Transcript of Durand Begault, Ph.D.

Date: May 22, 2023
Case: Eight kHz, LLC -v- Meta Platforms, Inc., et al.

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IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

EIGHT KHZ, LLC, Plaintiff, vs. META PLATFORMS, INC.; META PLATFORMS TECHNOLOGIES, LLC; TWISTED PIXEL GAMES, LLC, Defendants.) Civil Action No. 6:22-cv-575-ADA-DTG

VIDEOTAPED REMOTE DEPOSITION OF
DURAND BEGAULT, Ph.D.
MONDAY, MAY 22, 2023

STENOGRAPHIC REPORTER: CHRISTA YAN, CSR NO. 14316

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APPEARANCES:

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ALSO PRESENT:
MYLENE SANTIANO, The Videographer
HARUT AKOPYAN The Technician

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BE IT REMEMBERED that on MONDAY, the 22ND DAY OF MAY, 2023, at the hour of 9:03 A.M., Pacific Standard Time, of said day, before me via video conference, CHRISTA YAN, a Certified Shorthand Reporter, State of California, appeared via video conference DURAND BEGAULT, Ph.D., who was examined as a witness in said cause; that said transcript format was prepared in accordance with California Code of Regulations Section 2473.

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THE VIDEOGRAPHER: Here begins Media Number 1 in the videotaped deposition of Durand Begault, PhD, in the matter of Eight kHz, LLC, vs. Meta Platforms, Inc., et al., in the United States District Court for the Western District of Texas Waco Division, Case Number 6:22-cv-575-ADA-DTG. Today's date is May 22nd, 2023. The time on the video monitor is 9:03 a.m., Pacific Standard Time.

The remote videographer today is Mylene Santiano representing Planet Depos. All parties of this video deposition are attending remotely. Would counsel please voice identify themselves and state whom they represent starting with the taking attorney.

MR. HENRY: Chris Henry from the law firm Latham & Watkins for defendants.

MR. ELLIOTT: Kyle Elliott and Patrick Dunn on behalf of the law firm Spencer Fane on behalf of the plaintiffs.

THE VIDEOGRAPHER: The court reporter today is Christa Yan representing Planet Depos.

Would the reporter please swear in the witness.

DURAND BEGAULT, Ph.D.,

the Witness, called on behalf of the Defendants, being duly sworn to state the truth, the whole truth, and nothing but the truth, testified on oath as follows:

EXAMINATION

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BY MR. HENRY:

Q Dr. Begault, my name's Chris Henry. Nice to meet you.

A Nice to meet you.

Q Would you please state your full name for the record?

A Yes. Durand, D-u-r-a-n-d, René, R-e-n-é, with an accent mark on the final E, Begault, B-e-g-a-u-l-t.

Q And, Dr. Begault, where are you sitting today?

A I am sitting in my home office, and that is located in Muir Beach, California.

Q And what materials did you bring with you to the deposition today?

A I brought a clean copy of my declaration in paper form. So there are no notes or anything on it. It's a clean copy. I also have a clean copy of an errata sheet that we provided to you that is pertinent to that declaration.

Q Anything else?

A No.

Q Great.

So what we're going to -- have you done a remote deposition before, Dr. Begault?

A Yes.

Q And so you're probably already familiar with this

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whole, what we're going to do is we're going to introduce exhibits via the chat.

A Via the chat? Okay. So I should open the chat window then?

Q Once they're in, it should pop up, but either way, the exhibits will come via the chat function in Zoom. Have you done that before in a remote deposition?

A Yes. Typically, the software is a little different, in that there's sort of a split screen for the documents. So they're large. Since we're going to be doing it via the chat window, I might have to make a few adjustments as we go, but yes. So I will indicate, show chat previews. I'm not sure if I'm going to be doing it right. So when you show your first exhibit, we might need to take a moment to make sure that it's visible.

Q That's totally fine. As we go, if we need to -- any clarifications throughout the day, just let me know, including with exhibit distribution. Okay?

A Will do.

Q And let's just get your report, your declaration on the record as Exhibit 1. And then we're going to get your errata sheet on Exhibit 2. And that will give us a chance to practice the chat distribution. Okay?

(Whereupon Deposition Exhibit 1 was marked for identification.)

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THE WITNESS: Sounds good.
MR. HENRY: All right. So, Mr. Akopyan, what I'd like you to distribute to mark as Mr. Begault as Exhibit 1 and distribute via the chat is a document that you will find in the document folder with the file name 20230503, parentheses, 92-7 Exhibit 7_Begault declaration.
THE TECHNICIAN: I see that, Counsel. Stand by, please. (Indicating.)
Okay. It should be in the chat now.
BY MR. HENRY:
Q Dr. Begault, let me know if you see that document.
A Give me a moment. Okay. I see what appears to be a PDF that could be downloaded.
Q And now, Dr. Begault, as -- what I have found in these remote depositions is what helps is for you to download that and then just save it locally on your desktop. It's a lot easier to maneuver through the document as we go today. So I'd suggest you do that. Okay?
A All right. And then what I will be doing if I need to refer to the documents, is leaving the Zoom page and then going to the document page and sort of alternating back and forth. Is that the way that it --
Q Yeah, what I would -- yes, sorry to interrupt.

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What I would suggest is you open it in your separate Adobe Reader so it's next to you.
A Right, right. Okay. Well, stand by then. I need to do a little adjustment here to allow that to happen.
All right. And then are you going to be doing any sort of pointing to different lines or... et cetera in this document?
Q Yeah, throughout the day, I'll invite your attention to different lines in this document --
A I see.
Q If they look familiar, and other documents.
A Got it.
Q I could screen share, but oftentimes it's enough for us just to look at it. And I'll invite your attention to certain things.
A Okay. That sounds fine to me. Okay. So I have the document open now in a PDF reader, and I have my screen split between Zoom and the exhibits that we have downloaded. So I see now Exhibit 01.
Q Okay. And, Dr. Begault, you recognize Exhibit 1 as your May 3rd, 2023, declaration?
A Give me a moment.
Okay. I see my declaration, and then it's followed by my CV. Yes.

