 saw one that was claimed to be that. I believe it was a 12 mouse-like device that you could rotate the trackball to 13 indicate pitch, yaw, and roll, and then the stand that 14 that trackball was mounted on could also be moved. 15 BY MR. HENRY: 16 Q And the XYZ coordinates to be six? 17 A Yeah. And I'm trying to picture it. It's been 18 so many years since I've seen a sixth-degree-of-freedom 19 trackball. They didn't exactly take off. 20 Q I was going to say, if it -- holding it, moving 21 it in the Z direction seems a little bit odd. 22 A Yes. 23 Q Okay. All right. Let's see. 24 Was the Polhemus tracking system we've discussed 25 previously a six-degree-of-freedom system?
230 1 that virtual reality system usually involves sensors, 2 hardware such as magnetic or mechanical position trackers 3 six-degrees-of-freedom trackball, speech analyzers, and 4 data gloves. Do you see that? 5 A Yes, I do. 6 Q At the time you wrote this reference book, did 7 virtual reality systems usually involve those components? 8 MR. ELLIOTT: Objection; form, scope, and irrelevant. 9 THE WITNESS: They involved them either by intention 10 or by actual implementation. 11 BY MR. HENRY: 12 Q What is a -- actually, you mentioned earlier on 13 six-degree-of-freedom capability, and I see that -- I see 14 language here six-degrees-of-freedom trackballs. What is 15 six degrees of freedom referring to? 16 MR. ELLIOTT: Objection to form and irrelevant. 17 THE WITNESS: Well, three degrees of freedom might be, 18 for instance, tracking the head in terms of the pitch, 19 yaw, and roll, and then we can add another three degrees 20 of freedom in terms of the XY position of the human 21 themselves. 22 THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. It 23 sounded like you said John roll. What did you say? 24 THE WITNESS: Pitch, yaw, y-a-w, and roll, r-o-l-l. 25 THE STENOGRAPHIC REPORTER: Thank you.	232 1 MR. ELLIOTT: Objection to form and irrelevant. 2 THE WITNESS: Yes. I think it could be configured to 3 work that way, but I think you needed an extra sensor or 4 something like that. So it could be configured that way. 5 A lot of times it was just used as a 6 three-degree-of-freedom device. 7 BY MR. HENRY: 8 Q If you had pitch, yaw, and roll, usually what 9 additional sensor would you need to give you the ability 10 to move in the X, Y, and Z directions for six degree of 11 freedom with the Polhemus? 12 MR. ELLIOTT: Objection to form, irrelevant. 13 THE WITNESS: You're really testing my memory here, 14 but I believe that at least an extra receiver was needed. 15 I don't know if a separate transmitter was needed. And 16 that was the earliest generation of Polhemus, or as we 17 call them, Polhemi. That's P-o-l-h-e-m-i. I don't 18 know -- and I can't recall the capabilities of later 19 systems. 20 They might have made it so that multiple trackers 21 and, you know, transmitters and receivers could be 22 operated from the same external hardware device. 23 BY MR. HENRY: 24 Q Thank you. 25 And can you look at page 13, please.

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233 1 A Page 13. 2 Q Yeah. And you see the header, So what is 3-D 3 sound good for? 4 A Yes. 5 Q And the last paragraph -- strike that. 6 The first sentence of the paragraph at the bottom 7 of page 13 of your reference book reads, 3-D sound can 8 contribute to the sense of immersivity in a 3-D 9 environment. Do you see that? 10 A I do. 11 Q Do you agree with that statement? 12 MR. ELLIOTT: Objection to form and irrelevant. 13 THE WITNESS: My opinion has not changed about that. 14 BY MR. HENRY: 15 Q And the next sentence reads in part, One might be 16 able to work more effectively within a VR environment if 17 actions were accompanied by appropriate sounds that 18 seemingly emit from their proper locations. Do you see 19 that? 20 A (Indecipherable utterance.) 21 MR. ELLIOTT: Objection to form and irrelevant. 22 BY MR. HENRY: 23 Q Did you answer, Dr. Begault? If it did, it 24 didn't come through. 25 A Oh, I'm sorry, I -- what was your question? Do I	235 1 know that in some context, it might help, and in some 2 context it might not; is that fair? 3 MR. ELLIOTT: Objection irrelevant and form. 4 THE WITNESS: I don't know the answer to that 5 question. 6 BY MR. HENRY: 7 Q And you believed before 2014 and wrote in your 8 reference book that in certain circumstances, it could 9 help if sounds seemingly emit from their proper locations 10 in VR environments, right? 11 MR. ELLIOTT: Objection to form, also irrelevant. 12 THE WITNESS: Well, if you go to the topic, What is 13 3-D sound good for, that was being contrasted with non-3-D 14 sound, which typically was monaural sound, et cetera. So 15 the context for this sentence was what -- why go to the 16 trouble, at that time in particular, to implement 3-D 17 sound, what would be the advantages of doing so. 18 And so one possibility would be that you might be 19 able to work more effectively within the environment if 20 sounds came from their proper locations. However, even 21 during the time this was written, for instance, the Ames 22 Spatial Auditory Display, I had implemented systems where 23 sounds didn't come from a, quote/unquote, proper location. 24 It came from locations meant to optimize performance, for 25 instance, or to improve the user experience.
234 1 agree with that statement? 2 Q Do you see that statement? 3 A I see that statement, yes. 4 Q Do you agree with that? 5 MR. ELLIOTT: Objection to form and irrelevant. 6 THE WITNESS: I'll agree -- yes, I agree with that 7 statement. I'd like to emphasize the words might, as in 8 might be able. There could be situations where one might 9 be able to work more effectively if sounds did not emit 10 from their, quote/unquote, proper locations. 11 I think this was a reference to people using 12 monaural sound, let's say, but with digital graphics. It 13 didn't conceive of the advantage of having maybe 14 separation locations for sound and virtual images, in this 15 sentence at least. 16 BY MR. HENRY: 17 Q Do you agree that it might be helpful for users 18 in a VR environment if actions are accompanied by 19 appropriate sounds seemingly emitting from their proper 20 locations? 21 MR. ELLIOTT: Objection to form and irrelevant. 22 THE WITNESS: It may and it may not. It depends on 23 the particular context, what one is trying to accomplish. 24 BY MR. HENRY: 25 Q And before 2014, people in the industry would	236 1 BY MR. HENRY: 2 Q What would be an advantage of having a sound 3 seemingly emit from its, as you said here, proper 4 location? 5 A What would be the -- 6 MR. ELLIOTT: Objection. Objection to form. 7 Objection -- 8 BY MR. HENRY: 9 Q What would be an advantage -- 10 MR. ELLIOTT: Objection; irrelevant. 11 THE WITNESS: An advantage of sound being emitted from 12 the same location from a, quote/unquote, proper location? 13 BY MR. HENRY: 14 Q Yes. 15 A What would be the advantage, in other words -- 16 Q What would be the advantage? 17 A I believe one of the advantages could be for 18 the -- how could I put this -- the synthesis of the 19 auditory object with the visual object in one location. 20 So if that were important, for instance, if you had a 21 moving object and the sound came from the same direction 22 as the moving object, then that sense of motion could be 23 improved. As opposed to only seeing a truck pass by, 24 let's say, but hearing it monaural. 25 Q And that was an advantage that you were aware of