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MR. HENRY: All right. Mr. Akopyan, what I'd like you to do now is circulate another PDF in the chat which we will mark as Begault Exhibit 2. The filename for that is errata sheet Begault-C.PDF.
THE TECHNICIAN: Stand by.
(Whereupon Deposition Exhibit 2 was marked for identification.)
THE WITNESS: Okay. I am downloading it now.
BY MR. HENRY:
Q All right. Dr. Begault, let me know when you have it open.
A Okay. I now have it open.
Q And Dr. Begault, do you recognize Begault Exhibit 2 to be a document entitled, Errata sheet to declaration of Durand R. Begault, PhD, dated May 22nd, 2023?
A I do.
Q And that's errata sheet for your May 3rd, 2023, declaration fixing some typos, right?
A Right. Specifically Exhibit 2 corrects typos that are found in Exhibit 1.
Q Okay. All right, Dr. Begault. Is there anyone else with you in your office today?
A No.
Q Okay. And as we've already discussed, Zoom has a

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chat feature on it. But you understand that throughout the day, when we're on the record, you're not supposed to be chatting with counsel for Eight kHz via that feature, right?
A I will not be chatting with anybody via the chat function or any other function. I will strictly be communicating with you and examining documents that you present in the chat.
Q Sounds good.
And it sounds like this is not the first time you've been deposed, Dr. Begault. Do I understand that correctly?
A That is correct.
Q How many depositions, about, have you been a part of?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'd have to look at my CV to give you an exact number. I know it's over -- see, I'm not distinguishing trial and deposition since some trials don't have depositions. Some trials do have depositions, et cetera. But it's on the order of 70 or 80 times. I think if you combine the trials and the depositions, I'm up to about 90.
BY MR. HENRY:
Q So you have about 90 testifying experiences then,

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right?
A Yeah, that sounds about right. I haven't counted in a while. But it's present on my CV if you need an accurate number.
Q Okay. Oh, and you mentioned that your CV is an exhibit to your May 3rd, 2023, declaration, right?
A That's correct. I note that my latest CV has maybe one or two additional publications that aren't on this version of the CV because they just came out recently. So I'm happy to provide that if you would like it. As I say, I think it's just -- there's no change at all to the CV, including in terms of the trials and depositions, other than I think two additional publications.
Q So beyond the two publications that you just mentioned, the CV you attached on your declaration was accurate?
A Yes.
Q And it accurately reflects your experience in the industry and your testifying experience?
A It represents it to the degree that a CV can.
Q And you don't have any other changes besides the two publications that you mentioned; is that right?
A Two or three. Yeah. I don't remember the exact number. I think it might have been three. I don't recall

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exactly.
Q And you have a number of patents in your own name, right?
A That's correct, yes.
Q About how many?
A Well, referring to my CV, my name is present on four patents that were published.
Q Did you file for other patents that didn't issue?
A Well, I filed these patents through NASA, National Aeronautics and Space Administration. And so I have submitted other patents, but they ultimately were not developed to the point where they were submitted for publication.
Q Do you mean that you submitted invention disclosure statements that were not submitted to the patent office or do you mean you filed applications with the patent office that didn't issue?
A The former.
MR. ELLIOTT: Objection to form.
BY MR. HENRY:
Q Dr. Begault, what's your hourly rate for work in this case?
A Well, I have been retained through a third party, if you will. So I don't know what their hourly rate is, but I know it's a markup over my standard hourly rate. I

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can tell you my standard hourly rate, but I don't know what the billing rate is for this particular deposition nor do I know what the billing rate is for the attorneys at Spencer Fane.
Q Yeah, I don't need you to tell me Spencer Fane's rates.
What's your standard hourly rate, Dr. Begault?
A My standard hourly rate is $400 an hour and 580 for testimony or deposition.
Q So $400 an hour for nontestifying work in the cases in which you're engaged?
A That's correct.
Q Okay. And $580 an hour for testifying work?
A Yes, that's correct.
Q And as far as you know, that's the rate being charged for your services, plus a markup fee for the expert retention firm, right?
A As far as I know--
MR. ELLIOTT: Objection to form.
THE WITNESS: My apologies for talking over.
MR. HENRY: Yeah, sorry. I did interrupt a little bit. Just give me --
THE STENOGRAPHIC REPORTER: I'm sorry. Because of the talking over each other, I did not hear the objection correctly, I don't think.

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MR. ELLIOTT: Yeah, just objection to form.
And, Dr. Begault, if you can, give a little bit of pause so you can tell whether I'm going to object or not. I think there's probably a little bit of lag over this stuff, and I apologize for that.
BY MR. HENRY:
Q Do you want me to repeat the question, Dr. Begault?
A Yes.
Q Okay.
All right. As far as you know, your $400 an hour and $580 an hour rates are the rates being charged for your services in this case, plus a markup for the expert retention firm, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: I am not exactly sure if those are the exact rates that were settled with the outside firm that is handling the billings, et cetera, et cetera. It might have been negotiated differently. I don't recall exactly. But I can tell you that's usually my rate for these sorts of things.
BY MR. HENRY:
Q Do you know who Glen Norris is?
A I believe he's one of the named individuals on one of these patents.

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Q Did you know who Glen Norris was before you got involved in this lawsuit?
A No.
Q Do you know who Philip Lyren is?
A Same answer as about Glen Norris. I only heard of him or of that person, in connection with his name on the patents.
Q So you didn't know of Philip Lyren before you got involved in this lawsuit?
A No, I did not.
Q Had you ever heard of Eight kHz, the plaintiff in this case, before you got involved in this lawsuit?
A No.
Q When did you get involved in this lawsuit?
A Honestly, I don't recall. It was sometime last year I was contacted, I believe. And then I think there was a period of time where I didn't hear anything from the counsel. And then I was retained later on formally. I think there was an initial discussion.
Q Around when in 2022 was the initial discussion you had with counsel about this case?
A I do not recall. I'd have to research that.
Q Do you remember around when you were formally retained in this case?
A Same answer.

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Q Is that a no?
A I don't recall.
Q Do you understand that Eight kHz has asserted patents in this case against the Meta defendants, right?
A Yes, I do. I do understand that.
Q How many asserted patents are at issue in this case?
A Well, based on my declaration, I can count them for you. Those are the ones I'm familiar with. 1, 2...
Did I hear an objection?
MR. ELLIOTT: No.
THE WITNESS: Okay.
1, 2, 3, 4, 5, 6, 7, 8, 9.
BY MR. HENRY:
Q So you know there are nine asserted patents at issue in this case?
A That's my understanding.
Q And have you reviewed each of those patents?
A Briefly.
Q You've briefly reviewed each of those patents?
A Well, should I say it this way, I'm still reviewing them.
Q How much time have you spent reviewing all of the patents?
A I don't recall exactly.

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Q Is it more than 5 hours?
A Yes.
Q Is it more than 10 ten hours?
A Yes.
Q Is it more than 15 hours?
A Probably.
Q Is it more than 20 hours?
A Yeah, that sounds reasonable. Yes.
Q Is it more than 25 hours?
A Well, now you're getting into an area of estimates that are difficult for me to make. I think I could say safely that it's been somewhere over a certain amount of hours. And that's about as best I can do for you.
Q Can you estimate a number under which you spent hours reviewing the patents?
A I don't understand that question.
Q Sure, you said you could estimate for me some number over which you've spent in hours reviewing the patents. I'm just asking you, can you tell me whether you've spent less than 30 hours reviewing the patents?
A Oh, I understand what you're asking. I could tell you I spent less than 100 hours.
Q Did you spend less than 50?
A That, I'm not certain about.

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Q Did you spend less than 75?
A That, I'm not certain about.
Q Spent less than 85?
A That, I'm not certain about.
Q Did you spend less than 95?
A That, I'm not certain about.
Q You keep records of your time spent on this case, right?
A I submit my hours.
Q Okay. About how much time have you spent total on this case to date?
A I honestly don't recall.
Q Give me your best estimate, please.
MR. ELLIOTT: Objection to form.
THE WITNESS: Under 100 and over 20.
BY MR. HENRY:
Q So you spent somewhere between 20 hours and 100 hours on this case to date?
A Yes.
Q You can't give me any further specificity in the amount of time you spent on this case between those two numbers?
A Not without looking at my billing records.
Q Can you tell me a little bit more about how you got hired for this case?

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MR. ELLIOTT: Objection to form.
THE WITNESS: I believe a phone call interview was set up between myself and the attorneys via the third party that I had mentioned before.
BY MR. HENRY:
Q Which attorneys?
A I believe it was the attorneys that we are -- are present today.
Q Who is that?
A I see Kyle Elliott and I see Patrick Dunn. But there might have been other attorneys involved in the initial interview. I don't recall.
Q Do you remember any other attorneys by name who might have been involved in the initial interview?
A I don't recall, no.
Q In your work on this case, do you remember any other attorneys besides Kyle Elliott and Patrick Dunn that you've interacted with?
A There -- I can give you some names I have heard, but you asked me specifically about interaction. So you'd have to define what you mean by interaction.
Q Sure.
Have you emailed, spoken with, or met with any attorneys other than Kyle Elliott and Patrick Dunn representing Eight kHz?

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A The only name I can pull out for you out of my memory, I believe, is a Mr. Brian Bear who was on an email. I remember that name from an email. I don't believe I've spoken directly with Mr. Bear. I really don't recall.
Q Can you tell me a little bit about what you did to prepare for this deposition, Dr. Begault?
MR. ELLIOTT: Objection to form, ambiguous.
THE WITNESS: I reviewed my declaration. I reviewed a document from defendant that pertained to claim construction. And I also reviewed the patents at issue.
BY MR. HENRY:
Q What was that document that you said you reviewed from defendants that pertains to claim construction?
MR. ELLIOTT: Objection to form, and may call on attorney work product as to the actual contents of the document that was reviewed.
Go ahead and you can answer, Dr. Begault.
THE WITNESS: I don't recall the exact title of that document. I believe that it had to do with defendants' arguments regarding claim construction. That's all I recall about its title or its general topic area.
BY MR. HENRY:
Q Was it a brief or an expert declaration?
MR. ELLIOTT: Objection to form.

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THE WITNESS: I reviewed a brief. I believe I also reviewed, in part or briefly, an expert declaration as well.
BY MR. HENRY:
Q Okay. So you mentioned having reviewed your declaration, a document from defendants, and the asserted patents. And now you also mentioned reviewing an expert declaration, at least briefly; is that fair?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's -- that's some of the things I mentioned that I reviewed.
BY MR. HENRY:
Q What else did you review?
A You would have to look at my answer from about three minutes ago, but I believe I also just said that I reviewed some of the patents.
Q Yeah, I'm asking if there's anything you haven't identified yet that you reviewed.
A No, not that I could recall.
Q The expert declaration that you reviewed, do you recall the name of that -- of the expert on that declaration?
A I don't know how to pronounce it or exactly how to say the name. I believe the name was from -- I'm sorry. I would munge it. So I'm not going to attempt it.

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I know that the first initial is K, last initial is M.
Q Kyle McMullen, does that help?
A It does, if that's the person.
Q Do you know if that's the person?
A I would have to look at the document to confirm that, but I'll trust you on that.
Q Do you know Dr. Kyle McMullen?
A I do not.
Q Have you ever met Dr. Kyle McMullen?
A Not that I recall.
Q Do you know anything about Dr. Kyle McMullen's reputation in the field?
A No.
Q Had you ever seen the asserted patents before you got involved in this lawsuit?
A No.
Q Have you reviewed the file histories for the asserted patents?
A No.
Q Did you have any meetings to prepare for today's deposition?
A Yes.
Q How many?
A One.
Q When was that meeting?

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A Yesterday.
Q How long was that meeting?
A Somewhere between two and three hours.
Q Who was present at that meeting besides you?
A Mr. Kyle Elliott.
Q Was Patrick Dunn there?
A No.
Q Nobody other than Mr. Kyle Elliott?
A That's correct.
Q Have you ever spoken to anyone at Eight kHz?
A No.
Q And, Dr. Begault, because you've been in so many depositions before, I sort of skipped the rules of the road, but I'll cover a few them just quickly so that we're on the same page.
You understand that as we go today, you can ask me for breaks as we go, right?
A I do understand that.
Q And when you do and if you need one, I'm happy to take a break. It's totally fine. At your convenience, okay?
A Sounds good.
Q Okay. And you already understand the process that I'll ask you questions throughout the day. And your counsel may intersperse objections, but then you still

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have to proceed and answer my questions unless instructed not to, right?
A I do understand that.
Q All right. Is there any reason that you can't provide accurate and truthful testimony to my questions today?
A There's no reason.
Q You're not under the influence of any drugs or medication that would prevent that, right?
A That's correct.
Q Now, when you read the -- or also you've been a -- strike that.
Dr. Begault, in your experience as a testifying expert in patent cases, are familiar with the sort of shorthand used to refer to patents, where they're referred to by their last three numbers?
A Yes.
Q Okay. And can we use that shorthand today, and you'll know the patents that I'm discussing with you?
A Well, I'll qualify that by saying I will know that if you use the last three digits of a patent that that's a unique identifier for a longer patent number.
Q Okay. But similar to how you did that in your May 3rd declaration, right?
A Precisely.

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Q Now, with respect to the '090 Patent, you understand that's one of the asserted patents in this case, right?
A I do.
Q Okay. When you read that patent, did you reach any conclusion as to whether what was being claimed was new and different as opposed to things that had come before the '090 Patent?
MR. ELLIOTT: Objection to form, also scope and objection to relevancy.
THE WITNESS: No.
BY MR. HENRY:
Q When you read the '196 Patent, did you reach any conclusion as to whether what was being claimed was new and different, as opposed to things that had come before the '196 Patent?
MR. ELLIOTT: Objection to form, ambiguous, scope, and relevancy.
THE WITNESS: No.
BY MR. HENRY:
Q When you read the '090 Patent, did you anything jump out to you though based on your experience where you said, oh, wow, that's something new and different that you've never seen before?
MR. ELLIOTT: Objection to form and relevancy.