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237 1 before 2014; is that fair? 2 MR. ELLIOTT: Objection to form and irrelevant. 3 THE WITNESS: Was I rare of the advantage I wrote 4 about in 1994? Yes, I was. 5 BY MR. HENRY: 6 Q And actually, if you flip down to the next page, 7 page 14 of your reference book, do you see where you wrote 8 in the first sentence of the first full paragraph, Sound 9 provides an important channel of feedback that either can 10 be helpfully redundant to a visual cue or can provide 11 feedback for actions in situations that are out of field 12 of view of the listener? 13 A Correct. 14 Q In what -- you were just describing with the 15 truck moving and sort of sound -- associated sound moving 16 with it, is that what you're referring to here as a 17 redundant visual cue? 18 MR. ELLIOTT: Objection to form and irrelevant. 19 THE WITNESS: Oh, I think I was referring to that in 20 part, let me think here. I believe I was focusing in this 21 paragraph, on the topic sentence of situational awareness. 22 So here, I was thinking about high-stress human 23 interfaces, like a pilot or something of that sort. 24 For instance, if you picture a cockpit display or 25 something in a space shuttle at the time, different	239 1 BY MR. HENRY: 2 Q And in what direction were you exaggerating the 3 position of the audio cue, to the right of the visual cue, 4 left to the visual cue, behind the visual cue, which 5 direction? 6 MR. ELLIOTT: Objection to form, compound, scope, and 7 irrelevant. 8 THE WITNESS: In the example I'm citing, if the 9 aircraft were, say, 30 degrees to the left, relative to 10 the frontal view of a pilot, we would actually move it 11 to -- I can't remember, 45 degrees or 60 degrees. So 12 there was some ratio, 1 and a half, 150 percent of the 13 angular position, et cetera. 14 BY MR. HENRY: 15 Q What are individualized or personal HRTFs? 16 A Generally speaking, that would be either a 17 measurement made on a human with the microphones located 18 at some position in their ear canal. So that would be my 19 personal HRTFs could be measured in that way, along with 20 we haven't discussed the signal processing to eliminate 21 the influence of the measurement system. But we'll leave 22 that aside. 23 It could also be the selection that some people 24 have done of HRTFs according to kind of a shoe size 25 estimation. In other words, some HRTFs you might select
238 1 warning devices could be lit from different locations. 2 And so helpfully redundant to a visual cue meant that you 3 could direct your eyes to the location of the alert -- 4 visual alert, which frequently was associated with a 5 button for instance. 6 BY MR. HENRY: 7 Q And was -- were you discussing visual cues in 8 reality or in a virtual environment setting here? 9 MR. ELLIOTT: Objection to form, irrelevant. 10 THE WITNESS: Both. 11 BY MR. HENRY: 12 Q And so then the audio cue would be redundant with 13 the visual cue in its location? 14 MR. ELLIOTT: Objection to form and irrelevant. 15 THE WITNESS: Well, not always. So, for instance, in 16 a traffic collision avoidant system, I actually used 17 exaggerated audio cues relative to the actual position of 18 the visual cue, which was an aircraft outside the window 19 that you were going to crash into. 20 The reason we used exaggerated cues was because 21 it was better for performance to get people to look in the 22 general direction of where that potential hazard might be. 23 So it turned out that visual acquisition of target 24 information was actually better served by exaggerating 25 or -- yeah, exaggerating the position of the audio cue.	240 1 from different sound examples, and so some systems create, 2 quote/unquote, personalized HRTFs that aren't necessarily 3 your own, but the best match to your own. 4 And then finally there are synthetic HRTFs that 5 could be derived from, for instance, holding an iPhone or 6 similar handheld device up to your ear and moving your 7 head. 8 Q And what are non-individualized or generalized 9 HRTFs? 10 A Well, that would include, for instance, your 11 example of a KEMAR dummy head. It would include 12 measurements made on anything that is not you. So of 13 course, I was describing an overlap there because you 14 could have personalized HRTFs that are derived from 15 something that is not individualized. So if you want to 16 make the strictest definition of a personalized HRTF, it's 17 that the measurement was done on me. 18 But, again, there are sort of best-fit HRTF, and 19 then there's other approaches that people have done too, 20 for instance, compensating just for the ITD and not for 21 the HRTF. 22 Q And in your reference book, you discussed both 23 individualized and non-individualized HRTFs, right? 24 A I do. 25 Q And in spatialized audio systems predating 2014,

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241 1 people were using both individualized and 2 non-individualized HRTFs, right? 3 MR. ELLIOTT: Objection to form and irrelevant. 4 THE WITNESS: Your question was people were using 5 individualized and non-individualized HRTFs? 6 BY MR. HENRY: 7 Q I'll rephrase. 8 A No, no, that's fine if that's the question. 9 Q I'll strike the question. I'll rephrase it for 10 you. 11 A Okay. 12 Q In spatialized audio systems predating 2014, did 13 people of skill in the industry know that you could use 14 non-individualized HRTFs? 15 MR. ELLIOTT: Objection to form and irrelevant. 16 THE WITNESS: Yes. 17 BY MR. HENRY: 18 Q Okay. Before 2014, did people of skill in the 19 industry know that you could use in spatialized audio 20 systems individualized HRTFs? 21 MR. ELLIOTT: Objection to form and irrelevant. 22 THE WITNESS: Yes. 23 BY MR. HENRY: 24 Q If you could go to page 69 of your reference 25 book, which is PDF 80, if it's easier to navigate that	243 1 realistic representation of the environmental context, 2 and -- yeah, so this would be certainly an improvement for 3 a simulation to include those things. 4 BY MR. HENRY: 5 Q You agree that -- can we agree that reverberation 6 is key for the effective simulation of distance in the 7 perception of environmental context? 8 MR. ELLIOTT: Objection to form and irrelevant. 9 THE WITNESS: Except for some exotic cases, I might be 10 able to think of the environmental context as cued by 11 reverberation. 12 BY MR. HENRY: 13 Q Do you see the sentence right after what we just 14 covered, where you wrote, In fact, the same physical cue, 15 reverberation, is key for the effective simulation of 16 distance and the perception of an environmental context, 17 right? 18 MR. ELLIOTT: Objection to form and irrelevant. 19 THE WITNESS: Yes. I see that. 20 BY MR. HENRY: 21 Q Do you agree with that statement? 22 MR. ELLIOTT: Objection to form and irrelevant. 23 THE WITNESS: Yes. 24 BY MR. HENRY: 25 Q I'd like you to --
242 1 way. 2 THE TECHNICIAN: Stand by. 3 THE WITNESS: 69, did you say? 4 BY MR. HENRY: 5 Q Page 69. 6 A Yes. 7 THE TECHNICIAN: Stand by. 8 THE WITNESS: Okay. Page 69. I'm on page 69. 9 BY MR. HENRY: 10 Q It's the top of -- just so we're looking at the 11 same thing, do you see Chapter 3 at the top? 12 A I do. 13 Q Okay. And then you see the header, 3-D sound 14 distance and reverberation? 15 A I do. 16 Q The first sentence under that reads, The 17 inclusion of distance and environmental context within a 18 3D audio system is almost imperative for maintaining a 19 sense of realism among virtual acoustic objects, right? 20 MR. ELLIOTT: Objection to form and irrelevant. 21 THE WITNESS: Yes, that was my statement there, yes. 22 BY MR. HENRY: 23 Q And you agree with that statement? 24 MR. ELLIOTT: Objection to form and irrelevant. 25 THE WITNESS: Yes. If we're trying to make a	244 1 A You can simulate -- let me clarify, that you can 2 simulate distance, but you can't simulate the 3 environmental context and distance together without 4 reverberation. 5 THE STENOGRAPHIC REPORTER: Hi, Counsel. I need to 6 plug in my sound system. Can we take a really quick 7 break? I just need to re-plug it in. 8 MR. HENRY: Sure, of course. 9 Let's go off the record. 10 THE VIDEOGRAPHER: The time is 1657. We're going off 11 the record. 12 (Recess taken.) 13 THE VIDEOGRAPHER: The time is 1658. We're back on 14 the record. 15 BY MR. HENRY: 16 Q Dr. Begault, I'd like to look at page 95 of your 17 book, PDF 106. 18 A Page 95. Chapter 4. 19 Q Great. Do you see the number paragraph Number 1? 20 A I do. 21 Q Do you see the first two sentences there, You 22 pose questions? 23 A Yes. 24 Q Okay. And then the sentence after that, the 25 third sentence reads, In virtual reality and multimedia