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THE WITNESS: Repeat your question? I want to make sure I'm answering it correctly.
BY MR. HENRY:
Q Sure.
When you read the '090 Patent, did anything jump out to you based on your experience, where you said oh, wow, that's something new and different that you've never seen before?
MR. ELLIOTT: Same objection.
THE WITNESS: At this point, no, I haven't -- let's put it this way, analyzed the patent thoroughly yet. So I can't answer that question about jumping out.
BY MR. HENRY:
Q When you read the '196 Patent, did anything jump out to you based on experience where you said, oh, wow, that's something new and different that you've never seen before?
MR. ELLIOTT: Objection to form and relevancy.
THE WITNESS: I would give you the same answer I gave you for the prior patent that you mentioned.
BY MR. HENRY:
Q And same answer for each of the other seven asserted patents?
MR. ELLIOTT: Objection to form and relevancy. Scope also.

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THE WITNESS: Correct.
BY MR. HENRY:
Q And, Dr. Begault, you obtained a PhD in 1987 from the University of California San Diego, right?
A Correct.
Q What other degrees have you earned?
A Master of fine arts in electronic music and recording media from Mills College in 1981. And I received my bachelor's degree in a hybrid major at UC Santa Cruz in 1979 called music and heuristic models.
Q And you're currently a director of the Audio Forensic Center; is that right?
A I currently hold that title, yes.
Q What's the Audio Forensic Center?
A It is a wholly owned subsidiary of Charles M. Salter Associates.
Q And what type of company is it?
A Salter Associates or Audio Forensic Center.
Q Audio Forensic Center.
A Oh, Audio Forensic Center is a -- represents the legal work that is done as part of consulting for Charles M. Salter Associates for various types of cases involving litigation or due diligence, not necessarily litigation.
Q It's a consulting firm?
A Charles M. Salter Associates is a consulting firm

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in the area of acoustics, telecommunications, and security. And certain types of cases generally come to me that are typically of a forensic nature.
Q And typically come to you at the Audio Forensic Center; is that fair?
A Yes. That's a way of putting it.
Q How many employees are there that are employed in the Audio Forensic Center subsidiary of Charles M. Salter Associates?
A There is not a group of employees specifically titled with that. It is, again, a wholly owned subsidiary of Salter Associates, which has -- I believe we have 25 or 30 engineers with expertise in acoustics, telecommunications, and security. It may be more. And so as I direct the Audio Forensic Center for these types of cases, if I need other people power to assist with the case, I will draw from those employees of Charles M. Salter Associates.
Q Okay. But then do I understand correctly from that response that there aren't other employees besides you that are assigned specifically to the Audio Forensic Center?
A There may be or there may not be depending on the particular matter that we're dealing with.
Q But that's matter specific, right?

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A That's correct. I do most of the forensic work that involves things such as audio authentication, for instance.
Q What do you mean by that, you do the forensic work? What do you mean by forensic work?
A By forensic work, I mean issues that have -- pertain to a legal matter.
Q Can you explain that a little more? I'm not understanding the connection you're making between the term forensic and legal?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, I'm doing my best to give you a kind of dictionary definition of forensic, which usually has to do with things -- well, when you're talking about a forensic expert, you're talking about an expert who might have greater expertise than a layperson in certain areas, that that expert has a background in.
And so I have expertise in both audio acoustics and video. There are other people at Charles M. Salter Associates that also have these types of expertise. And so people are brought together either under the title of Audio Forensic Center or under Charles M. Salter Associates on occasion to do consulting for legal matters, as opposed to let's say consulting for an architect who is designing the acoustics of a room.

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BY MR. HENRY:
Q Do you also do that type of consulting for architects?
A No. Not so much now. I don't do that. I used to, but not now.
Q Is most of your work litigation oriented at the Audio Forensic Center?
MR. ELLIOTT: Objection to form.
THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, I'm not hearing you very well right now.
MR. HENRY: I will turn up my volume and speak up.
BY MR. HENRY:
Q My question for you, Dr. Begault, is, is most of your work at the Audio Forensic Center litigation oriented?
MR. ELLIOTT: Objection to form.
THE WITNESS: So litigation is a legal term, and I don't know if my understanding of that word is the same as yours. Because if litigation means that something is actually litigated, at times, I will provide information to attorneys where litigation has not occurred. If I understand what litigation means, where an actual lawsuit is filed.
So at times, for instance, I might analyze evidence before actual litigation occurs, presuming I'm

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understanding the precise definition of litigation. So legal matters might be a better word than litigation here or potentially legal matters.
BY MR. HENRY:
Q Sure, that's fine.
Is most of your work at the Audio Forensic Center related to legal matters or potential legal matters?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. Yes. Most of it is. There's a percentage of it that's also concerned with due diligence, product development, testing. That sort of thing.
BY MR. HENRY:
Q And what's your ballpark of that percentage?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't know exactly, but I could give you a guess.
BY MR. HENRY:
Q Sure, what's your best guess? It's your work.
MR. ELLIOTT: Objection to form.
THE WITNESS: Oh, my best guess is maybe 10 percent is due-diligence-type of work, and the other 90 percent is some sort of legal matter.
BY MR. HENRY:
Q Have you ever designed (indecipherable utterance) a CPU?

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THE STENOGRAPHIC REPORTER: I'm sorry. Can you repeat that, Mr. Henry?
MR. HENRY: Sure.
BY MR. HENRY:
Q Have you ever designed a CPU?
A I have not designed an entire central processing unit.
Q Have you designed some component of a CPU?
MR. ELLIOTT: Objection to form.
THE WITNESS: I have designed signal processing for spatial audio that uses a CPU.
BY MR. HENRY:
Q And what did that design work entail?
A It entailed designing sound processing in order to take and input sound and spatially distribute it to a listener.
Q What do you mean when you say spatially distributed to a listener?
A I mean many things. Basically my interests, my career has been focused on either measuring or propagating sounds that contain spatial audio cues of various types using different techniques. That could include unrelated transfer functions. That could include beamforming. That could include microphone arrays or loud speaker arrays. So a whole variety of different things.

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Q When you say spatial audio, what do you mean by that?
A I use that as a kind of general description for audio presentation where there is likely an intention on the part of someone who's operating the software to create a spatial presentation of audio, in other words, to manipulate it somehow in acoustic space for the perception of a listener.
Q And would the manipulation include trying to position sound sources around a user, maybe --
MR. ELLIOTT: Objection --
BY MR. HENRY:
Q -- so they're perceived from different locations?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Are you -- did you see in the asserted patents that the patents often use the term sound localization point?
A I believe that is the phrase that's associated with the acronym S, as in Sam, L, as in Larry, P, as in Paul.
Q And you saw that phrase and that acronym used in the asserted patents, right?
A I did.