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245 1 applications, most sounds are somehow connected to visual 2 events requiring decisions as to how representative they 3 need to be. Do you see that? 4 A I do. 5 MR. ELLIOTT: Objection to form. Objection to form 6 and irrelevant. 7 BY MR. HENRY: 8 Q Do you agree with that statement? 9 MR. ELLIOTT: Objection to form and irrelevant. 10 THE WITNESS: Yeah, I agree with that statement. I 11 mean, in the context of the audio guru on a design team 12 for an application in most cases. 13 BY MR. HENRY: 14 Q What is interpolation, Dr. Begault? 15 MR. ELLIOTT: Objection to form and irrelevant. 16 THE WITNESS: Mathematically, it's the -- an 17 intermediate value between two other values, but in the 18 context of 3-D sound, if one has measured positions and 19 one was to simulate a position that is not at a measured 20 position, then one would use the technique of 21 interpolation to achieve an intermediate spectral 22 modification of the sound. 23 BY MR. HENRY: 24 Q Are there different methods of interpolation? 25 MR. ELLIOTT: Objection to form and irrelevant.	247 1 Sometimes different methods are used to interpolate the 2 interaural time delay separately from the magnitude 3 transfer function. 4 Q When you say separate from the magnitude transfer 5 function, what transfer function are you referring to when 6 you say magnitude transfer function? 7 MR. ELLIOTT: Objection to form and irrelevant. 8 THE WITNESS: The spectral component of the HRTF, 9 absent in its time delay component (indecipherable 10 utterance.) 11 BY MR. HENRY: 12 Q Thank you. 13 THE STENOGRAPHIC REPORTER: I'm sorry. Can you repeat 14 that answer, please? 15 THE WITNESS: The spectral, s-p-e-c-t-r-a-l, 16 component, separate from the time delay component. 17 THE STENOGRAPHIC REPORTER: Thank you. 18 THE WITNESS: Yeah. 19 BY MR. HENRY: 20 Q If you look at page 167, which is PDF 177, if you 21 want to navigate it that way. 22 A 167? 23 Q That's right. 24 A Yes. 25 Q Do you see the heading, Head-tracked 3D audio for
246 1 THE WITNESS: Yes there are. 2 BY MR. HENRY: 3 Q What are some of those, Dr. Begault? 4 MR. ELLIOTT: Objection to form and irrelevant. 5 THE WITNESS: One form of interpolation is simply 6 cross fading between prerecorded 3D-audio sounds, which 7 was done early on. There are a couple of techniques that 8 are bandied about in the literature for determining the 9 best way to interpolate between measured HRTFs, and some 10 of those depend on linear interpolation. 11 Some of those involve spherical coordinate 12 interpolation. And then there are people these days more 13 recently who record so many positions, that interpolation 14 is almost unnecessary, or it can be done in the 15 old-fashioned way with the cross fading. 16 BY MR. HENRY: 17 Q And you mentioned linear interpolation and 18 spherical interpolation in that response. Were there any 19 other methods of interpolating between measured HRTF 20 positions? 21 MR. ELLIOTT: Objection to form, irrelevant. 22 THE WITNESS: Simple cross fading. 23 BY MR. HENRY: 24 Q Any other methods? 25 A Those are the three I'm most familiar with.	248 1 virtual environments? 2 A I do. 3 Q The first sentence under that heading on page 167 4 of your reference book reads, In virtual reality, the key 5 to immersivity is directly tied to the success of the 6 interface in providing realistic information at the 7 effectors and the degree to which sensors are able to 8 track human interaction. Do you see that? 9 MR. ELLIOTT: Objection to form and irrelevant. 10 THE WITNESS: I see that. 11 BY MR. HENRY: 12 Q Do you agree with that statement? 13 MR. ELLIOTT: Objection to form and irrelevant. 14 THE WITNESS: Yes. There's some other keys to 15 immersivity. So I don't want to say that this is the 16 exclusive list of things. I think in my writing style 17 there, I was saying that one of the key elements. 18 BY MR. HENRY: 19 Q And the sentence after the one that we just read 20 on page 167 reads, For this reason, head-tracked virtual 21 acoustic systems represent the best approach to 22 implementing sound so that sound sources can remain fixed 23 in virtual space independent of head movement, as they are 24 in natural spatial hearing. 25 Do you see that?