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Q And what do you understand a sound localization point to be?
A A location in acoustic space as perceived by a listener. I will give you a qualification to that, that I have not read every mention of the word sound localization point in all of the asserted patents. Therefore, I've given you my understanding of that phrase. I may come to a different conclusion as I understand the totality of the contents of these patents.
So I would like to qualify what I just said by stating that.
Q Sure, and as we go today, Dr. Begault, as I'm sure other attorneys have told you in other depositions, if you want to make a clarification or qualification, just let me know. I'm happy to make sure that you get your testimony on the record clearly as you prefer. Okay?
A I appreciate that.
Q Yeah, sure.
And I'm not -- I wasn't trying to trick you with the asking you about SLPs. I'm just trying to make sure that we can talk about them in a way where we don't get tripped up by that term as we go today. Okay?
A That's fair enough. I thought you might be referring to the use of that phrase throughout the totality of the patents, which is why I made the

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qualification that I made. So I'm giving you my understanding of that phrase as I understand it today.

Q Yeah, that's totally fine. And I'm happy to represent to you that the parties are in general agreement that that term means a location where a listener localizes sound. Okay?

A Yes.

Q And so when I use that phrase, is that fair between us that you'll understand that's what I'm talking about when I use either sound localization point or SLP, we're talking about a location where a listener localizes sound, you understand that?

A I do.

Q Okay. And that that's consistent with your understanding of that term, right?

MR. ELLIOTT: Objection to form.

THE STENOGRAPHIC REPORTER: I'm sorry. What was your answer, Doctor?

THE WITNESS: As of today.

THE STENOGRAPHIC REPORTER: Thank you.

BY MR. HENRY:

Q Have you ever designed a digital signal processor?

MR. ELLIOTT: Objection to form.

THE WITNESS: Yes.

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BY MR. HENRY:

Q And what did that design work entail?

MR. ELLIOTT: Objection to form.

THE WITNESS: That involved designing -- or should I say, using the facilities afforded by a Motorola 56001 digital signal processing chip.

BY MR. HENRY:

Q And what did you use that DSP chip in?

A What did I use it in? I think you're asking what was that DSP part of?

Q Yes, that's what I'm asking.

A It was part of a spatial audio communication system.

Q Okay. So did that spatial audio communication system have a name?

A Yes, it did.

Q What was that name?

A The Ames Spatial Auditory Display.

Q Is that the same as or different than the VIEW system, The NASA VIEW System.

MR. ELLIOTT: Objection to form.

THE WITNESS: Different. This was a prototype device that I designed and demonstrated to launch control at Kennedy Space Center.

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BY MR. HENRY:

Q Did you also work on the VIEW system?

MR. ELLIOTT: Objection to form.

THE WITNESS: The VIEW system came about, I believe, a year before I came on the scene at NASA. When I came to NASA, the VIEW system, which was a virtual reality system that had audio controlled by a device called the Convolvotron had already been implemented. So I was working in the area of auditory perception and psychoacoustics, where we would use the Convolvotron in studies.

So I could say that my research work might have fed back into the usage of the VIEW system or understanding of its capabilities. But the design of the VIEW system was done by some folks about a year or so before myself.

THE STENOGRAPHIC REPORTER: I'm sorry. Are you saying VIEW System, V-I-E-W?

THE WITNESS: Yes.

THE STENOGRAPHIC REPORTER: Thank you.

THE WITNESS: All caps.

BY MR. HENRY:

Q Dr. Begault, what does VIEW stand for?

A I don't recall all of the letters, but I believe it was Virtual Interactive Environment. And then I forget

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the W. Might have been wearable. I don't recall exactly.

Q And so Dr. Begault, is it fair to say your research used the Convolvotron in the VIEW system?

MR. ELLIOTT: Objection to form.

THE WITNESS: Over the years my research has used components of the total VIEW System. I think the VIEW system could -- you know, it's been 35 years or something, what you're referring to. So I'm having to go back thinking about its initial implementation. But it was a goggles and glove and 3D audio interactive system.

And there might have been some variants on it, even, as we went along, for instance, instead of a head-mounted display, there could have been another type of display on a boom, that you look through. So the hardware components would change. And I don't really recall if these variants still were described under the rubric of VIEW System.

So to answer your question, my research involved components of the VIEW system, but I think if you went back 35 years and looked at the literature, I think the literature was mostly talking about the system originally compiled by Scott Fisher, which involved a interactive system involving a beta glove, a head-mounted display, and 3D audio. And I believe it had six degrees of freedom capability as well.

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THE STENOGRAPHIC REPORTER: I'm sorry. Did you say what glove?
THE WITNESS: Boy, what did I say?
MR. HENRY: Data. It's d-a-t-a, right, Dr. Begault?
THE WITNESS: Thank you, that's what they referred to it as, a data glove.
BY MR. HENRY:
Q And, Dr. Begault, when in time did that system you just described with the HMD, the data glove, and the 3D audio that was designed or developed by Scott Fisher exist?
MR. ELLIOTT: Objection to form.
THE WITNESS: So you're asking me to give you an exact historical point, which I'm unable to do. So I arrived at NASA in I believe it was 1988. The system had already existed, I believe. If you look at the literature, you would find an article authored by Fisher, Wenzel, W-e-n-z-e-l, and -- yeah, Fisher, Wenzel, and... there's another person -- Foster, F-o-s-t-e-r. And I don't recall the exact date of that.
And, again, publications usually follow embodiments or whatever the proper term is, you know, the manifestation by a year or two. So I can't give you an exact historical point in time. That's a historical question which could be researched, I guess.

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BY MR. HENRY:
Q Totally fair.
But by the time you got to NASA in 1988, the VIEW system and the Convolvotron system already existed; is that fair?
A Yes. So they were going through different iterations and development of the systems. But some form of those existed, yes.
Q And the system already had an HMD, which is a head-mounted display, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q And the system, there's a data glove, right?
A Yes.
Q Okay. And you said the system also used 3D audio, fair?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q What's a data glove?
A A data glove was a thin glove which had both a -- oh, I'm going to give you the 1980s version of what a data glove was. It had a Polhemus tracker device on it so that the position of the hand could be registered. And it also had sensors in the fingers so that different gestures could be interpreted by a computer, such as gripping and pointing and that sort of thing.
Q And you said, for the benefit of the court reporter, Polhemus. Could you spell that, please?
A Sure. Capital P-o-l-h-e-m-u-s.
THE STENOGRAPHIC REPORTER: Thank you.
BY MR. HENRY:
Q So a user of the data glove would wear that data glove on the user's hand?
MR. ELLIOTT: Objection; relevancy. I'm just going to object to the line of questioning as being irrelevant. This is on claim construction. So obviously, you can continue down the line of questioning if you want, but none of this is relevant to the claim construction we're here for today.
THE WITNESS: So your question again, please?
BY MR. HENRY:
Q Sure. So the user of the data glove would use that glove on the user's hand, right?
A It's hard to imagine somebody wearing a glove somewhere else other than their hand.
Q And you said sensors could track gestures like pointing; is that fair?
A Well, again, I'm relying on 35 years of memory here, but what I recall was that there was a type of sensor that went along the fingers and maybe in the hand part. And those sensors would transmit a voltage based on the position of the fingers. And then there was also, again, this tracker device. So the idea was at the time that you might be able to point to a menu, a virtual menu floating in the sky that you would see through the HMD or you might be able to grab a virtual object and move it.
I don't know, honestly, how much development was present at the time. I mean, again, it was a continual evolution. So I know that in theory, that's what these things were capable of doing. I don't know how often the computer needed to be restarted or how successful these things were. If you give me a particular year or, you know, if smoke was coming out of the computer at a certain point.
But conceptually, that's how all this stuff was supposed to work, and I actually did try it at some of these demonstrations when I was at NASA in the late 1980s. So I think it was developed pretty well by that point.
BY MR. HENRY:
Q I apologize. I thought you were done.
A No, that's my fault. I didn't give you a proper pause. I am done now.
Q Thank you.