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249 1 MR. ELLIOTT: Objection to form and irrelevant. 2 THE WITNESS: I do. 3 BY MR. HENRY: 4 Q Do you agree with that statement? 5 MR. ELLIOTT: Objection to form and irrelevant. 6 THE WITNESS: Well, 35 years plus experience -- or how 7 many years has it been since I wrote this? I can't do the 8 math. Close to 40; is that right? No. But anyway -- 9 BY MR. HENRY: 10 Q This is 2023. So -- 11 A Yeah, dang it. Okay. 12 Q A little bit more. 13 A Yeah, yeah, yeah, okay. All right. So point is 14 that I can, with that based off my experience, 15 head-tracking virtual acoustic systems were very idealized 16 at that time. I think what we have found is that in some 17 applications, it's better not to use head tracking. I 18 think there's some recent Apple headphone, like the ones 19 I'm wearing now, that can include head tracking. 20 And some people find it very disturbing to have 21 the world moving in quasi-realistic fashion. Another 22 thing that we found over the last almost 40 years is the 23 effect of latency. And if the processors can't keep up 24 with moving your head, then you can get something called 25 virtual environment sickness.	251 1 MR. ELLIOTT: Objection to form and irrelevant. 2 THE WITNESS: Yes. 3 BY MR. HENRY: 4 Q And processed HRTFs? 5 MR. ELLIOTT: Objection to form and irrelevant. 6 THE WITNESS: It used -- it implemented the 7 head-related transfer function for sources. 8 BY MR. HENRY: 9 Q If you turn to page 168, do you see the paragraph 10 under the image, not the caption, but the paragraph below 11 the image? 12 A These impulse responses? 13 Q Yeah. 14 A Yeah. 15 Q And that goes on to say, These impulse responses 16 are convolved, and then continues from therein, correct? 17 MR. ELLIOTT: Objection to form and irrelevant. 18 THE WITNESS: Correct. 19 BY MR. HENRY: 20 Q So the -- is it fair to say that Convolvotron was 21 using convolution processes with HRTFs? 22 MR. ELLIOTT: Objection to form and irrelevant. 23 THE WITNESS: Yes. 24 BY MR. HENRY: 25 Q If you go to the next page 169, and the bottom
250 1 BY MR. HENRY: 2 Q When you wrote your reference book, it was known, 3 though, that head-track virtual acoustic systems could 4 keep a sound source fixed in a location in virtual space 5 independent of head movement, right? 6 MR. ELLIOTT: Objection to form and irrelevant. 7 THE WITNESS: Yes. With the proviso of latency that I 8 just gave you there, but yes, that was a very exciting 9 discovery in the 80s. 10 BY MR. HENRY: 11 Q And actually, if you look down below it, under 12 the heading, Crystal River Engineering, it seems you 13 described the Convolvotron as one of the first head-track 14 virtual audio systems. Do you see that? 15 MR. ELLIOTT: Objection to form, irrelevant. 16 THE WITNESS: Yes, that's a true statement. 17 BY MR. HENRY: 18 Q And Convolvotron, described in -- as described in 19 your reference book, used spatialization functions run 20 through software or other routines, right? 21 MR. ELLIOTT: Objection to form and irrelevant. 22 THE WITNESS: I think it says that somewhere. 23 BY MR. HENRY: 24 Q Okay. Well, even without that, Convolvotron used 25 spatialized audio, right?	252 1 paragraph on that page that begins, The Convolvotron 2 hardware, are you there? 3 A I'm there. 4 Q Okay. And then in that paragraph, it talks about 5 the Convolvotron using DSPs, right? 6 MR. ELLIOTT: Objection to form and irrelevant. 7 THE WITNESS: Let's see. DSPs is mentioned 8 specifically in the sentence beginning, The convolution 9 engine. 10 BY MR. HENRY: 11 Q Yeah, and that sentence reads, The convolution 12 engine is a custom-made board that contains four INMOS 13 A-100 cascable DSPs, and then continues from there, 14 right? 15 MR. ELLIOTT: Objection to form and irrelevant. 16 THE WITNESS: Yes. 17 BY MR. HENRY: 18 Q So do I understand from that then, that 19 Convolvotron was using DSPs for its sound processing? 20 MR. ELLIOTT: Objection to form and irrelevant. 21 THE WITNESS: It was using a DSP hardware chip that 22 was mounted to this custom-made board. 23 BY MR. HENRY: 24 Q And using that DSP chip for sound processing, 25 right?

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253 1 MR. ELLIOTT: Objection to form and irrelevant. 2 THE WITNESS: Yes. So it was using those DSPs for 3 sound processing. 4 BY MR. HENRY: 5 Q On the bottom of page 170, your reference book 6 discusses something called, Focal Point. Do you see that? 7 A I do. 8 Q And in the second paragraph, the first sentence 9 reads, Gehring later entered the virtual reality market 10 with a low-cost device known as the Focal Point system, a 11 head-tracked virtual acoustic display for either the 12 Macintosh or the PC. Do you see that? 13 MR. ELLIOTT: Objection to form and irrelevant. 14 THE WITNESS: Yes. 15 BY MR. HENRY: 16 Q Okay. And then -- actually, I'll just ask you, 17 before 2014, did people of skill in the industry know that 18 you could use DSPs with Macs for sound processing? 19 A Yes. 20 Q Did they know you could use DSPs with Macs for 21 processing spatialized audio? 22 A (Indecipherable utterance.) 23 MR. ELLIOTT: Objection to form. Objection to form 24 and irrelevant. 25 And, Mr. Henry, can we take a break? And also I	255 1 spatialized audio? 2 A Yes. 3 MR. HENRY: Okay. Let's go off the record. 4 THE WITNESS: How long? 5 MR. HENRY: We'll go off the record, and then we'll 6 discuss. 7 THE VIDEOGRAPHER: The time is 1714. We're going off 8 the record. 9 (Recess taken.) 10 THE VIDEOGRAPHER: The time is 1727. We're back on 11 the record. 12 BY MR. HENRY: 13 Q Dr. Begault, I want to look at your report, which 14 is Exhibit 1. You still have that, your declaration? 15 A Yes. 16 Q Now, your declaration, not counting your CV, is 17 eight pages long, right? 18 A I haven't counted. Though, I will. Yes, I see 19 eight pages, and that includes, I believe, a cover 20 sheet -- no, does not include the cover sheet nor the 21 table of contents. 22 Q 17 paragraphs, right? 23 A I haven't counted those paragraphs, but I will 24 believe you that there's 17 paragraphs. Yes, it appears 25 there are 17 paragraphs.
254 1 just want to launch a general objection in the record that 2 we have wasted hours of time turning this into a prior art 3 deposition, wherein its purpose is claim construction. 4 MR. HENRY: We can take a break if you need a break. 5 That's fine. I'm happy to go off the record, as I said 6 before, but there is a pending question. So we're going 7 to get an answer to my question before we break -- 8 MR. ELLIOTT: Oh, I apologize. 9 MR. HENRY: That's fine. 10 And your objection was noted for the record. We 11 don't have to quibble about it now. But I disagree 12 including because you have been objecting to things that 13 were specifically discussed in defendant's expert's claim 14 construction declaration as irrelevant. Which -- and 15 also, it's a deposition. So your relevance objections 16 are, you know, likely improper. And you know that. 17 But, yeah, sure. Let's get an answer to the 18 pending question. 19 MR. ELLIOTT: That's fine. 20 MR. HENRY: And then we can take a break if you'd 21 like, and then we will reconvene. 22 BY MR. HENRY: 23 Q So let me just restate my question for you, 24 Dr. Begault. Before 2014, did people of skill in the 25 industry know you could use DSPs with Macs to process	256 1 Q And on page 8 of your declaration, that's your 2 signature? 3 A Yes, it is. 4 Q Do you know what a means-plus-function term is? 5 A No, not exactly. 6 Q Do you have any understanding of what a 7 means-plus-function term is? 8 A Not that I -- no, I'll say no. I don't really 9 have a full understanding of it. 10 Q In your declaration, Dr. Begault, do you cite any 11 patents, articles, publications, or documents other than 12 the asserted patents? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: I don't believe I included any citations 15 to other documents other than the patents. 16 BY MR. HENRY: 17 Q Dr. Begault, I may have question for you 18 following your counsel's questions, but if not, I don't 19 have any further questions for you right now. So thank 20 you for your time. 21 A Thank you. 22 EXAMINATION 23 BY MR. ELLIOTT: 24 Q All right. Dr. Begault, you remember the series 25 of questioning by Mr. Henry where you were asked about

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257 1 computing devices that perform the processing steps and 2 were asked if these were not processors, do you remember 3 that line of questioning? 4 MR. HENRY: Object to form, ambiguous. 5 THE WITNESS: Yes. I remember that line of 6 questioning, that was over the series of patents that we 7 looked at. 8 BY MR. ELLIOTT: 9 Q Mm-hmm. Can a processor that performed those 10 processing steps that claims also be a software processor? 11 A Yes. 12 MR. HENRY: Object to form. 13 THE WITNESS: Sorry, sorry. I'll stop -- 14 BY MR. ELLIOTT: 15 Q Go ahead and pause like you did before so 16 Mr. Henry can get his objections down as well. 17 A Yes. 18 Q So those steps can be performed by software; is 19 that correct? 20 A Yes, they can. 21 Q And that's true of each one of those processing 22 limitations that you went through with Mr. Henry? 23 A I believe so, yes. 24 Q If I can please direct you to the '090 Patent? 25 A Okay.	259 1 Dr. Begault's testimony. 2 THE WITNESS: It says, From the point of view of the 3 listener can be proximate to the listener, such as in the 4 same room -- which is consistent with my prior 5 testimony -- Or far away from the listener, such as 6 several kilometers away. 7 BY MR. ELLIOTT: 8 Q All right. Then if you would, turn to column 9 11 -- or excuse me, sorry. Column 9 first. 10 A Column 9. 11 Q And look at the paragraph, would be about 12 Line 22, beginning with, The sound localization point. 13 A Yes. 14 Q And then the middle of the paragraph, probably 15 around Line 25, you want to read the end of that 16 paragraph, and let me know when you're finished? 17 A Okay. 18 Yes, I've finished. 19 Q Okay. Does this language give you a definition 20 of proximate within the patent? 21 MR. HENRY: Objection to form, beyond the scope, not 22 in Dr. Begault's declaration. It's a clear attempt to 23 supplement his opinions on the improper redirect. 24 THE WITNESS: This statement here is wholly consistent 25 with my earlier testimony about speech levels, and it has
258 1 Q And I apologize. I don't remember which exhibit 2 that turned out to be. 3 Do you know, Mr. Henry? 4 MR. HENRY: Exhibit 3. 5 MR. ELLIOTT: Thank you. 6 THE WITNESS: All right. I'm at the '090 Patent, yes. 7 BY MR. ELLIOTT: 8 Q Okay. If you would, go to column 4, lines about 9 38 to 41. 10 A Column 4, lines 38 through 41. I am there. 11 Q Paragraph beginning, Further yet, why don't you 12 go ahead and read that, and then once you've read it, tell 13 me if that gives you a definition of proximate. 14 MR. HENRY: Objection to form, outside the scope. Not 15 cited in his declaration to be clear. 16 THE WITNESS: Okay. I've read it. 17 BY MR. ELLIOTT: 18 Q And does that give you an indication of what the 19 patent means by proximate? 20 MR. HENRY: Same objections. 21 THE WITNESS: Yes. That's consistent with my 22 testimony earlier. 23 BY MR. ELLIOTT: 24 Q And what definition does it give here? 25 MR. HENRY: Same objections and mischaracterizes	260 1 to do with a second individual being proximate, such as 2 both individuals being in the same room together. 3 BY MR. ELLIOTT: 4 Q And then column 11, Line 46. 5 A Yes, I am there. 6 Q And go ahead and read from Line 46 down through 7 the end of that paragraph, the paragraph beginning, Sound 8 adjustments are made. 9 A Okay. From Line 44. 10 Yes, I've read it. 11 Q And does this also give you an instance in 12 respect where there is a definition of proximate? 13 MR. HENRY: Objection to form, beyond the scope, not 14 in Dr. Begault's declaration. Again, another clear 15 attempt to supplement Dr. Begault's opinions with improper 16 redirect. 17 THE WITNESS: Yes, again, this statement is wholly 18 consistent with my earlier testimony. And one moment... 19 It's also wholly consistent with my declaration 20 paragraph 10. 21 BY MR. ELLIOTT: 22 Q And does this -- what definition does this give 23 for proximate? 24 MR. HENRY: Same objections. 25 THE WITNESS: Let's see. It gives us a definition of