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So you actually used that system in the late 1980s?
MR. ELLIOTT: Objection; relevance, scope.
THE WITNESS: Well, I'm going to test my memory here, but I'm pretty certain that we had quite a few people coming through for demonstrations of the system. This is one of the earliest virtual reality systems. And it was -- made quite a splash, if you will.
And there were demonstrations of different applications that would be relevant to NASA's mission. But of course, popular media became entranced by what it had potential to do. So folks like Jaron Lanier, who I don't remember how to spell his name, I know he'd come through the lab and various people would come and... it was a new thing at that time.
BY MR. HENRY:
Q Sure.
But you also used it yourself, right?
MR. ELLIOTT: Objection; relevancy, scope.
THE WITNESS: I used --
MR. ELLIOTT: Calls (indecipherable utterance) for speculation.
THE STENOGRAPHIC REPORTER: What was that, Mr. Elliott?
MR. ELLIOTT: Also objection, calls for speculation.

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THE STENOGRAPHIC REPORTER: Thank you.
THE WITNESS: I used primarily the Convolvotron, because my work was in psychoacoustics. So I was using it for psychoacoustic studies. And then I think some of my earlier work might have fed into the larger virtual reality system as far as, oh, here's something Begault developed. And now let's try it as part of the full system.
But I wasn't engineering the visual component, let's say, of the system.
BY MR. HENRY:
Q Yeah, that's totally fine. I wasn't asking if you were engineering the visual component. I just want to know if you actually used the system, like did you wear the data glove and wear the HMD and then try out the VIEW and Convolvotron system?
MR. ELLIOTT: Objection to scope, relevancy, and calls for speculation.
THE WITNESS: I'll repeat my prior answer. I used the Convolvotron in my own studies, and I was one of many people who used the system in terms of trying out demonstrations of it. I might have even participated in a study that a different researcher was doing, you know, as a subject, that used some parts or components of the VIEW system.

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So, again, it was a system that was demonstrated to many people. I was one of the people that tried it out. I was very interested, of course, in the audio portion of the system. And we were all part of the same team, in the same group.
BY MR. HENRY:
Q And you could point at and move virtual objects with this system?
MR. ELLIOTT: Objection to form, outside the scope, and not relevant.
THE WITNESS: Could I -- I'm sorry. State your question again?
BY MR. HENRY:
Q Sure.
Would this system, the VIEW system and the Convolvotron system, could you point at and move virtual objects?
MR. ELLIOTT: Objection to form, scope, and irrelevant.
THE WITNESS: Yes. At various points in its development, you could select things from a menu, I recall, and interact with it. And I believe you could interact with virtual objects.
BY MR. HENRY:
Q Now, could you also point at and move sound

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sources?
MR. ELLIOTT: Objection to form, outside the scope and irrelevant.
THE WITNESS: That, I don't recall specifically. It might have come up at some point. I don't really recall anything where sound sources were moved by let's say in the virtual environment using one's hand.
BY MR. HENRY:
Q Do you recall them being moved by any other process?
MR. ELLIOTT: Objection to form, outside the scope, irrelevant, and calls for speculation.
THE WITNESS: The Convolvotron allowed you to create sound trajectories or to move sounds so you could play sounds in different locations. So in that sense, you could move them.
BY MR. HENRY:
Q What were some of the processes that the Convolvotron used to facilitate that movement?
MR. ELLIOTT: Objection to form, outside the scope, and irrelevant.
THE WITNESS: Well, to be a little more specific here, I mean, you could move your head, and sound sources would maintain their same virtual position, unlike with a normal set of headphones where the sounds would move with your

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head. So the sounds would maintain their position. But if you wanted to move the sounds, what I recall was that that was a matter of (indecipherable utterance) interacting with the computer display.

THE STENOGRAPHIC REPORTER: I'm sorry. Matter of what?

THE WITNESS: Moving the sounds with a computer display.

THE STENOGRAPHIC REPORTER: Thank you.

BY MR. HENRY:

Q How did the Convolvotron maintain sound sources in the same virtual position when a user's head was (indecipherable utterance) moving?

MR. ELLIOTT: Objection to form --

THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, your sound really isn't that good on my end for some reason. I can hear everyone really great, but I'm not hearing your -- like this one question, you trailed off for some reason. Your audio is trailing off.

MR. ELLIOTT: Chris, I think you're turning your head, and that's what's causing it to trail off. I don't know if Chris is watching the screen, but I do hear your voice trail off as you like turn your head as you finish your question.

THE TECHNICIAN: Mr. Henry, we can try doing something

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in Zoom if you want to go off record real quick.

THE WITNESS: I'm going to take a two-minute break. I'll be right back.

MR. HENRY: Yeah, that's fine. Let's go off the record.

THE VIDEOGRAPHER: The time is 10:09. We're going off the record.

(Recess taken.)

THE VIDEOGRAPHER: The time is 10:21. We are back on the record.

BY MR. HENRY:

Q All right. Dr. Begault, how did the Convolvotron maintain sound sources in the same virtual position when a user's head was moving?

MR. ELLIOTT: Objection to form. Objection to form, scope, and irrelevant.

THE WITNESS: Basically, it was a matter of analyzing head position relative to the intended virtual source position, and then selecting or interpolating between the appropriate HRTFs.

BY MR. HENRY:

Q And when you say HRTFs, you mean head-related transfer functions?

A That's correct.

Q Where was the (indecipherable utterance) Polhemus

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tracker on VIEW and Convolvotron system.

THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, what was the what tracker?

MR. HENRY: Polhemus again, P-o-l-h-e-m-u-s.

MR. ELLIOTT: And objection to form, calls for speculation, outside the scope and irrelevant.

THE WITNESS: Where was the Polhemus tracker? That is a system of devices. Do you want me to describe where each of the devices were located?

BY MR. HENRY:

Q Please, that would help me. Go ahead.

A Sure.

MR. ELLIOTT: Objection to form, calls for speculation, irrelevant, and outside the scope.

THE WITNESS: There was a transmitter that in the VIEW system was mounted to the top of the headband of a headset. For the audio transformations to the Convolvotron. And then there was a receiver that was mounted I believe on a pole. It was kind of an arbitrary location, and sometimes it would be mounted to the ceiling. And then those were wired to the actual box that would take the coordinates of the transmitter and the receiver and transmit them to the computer. And I don't know exactly where that was located, but I believe proximate to the computer.