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261 1 proximate, as... if the listener were standing or sitting 2 next to the talker or otherwise physically located at or 3 proximate to the virtual microphone point. And it's as if 4 the listener and talker were talking to each other -- 5 well, I think I already stated it. 6 BY MR. ELLIOTT: 7 Q Then column 15, Line 12, you have a sentence -- 8 A Yes. 9 Q The sentence beginning, The HPED. 10 A Yes. 11 Q Go ahead and read that down through about 12 Line 17. 13 A Yes, I see it. 14 Q Does this also give a definition of proximate in 15 the specification of the patent? 16 MR. HENRY: Objection to form, beyond the scope. Not 17 in Dr. Begault's declaration. Another clear attempt to 18 supplement Dr. Begault's opinions with improper redirect. 19 THE WITNESS: Yes. This states a definition of 20 proximate -- or an example of proximate, I should say, 21 between 1 to 3 feet from the face or mouth of a person, 22 again, wholly consistent with my declaration paragraph 10. 23 And also, wholly consistent with my earlier testimony with 24 regards to speech levels. 25	263 1 MR. HENRY: Objection to form, beyond the scope. Not 2 in Dr. Begault's declaration. Another clear attempt to 3 supplement Dr. Begault's opinions with improper redirect. 4 THE WITNESS: I see electronic telephone call. And 5 what was the other phrase? 6 BY MR. ELLIOTT: 7 Q Telephone call. 8 MR. HENRY: Same objections. 9 THE WITNESS: Yes, I see both phrases in this same 10 paragraph, the same discussion of an example. 11 BY MR. ELLIOTT: 12 Q Okay. And so in reference to Figure 5, are the 13 terms electronic call, electronic telephone call, and 14 telephone call used interchangeably in this column 11? 15 MR. HENRY: Objection to form, beyond the scope. Not 16 in Dr. Begault's declaration. Another clear attempt to 17 supplement Dr. Begault's opinions with improper redirect, 18 improper leading. 19 THE WITNESS: Yes. I see these terms used 20 interchangeably with regards to Figure 5. Specifically, I 21 see the words electronic call, electronic telephone call, 22 and -- where's the third one -- telephone call. 23 And these are reflected in my declaration. 24 BY MR. ELLIOTT: 25 Q At one point in time, you were -- you had given
262 1 BY MR. ELLIOTT: 2 Q Okay. If I can take you back to column 11. 3 A Yes. 4 Q And take a look at the paragraph towards the top 5 of column 11, beginning with Figure 5. And read those two 6 paragraphs there. 7 A Okay. 8 Okay. I read it. 9 Q Okay. And is -- are the terms electric call -- 10 or excuse me, electronic call used in that particular 11 paragraph there? 12 MR. HENRY: Objection to form, beyond the scope. Not 13 in Dr. Begault's declaration. Yet another clear attempt 14 to supplement Dr. Begault's opinions with improper 15 redirect. 16 THE WITNESS: I see the term or phrase electronic 17 call. 18 BY MR. ELLIOTT: 19 Q And then if you would, still in column 11, read 20 the last partial paragraph. No need to carry over into 21 column 12. 22 A Okay. 23 Yes. 24 Q And do you see the terms electronic telephone 25 call and telephone call in that partial paragraph?	264 1 some testimony on DB, decibels, and I believe your -- you 2 said at some point in there -- correct me if I'm wrong, 3 but I think you said you haven't reviewed the patents 4 carefully? 5 A That's correct. I don't -- would not say I've 6 had a careful review of the patents. 7 Q Okay. Do you mean you haven't reviewed them 8 carefully to see if DB references are in the patents? 9 A That's correct. I don't -- I can't say that 10 they're not. 11 Q Also, Mr. Henry took you through a series of 12 things being distant. I think we went around the world 13 and into outer space -- 14 A We certainly did. 15 Q Are any of these being distant from you relevant 16 to a distance, as that term is used in the patent? 17 MR. HENRY: Objection to form. 18 THE WITNESS: Based on my initial review of these 19 patents, I saw no references to planetary distances or 20 distances such as Paris, Tokyo, or some of the other 21 examples that were cited. 22 BY MR. ELLIOTT: 23 Q We've used the word phone a lot today. Is the 24 definition of phone a static item over time? 25 MR. HENRY: Objection to form, beyond the scope --

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265 1 THE WITNESS: No. 2 MR. HENRY: -- improper supplement of Dr. Begault's 3 opinions. 4 THE WITNESS: No. Well, the root of the word phone is 5 sound. And it's manifested itself in many different ways. 6 BY MR. ELLIOTT: 7 Q What do you think the definition of a phone would 8 be in 1965? 9 MR. HENRY: Objection to form, beyond the scope. 10 Improper attempt to supplement Dr. Begault's declaration. 11 THE WITNESS: It's -- in my earlier testimony, I gave 12 an example of a Western Electric landline telephone which 13 were widely used by the Bell System in the United States. 14 BY MR. ELLIOTT: 15 Q And what do you think the definition of phone 16 would be in 1985? 17 MR. HENRY: Same objections. 18 THE WITNESS: Well, we have a whole variety of ways of 19 communicating. Speech or even other types of signals, by 20 1985, I believe it was possible to do some primitive voice 21 communication over computers. I don't know if that's our 22 era of wireless telephones, if those were yet available at 23 the time, but I think they were with the big, long 24 antennas. And so that might have been considered a phone. 25	267 1 MR. HENRY: Same objections and mischaracterizes 2 Dr. Begault's testimony. 3 THE WITNESS: I think that would constitute a 4 plethora. I mean, I don't have a single number, and I 5 think I testified earlier that I was using that term as 6 equivalent to the idea of many, which I can also define as 7 more than one. 8 MR. ELLIOTT: Okay. I've got no more questions for 9 him, Mr. Henry. 10 FURTHER EXAMINATION 11 BY MR. HENRY: 12 Q Okay. Dr. Begault, can you please go to column 13 4, lines 38 to 41 of the '090 Patent, which is Begault 14 Exhibit 3? 15 A Sure. Column 4. And which lines? 16 Q Lines 38 to 41. 17 A 38 through 41. Yes. 18 Q Do you remember Mr. Elliott asked you questions 19 about those? 20 A I remember he asked me questions about this 21 section of the patent. 22 Q Yeah, did I ask you a question about that section 23 of the patent today? 24 A I don't recall. 25 Q Did you cite column 4, lines 38 to 41 in your
266 1 BY MR. ELLIOTT: 2 Q What about the definition of a phone in 2014? 3 MR. HENRY: Same objections. 4 THE WITNESS: We could include systems such as Zoom, 5 that we're using now or other Voice over Internet Protocol 6 types of communication systems, where a communication 7 signal is transmitted between two parties electronically. 8 We have smart phones, any number of different hardware 9 implementations, even emergency systems on cars and -- can 10 talk to you. And sometimes there's a human, and sometimes 11 there's not a human that is communicating. 12 BY MR. ELLIOTT: 13 Q Is a walkie-talkie just a specialized type of 14 phone? 15 MR. HENRY: Same objections. 16 THE WITNESS: Yeah, there's a lot of similarity to a 17 walkie-talkie and a cellular telephone, in that both are 18 using radio signals to transmit speech signals from one 19 location to another. 20 BY MR. ELLIOTT: 21 Q I'm sorry to shift topics back to kind of where I 22 began, but the definitions that we found for proximate in 23 the specification, the '090 Patent, there were four of 24 them. Would that be considered a plethora as cited in 25 your declaration?	268 1 declaration? 2 A Not specifically. 3 Q Go to column 9, lines 22 to 29, please. 4 A Column 9, lines 22 through 29, yes. 5 Q Do you remember Mr. Elliott asking you questions 6 about that section of the '090 Patent? 7 A Yes. 8 Q Did I invite your attention to that section of 9 the '090 Patent today? 10 A No, not directly. 11 Q Did you cite column 9, lines 22 to 29 in your 12 May 3rd, 2023, declaration? 13 A Not specifically. But we discussed in this 14 declaration, the concept of proximate. 15 Q Did you cite lines -- did you cite column 9, 16 lines 22 to the 29 from the '090 Patent in your 17 declaration? 18 A No, I did not. 19 Q Please go to column 11, lines 44 to 51, please. 20 A 44 through 51. Yes, I am there. 21 Q Do you remember Mr. Elliott asking you questions 22 about that section of the '090 Patent today? 23 A Yes, I do. 24 Q Did I ask you any questions about that section of 25 the '090 Patent today?

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269 1 A Only in the sense that you were asking me about 2 the word proximate. 3 Q Did I invite your attention to column 11, lines 4 44 to 51 today? 5 A You've made no such invitation. 6 Q Did you cite column 11, lines 44 to 51 in your 7 May 3rd, 2023 declaration? 8 A No, I did not. 9 Q Please go up to column 11, lines 9 to 17. 10 A Lines 9 through 17. 11 Q Do you remember Mr. Elliott asking you questions 12 about that section of the '090 Patent? 13 A Let's see. 14 Yes. I do. 15 Q Did I invite your attention to column 11, lines 9 16 to 17 at any point in time today during my questioning? 17 A Not directly, no. 18 Q Did you cite column 9, lines -- strike that. 19 Did you cite column 11, lines 9 through 17 in 20 your May 3rd, 2023, expert declaration? 21 A No, I did not cite it in this particular 22 declaration. 23 Q Did you cite it in any other declaration served 24 in this case? 25 A None that exist so far.	271 1 THE WITNESS: Wasn't that the exact question you just 2 asked? 3 BY MR. HENRY: 4 Q No. 5 A Then I don't understand. 6 Q I'll repeat -- 7 A I thought you repeated your question. 8 Q I did not. 9 Have you been asked to prepare another 10 declaration in this case relating to claim construction? 11 A No, I have not been asked at this point. 12 Q Please go to column 11, lines 52 to 67, please, 13 of the '090 Patent? 14 A I am there. 15 Q Do you remember Mr. Elliott asking you questions 16 about that? 17 A Yes. 18 Q Did I invite your attention to column 11, lines 19 52 to 67 during my questioning today? 20 A No, you did not. 21 Q Did you cite in your May 3rd, 2023, declaration 22 column 11, lines 52 to 67 of the '090 Patent? 23 A Not directly. 24 Q Please go to column 15 of the '090 Patent, lines 25 12 to 17.
270 1 Q Are you actively preparing another declaration? 2 MR. ELLIOTT: Objection; calls for work product. 3 You can answer that question, though. 4 THE WITNESS: I am not actively doing other -- 5 anything on this case other than responding to your 6 questions in this deposition. 7 BY MR. HENRY: 8 Q Are you preparing another declaration for this 9 case? 10 MR. ELLIOTT: Objection; calls for work product. 11 You can answer that question. 12 THE WITNESS: I am currently not preparing any other 13 declaration. 14 BY MR. HENRY: 15 Q Do you plan to prepare another declaration 16 relating to issues about claim construction in this case? 17 MR. ELLIOTT: Objection; again, work product. 18 Yeah, you can go ahead and answer. 19 THE WITNESS: I would be prepared to do so if asked by 20 counsel. 21 BY MR. HENRY: 22 Q Have you been asked to prepare another 23 declaration in this case relating to claim construction? 24 MR. ELLIOTT: Objection; work product. 25 You can go ahead and answer.	272 1 A Okay. I am there. 2 Q Do you remember Mr. Elliott asking you questions 3 about that section of the '090 Patent? 4 A I do. 5 Q Did I invite your attention to column 15, lines 6 12 to 17 during my questioning today? 7 A No. You only directed my attention to the 8 concept of proximate. 9 Q Did you cite column 15, lines 12 to 17 in your 10 May 3rd, 2023, declaration? 11 A No, I did not. 12 Q In your May 3rd, 2023, declaration, did you offer 13 an opinion about the definition of phone or telephone in 14 the year 1965? 15 A No, I don't think I directly addressed that. 16 Q In your May 3rd, 2023 declaration, did you offer 17 an opinion about the definition of phone or telephone in 18 the year 1985? 19 A No, I don't believe I did. 20 Q In your May 3rd, 2023 declaration, did you offer 21 an opinion about the definition of phone or telephone in 22 the year 2014? 23 A Yes, I did. Essentially, I spoke about the terms 24 being equivalent and their interchangeability in the 25 specifications.

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273 1 Q What was the definition for phone or telephone 2 that you offered in your May 3rd, 2023 declaration for the 3 year 2014? 4 A It's -- I used the definition of describing the 5 use of any type of medium to enable communication between 6 two or more locations over some sort of electronic 7 network. 8 Q And there, you're referring to your 9 interpretation of the terms electronic call, electronic 10 phone call, and telephone call in paragraph 8 of your 11 declaration, right? 12 MR. ELLIOTT: Objection to form. 13 THE WITNESS: I'm referring to my analysis of the call 14 terms in the patents at issue. 15 BY MR. HENRY: 16 Q And what are those call terms? 17 A Electronic call, electronic phone call, and 18 telephone call. 19 Q Okay. Are those -- in that paragraph 8 of your 20 May 3rd, 2023, declaration, do you state what a definition 21 for the term telephone would be in the year 2014? 22 A I do not specifically call out the word telephone 23 individually. I use the word telephone call. Phrase, not 24 word, phrase. The phrase telephone call. 25 Q So is it fair to say in your declaration, you	275 1 BY MR. HENRY: 2 Q So do you equate the word telephone to any type 3 of medium? 4 MR. ELLIOTT: Objection; asked and answered, beyond 5 the scope of the redirect. 6 THE WITNESS: No. You can read in my declaration that 7 I constrain that type of medium that enables communication 8 between two or more locations using some sort of 9 electronic network. 10 BY MR. HENRY: 11 Q We talked about a train earlier. Do you believe 12 a train is a telephone? 13 MR. ELLIOTT: Objection to form. 14 THE WITNESS: No. 15 BY MR. HENRY: 16 Q Do you believe a boat is a telephone? 17 A No. 18 Q Do you believe an airplane is a telephone? 19 MR. ELLIOTT: Objection to form. 20 THE WITNESS: No. These examples fall outside of my 21 definition. 22 BY MR. HENRY: 23 Q You believe a computer is a telephone, though? 24 A It can be used -- 25 Sorry. Go ahead.
274 1 didn't actually define the term telephone? 2 A Well, no. That's not fair. 3 Q Okay. Show me the definition of telephone in 4 your declaration. 5 A Well, when I refer to an electronic call, 6 electronic phone call, and telephone call, that's the 7 function of what a telephone does. Which is something 8 that allows communication between two or more locations. 9 So clearly, the function of the noun telephone is 10 associated with the word call. And so therefore, it is 11 defined. 12 Q Please point me to the language in paragraph 8 of 13 your declaration that you contend defines the term 14 telephone as it would be understood in the year 2014. 15 MR. ELLIOTT: Objection to form, argumentative, 16 badgering the witness. Asked and answered. 17 THE WITNESS: Electronic call, electronic phone call, 18 and telephone call are equivalent. The terms used -- are 19 used interchangeably in the specification to describe the 20 use of any type of medium. Any type of medium includes 21 phone, because we are talking about an electronic phone 22 call, or a telephone call with the understanding that the 23 root of the word phone is sound, and the root of the words 24 tele is distant. 25	276 1 MR. ELLIOTT: Objection to form. 2 THE WITNESS: A computer can be used as a telephone. 3 BY MR. HENRY: 4 Q So is it your opinion that a computer is a 5 telephone? 6 MR. ELLIOTT: Mr. Henry, we've been through this 7 testimony previously today, and he's provided those 8 answers. To me, this is just wasting further time on 9 testimony he's already given. 10 So I'll enter my objection to form, but also, you 11 know, further object to additional waste of time going 12 down this duplicate line of questioning. That is also of 13 the redirect. 14 MR. HENRY: It's a brazen objection to lodge after the 15 improper redirect that you just conducted. 16 MR. ELLIOTT: No -- 17 BY MR. HENRY: 18 Q Dr. Begault, would you answer my question? 19 MR. ELLIOTT: There's nothing improper about the 20 redirect I just conducted. You asked him about citations, 21 if they were there. You asked him what a plethora was, I 22 walked him through the base for his opinion. 23 MR. HENRY: The record will speak for itself. 24 MR. ELLIOTT: It will. It will. I agree with that. 25