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BY MR. HENRY:

Q And the transmitter on the top of the headband, did that track head movement or did something else track head movement?

MR. ELLIOTT: Objection to form, outside the scope, irrelevant. Compound. Just to be clear, we're talking about the first versions of the Convolvotron, in the 1980s using a Polhemus tracker device. So if that's what we're referring to now, you have to remind me your question.

BY MR. HENRY:

Q Sure.

Was it the transmitter on the top of the headband that tracked head movement or was it something else?

MR. ELLIOTT: Objection to form. Outside the scope, irrelevant. Calls for speculation.

THE WITNESS: It was not just the transmitter. It was also the receiver and the interface box.

BY MR. HENRY:

Q Working as unit, the components that you testified about to before?

MR. ELLIOTT: Objection to form and irrelevant.

THE WITNESS: Yes. Correct. That's how that system works.

BY MR. HENRY:

Q Did you say, Dr. Begault -- actually, strike

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that.
Dr. Begault, at what period of time did you work on the AMES Spatial Audio Display?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: This would be approximate, but I believe I came up with the concept in 1990. And I believe -- I'd have to refer to my CV to give you an exact year, but I think our prototype was ready by '92 or '93. It's been a while.
BY MR. HENRY:
Q When did you stop doing work that was related to the AMES Spatial Audio Display?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: That's a difficult -- the way you phrase the question is difficult to answer specifically. Because much of my work is related to what the Ames Spatial Auditory Display was designed for. But if you mean -- why don't you clarify what you mean in your question.
BY MR. HENRY:
Q I would imagine at some point you -- well, actually, are you still working for NASA?
A Yes.
Q Are you still working on that project?
A The Ames Spatial Auditory Display specifically?
Q Yes?

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A That was a hardware prototype. So I stopped working on that. Let's put it this way. I demonstrated the prototype. I wrote a paper about it. There was a patent that was related to it, and so I probably stopped working, other than doing demonstrations, I know we did a number of demonstrations with the device through the mid-90s, but I wasn't really doing any additional development on that specific device past, I don't know, 1995 or something.
BY MR. HENRY:
Q So you weren't doing any specific development work on the AMES Spatial Audio Display past around 1995; is that fair?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: First part of your question was garbled. You'll have to repeat it.
BY MR. HENRY:
Q Sure.
So you weren't doing any specific development work on the AMES Spatial Audio Display past around 1995; is that fair?
MR. ELLIOTT: Same objection.
THE WITNESS: Yes. And by the way, the audio is getting more garbled. So I could hear you say the word specific, but it sounded like (indicating.)

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And, Court Reporter, you don't need to transcribe that, other than noise.
But maybe some other people have their microphones open that shouldn't. I don't know. But there was some garbling in there. So just as a heads up.
BY MR. HENRY:
Q For the purposes of a clean record, Dr. Begault, I'm going to ask this again.
You weren't doing any specific development work on the AMES Spatial Audio Display past around 1995; is that fair?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: That's my best estimate.
BY MR. HENRY:
Q Dr. Begault, did you write your May 3rd, 2023, declaration?
A I wrote it interactively with counsel.
Q Which counsel?
A I'm not sure which counsel were actually involved, but I will state that I was communicating with Patrick Dunn and Kyle Elliott about it.
Q Anyone else?
A I don't recall.
Q And what do you mean by you wrote it interactively with counsel?

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MR. ELLIOTT: Objection to form.
THE WITNESS: The substance of the arguments I wrote, and I would say that the formatting and the outline and some of the references that were addressed in the errata came from counsel -- were provided by counsel.
But let me follow up and says the references.
BY MR. HENRY:
Q I'm sorry. I'm not following. What are you referring to when you say the references?
A The errata addresses specific sections or references to specific quotes in the materials in the patents.
Q And those were provided by counsel?
A Yes. I asked for examples of these processor claims that I was asked to address.
Q And in response to that request, counsel provided the citations presented in the errata?
A Presented in the declaration and corrected in the errata.
MR. ELLIOTT: Objection to form.
BY MR. HENRY:
Q Did the AMES Spatial Audio Display use 3D audio?
MR. ELLIOTT: Objection to form, outside the scope, and irrelevant.
THE WITNESS: Yes.

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BY MR. HENRY:
Q What in your view is 3D audio?
MR. ELLIOTT: Objection to form.
THE WITNESS: Three-dimensional audio presentation.
BY MR. HENRY:
Q How, if at all, is that different from binaural sound or binaural audio?
MR. ELLIOTT: Objection to form.
THE WITNESS: There are similarities and differences. We could go into those if you like.
BY MR. HENRY:
Q Sure.
How does binaural audio differ from 3D audio in your view?
MR. ELLIOTT: Objection to form.
THE WITNESS: Binaural audio has been a term of art, so to speak, in the research community for many, many years going back decades. And so one can find references to binaural recording technique, for instance, where a dummy head might be used to capture spatial audio cues from the perspective of a dummy head.
3D audio was a term that came about, I think, in the 1980s, late 1980s. I don't know exactly who invented that term, but generally speaking, without being restrictive about the overlap between the two terms or

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excluding one thing from the other because of course there are similarities, 3D audio is kind of a term that came about when virtual reality became known to the public. It became a kind of way of capturing the concept of manipulating binaural sound, if you will, with a computer.
BY MR. HENRY:
Q Did the AMES Spatial Audio Display use binaural audio?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: In a sense, yes. That's the overlap with 3D audio, if you will, in that it used head-related transfer functions for its processing.
BY MR. HENRY:
Q Did it use a digital signal processor for that head-related transfer function processing?
MR. ELLIOTT: Objection to form. And irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q Were you the only one in the industry using a digital signal processor to process head-related transfer functions -- (simultaneous cross-talk) --
MR. ELLIOTT: Objection; form --
BY MR. HENRY:
Q -- in the 1990s?
MR. ELLIOTT: Objection to form, calls for

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speculation. Also irrelevant.
THE WITNESS: No.
BY MR. HENRY:
Q At that time, in the 1990s were there publications that you were aware of discussing using digital signal processors to process head-related transfer functions to generate binaural audio?
MR. ELLIOTT: Objection to form, irrelevant.
THE WITNESS: There were many.
BY MR. HENRY:
Q Were there also many references at that time discussing using convolution processes to process head-related transfer functions with digital signal processors for binaural audio?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q What is convolution, Dr. Begault?
A Convolution is a mathematical operation by which the frequency domain of two signals can be multiplied.
Q You recall mentioning convolution in your May 3rd declaration?
A I do.
Q Is there only one convolution process, Dr. Begault, or are there many different convolution

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processes?
MR. ELLIOTT: Objection to form.
THE WITNESS: Literally speaking, I guess there's an infinite number of convolution processes.
BY MR. HENRY:
Q Why do you say that, Dr. Begault?
MR. ELLIOTT: Objection to form.
THE WITNESS: I say infinite because any number of an infinite number of things can be convolved with another.
BY MR. HENRY:
Q Sure, I think you're referring to inputs to a convolution process.
What I'm asking is, is there just one convolution process known to you into which such --
MR. ELLIOTT: Objection to form.
BY MR. HENRY:
Q -- or are there more than one convolution process?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm aware of the basic convolution process.
THE STENOGRAPHIC REPORTER: I just want to let you know, Mr. Henry, I didn't hear your full question because there was some talking over one another with the objection so I wasn't able to hear the full question.