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277 1 BY MR. HENRY: 2 Q Dr. Begault, is a computer a telephone? 3 A A computer can function as a telephone. 4 Q Okay. 5 A It can also function as other things 6 simultaneously. It can enable communication between two 7 or more locations using an electronic network. 8 Q Can a train do that with its radios? 9 A The radios are a component of a train that could 10 be -- I'm sorry. Let me start over. 11 The telephone communication system that might be 12 present on a locomotive can be used to enable voice 13 communication between two or more locations. 14 Q Dr. Begault, have you seen a Meta Quest headset? 15 MR. ELLIOTT: Objection; scope. 16 THE WITNESS: No. 17 MR. HENRY: No further questions. 18 MR. ELLIOTT: Just one other question. 19 FURTHER EXAMINATION 20 BY MR. ELLIOTT: 21 Q Did you give testimony under Mr. Henry's 22 questioning earlier today discussing what the definition 23 of phone might be? 24 A I'm sorry. Can you repeat your question? I'm 25 sorry. I missed the first part.	279 1 communication between two parties is a telephone? 2 MR. ELLIOTT: Objection; argumentative, form 3 THE WITNESS: It can function like a telephone, if it 4 is capable of adhering to the definition that I laid out 5 in my declaration. 6 BY MR. HENRY: 7 Q Can you identify any device capable of voice 8 communication -- electronic voice communication between 9 two parties that is not a telephone -- 10 MR. ELLIOTT: Objection -- 11 Sorry, Mr. Henry. 12 Objection to form. 13 THE STENOGRAPHIC REPORTER: I didn't hear your full 14 question, Mr. Henry. 15 MR. HENRY: Sure. 16 BY MR. HENRY: 17 Q Dr. Begault, if you are able, I'd like you to at 18 this time identify any device that is capable of 19 electronic voice communication between two parties that 20 you would say is not a telephone. 21 MR. ELLIOTT: Objection to form. 22 THE WITNESS: Again, any device that could enable 23 voice communication between two parties can function as a 24 telephone. 25
278 1 Q Did you give testimony earlier today when 2 Mr. Henry was first questioning you, discussing what the 3 definition of phone might be? 4 MR. HENRY: Objection to form. 5 THE WITNESS: Yes. I think we iterated several 6 examples likes boats and trains and things of that sort. 7 MR. ELLIOTT: No further questions. 8 MR. HENRY: One more question. 9 FURTHER EXAMINATION 10 BY MR. HENRY: 11 Q Just so I can confirm your opinion. 12 In your view is it true, Dr. Begault, that any 13 device, any device capable of electronic voice 14 communication between two parties is a telephone? 15 MR. ELLIOTT: Objection to form. 16 THE WITNESS: I'll answer this way. I thought that my 17 watch would never be able to function as a telephone and 18 it was only something that Dick Tracy had, and now I can 19 make phone calls on my watch. 20 BY MR. HENRY: 21 Q That's not responsive, Dr. Begault. 22 MR. ELLIOTT: Objection -- 23 BY MR. HENRY: 24 Q Do I understand correctly that it's in your 25 opinion, any device capable of electronic voice	280 1 BY MR. HENRY: 2 Q I'll give you one more opportunity. If you are 3 able to identify any device falling outside of the scope 4 of what you have articulated a number of times, please do 5 so now. 6 MR. ELLIOTT: Objection to form. 7 THE WITNESS: No. Because the definition I have given 8 you states that any device capable of functioning as a 9 telephone can be considered a telephone so long as it's 10 done electronically. 11 MR. HENRY: I have no further questions. 12 MR. ELLIOTT: No further questions here. 13 THE STENOGRAPHIC REPORTER: Okay. Before we go off, 14 Mr. Elliott, we did confirm off the record, you want the 15 rough draft and regular final, correct? 16 MR. ELLIOTT: Yes, that's correct, please. 17 THE STENOGRAPHIC REPORTER: And, Mr. Henry, we have 18 your standing order, thank you. 19 MR. HENRY: Thank you. 20 THE VIDEOGRAPHER: This marks the end of the 21 deposition of Durand Begault, PhD. The time is 1803. We 22 are off the record. 23 (WHEREUPON THE DEPOSITION WAS 24 CONCLUDED AT 6:03 P.M. PACIFIC 25 STANDARD TIME.)

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Transcript of Durand Begault, Ph.D.
Conducted on May 22, 2023

71 (281 to 284)

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1 Please be advised I have read the 2 foregoing deposition, pages 1 through 3 283, inclusive. 4 I hereby state there are: 5 6 7 (Check one) _____ no corrections 8 _____ corrections per attached 9 _____ 10 11 DURAND BEGAULT, Ph.D. 12 13 14 15 16 17 18 19 --oOo-- 20 21 22 23 24 25	1 REPORTER'S CERTIFICATE 2 I, Christa Yan, CSR No. 14316, do hereby declare: 3 That, prior to being examined, the witness named in 4 the foregoing proceeding was by me duly sworn pursuant to 5 Section 30(f)(1) of the Federal Rules of Civil Procedure, 6 and the proceeding is a true record of the testimony given 7 by the witness as accurately as possible. That said 8 proceeding was taken down by me stenographically at the 9 time therein named and thereafter reduced to text under my 10 direction. 11 12 <u> X </u> That said witness was requested to review the 13 transcript and make any changes to the transcript as a 14 result of that review pursuant to Section 30(e) of the 15 Federal Rules of Civil Procedure. 16 <u> </u> No changes have been provided by the witness 17 during the period allowed. 18 <u> </u> The changes made by the witness are appended to 19 the transcript. 20 <u> </u> No request was made that the transcript be 21 reviewed pursuant to Section 30(e) of the Federal Rules of 22 Civil Procedure. 23 24 I further declare that I have no interest in the 25 event of the action. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. WITNESS my hand this 26th day of May 2023.  _____ Christa Yan, CSR NO. 14316 21 22 23 24 25
1 WITNESS'S CHANGES OR CORRECTIONS 2 3 NOTE: If you are adding to your testimony, print 4 the exact words you want to add. If you are 5 deleting from your testimony, print the exact 6 words you want to delete. Specify with "Add" 7 or "Delete" and sign this form. 8 9 Deposition of: DURAND BEGAULT, Ph.D. 10 Case Title: EIGHT KHZ V. META 11 Date of Deposition: MAY 22, 2023 12 13 I, _____ have 14 the following corrections to make to my deposition: 15 PageLine Change/Add/Delete 16 17 18 19 20 21 22 23 24 25	

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