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MR. HENRY: Thank you. I'll repeat it.
BY MR. HENRY:
Q Dr. Begault, is there just one convolution process or are there more than one convolution processes?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm familiar with one convolution process.
BY MR. HENRY:
Q And --
A And if you mean the literal definition of convolution in the time domain.
Q I'm sorry. I think -- is it in the time domain or in the frequency domain that convolution is used?
A In the time domain.
Q And in the frequency domain, you just use the matrix multiplication process; is that right?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't understand your question.
BY MR. HENRY:
Q Sure.
Well, what do you use in the frequency domain if you don't use convolution to render 3D audio?
A We use convolution in the time domain in order to multiply signals in the frequency domain. So in my use of the word convolution in 3D audio, we're performing that

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operation in the time domain in order to impart the frequency domain transfer function of a head-related transfer function.
Q But isn't convolution using head-related impulse responses and not head-related transfer functions?
A That is correct. One is using head-related impulse responses or transformed head-related impulse responses to convolve in order to get the frequency domain equivalent.
Q So the convolution process is used with head-related impulse responses, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: Either head-related impulse responses or some approximation of it.
BY MR. HENRY:
Q But you don't actually use convolution on head-related transfer functions, do you?
A Well, people will use the phrase convolve with a head-related transfer function and what they really mean is that the operation is happening in the time domain in order to filter something with a head-related transfer function. But technically speaking, convolution is used is a time domain operation that's used to multiply two spectra.
Q What does the acronym IIR stand for, are you

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familiar with that?
A I am familiar with that. Do you want me to define it?
Q Please?
A Infinite impulse response.
Q And what does the acronym F, as in fox, I, as in indigo, R, as in Roger, stand for?
A Finite impulse response.
Q And what do you use infinite impulse responses for?
A Well, they can be used for the same purpose as an FIR filter. IIR filters can be used to filter a sound just as an FIR can be used to filter sound. And, in fact, you can use an IIR filter to approximate the transfer function of an HRTF.
So in a way, these are two approaches in terms of digital signal processing to create a spectral modification, and both can be used -- I'll just follow up with that. And both can be used in spatial audio processing.
Q Can you perform convolution processes with IIR filters for spatial audio?
A No. I don't believe it's referred to in that way as a convolution operation. It's a feedback system for developing a filter. So one could design IIR filters that

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are using feedback, whereas the convolution operation is more towards feed-forward operation.
Q Can you perform convolution processes with FIR filters for spatial audio?
A That is what is typically done.
Q Can you describe what the one convolution process that you said you're familiar with entails?
MR. ELLIOTT: Objection to form.
THE WITNESS: Sure. So we have a sequence of numbers that represents, let's say, a digital filter. And we have another sequence of numbers that represents an input signal that has been digitized. So these are both in the digital domain. So I'm familiar with it. And what we're doing is we are multiplying the two arrays, shifting one of the arrays relative to the other one, and then summing the output and then shifting again and summing the output.
BY MR. HENRY:
Q And what types of digital filters can be used in that process?
A Band pass filters. Low pass filters. High pass filters. Filters that represent head-related transfer functions.
Q Any others?
A Reverberation.
Q Any others?

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A Arbitrary filters.
Q Any others?
A I think I've exhausted the list. If I think of any others later, I'll tell you.
Q What's an arbitrary filter?
A Well, it's to contrast what I was describing as a band-pass filter, a low-pass filter, or a high-pass filter. So an arbitrary filter means that its frequency response can be, quote/unquote, arbitrarily designed to have a particular characteristic.
Q I think you mentioned reverberation filter. What would that be?
A What that would be, it's -- maybe I didn't say reverberation filter. I meant that the FIR filter could be used to simulate reverberation. That's what I meant to say.
Q What is a biquad configuration of a filter?
A A biquad -- a biquad filter in digital signal processing has both a feed forward and a feedback component.
Q Are those used in convolution processes?
MR. ELLIOTT: Objection to form.
THE WITNESS: More properly stated, it could be used in a filtering process.

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BY MR. HENRY:
Q Will you help me understand that qualification? I'm just... what is the relationship between the filters that we've gone through and the convolution process? Are they used in that convolution process or am I not capturing that correctly? Just trying to understand.
MR. ELLIOTT: Objection to form -- sorry, objection to form.
THE WITNESS: My understanding is the convolution process applies to a feed forward operation but not to a feedback operation.
BY MR. HENRY:
Q So then what filters of the filters that we mentioned could be used in the convolution process?
MR. ELLIOTT: Objection to form.
THE WITNESS: I can't answer your question the way you phrased it. What filters can be used?
BY MR. HENRY:
Q Sure. We've covered the FIR filter, and we mentioned the biquad configuration of a filter, and an IRR filter. Are any of those used in convolution processes?
MR. ELLIOTT: Objection to form.
THE WITNESS: My understanding is that the feed forward operation of the FIR portion of a filter represents convolution. I don't know if it's properly

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addressed the feed forward portion of a biquad filter also which has a feedback portion as a convolution process. I guess you could, but I'm not entirely sure about that.
BY MR. HENRY:
Q What I'm trying to understand, Dr. Begault, and just help me out because I'm not an audio expert. But I thought you testified that you have a sequence of numbers that you're going to use in convolution that represents a digital filter, and then you have a sequence of numbers that represent the input. And then those two things are convolved in order to render spatial audio signal. Is that not the case?
MR. ELLIOTT: Objection to form.
THE WITNESS: If I know what you're referring to with my example of two sequence of numbers where I was doing a shift and a feed forward operation, I would call that convolution. It's not the only way to render a spatial audio filter, though.
BY MR. HENRY:
Q Sure.
But what I just mentioned, where you have the numbers that represent the filter, and the numbers for your input and you're doing a feed forward process for convolution, which of the filters that we discussed can be used in that process?

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MR. ELLIOTT: Objection to form.
THE WITNESS: You could design a filter using FIR techniques of any type.
BY MR. HENRY:
Q So any FIR filter could be used?
A No. Wait a minute. That's twisting my words in some weird way.
Q I --
A You said you could use -- let me clarify.
Q Sure, please.
A You could use an FIR filter to design just about any type of filter.
Q And then would you use that resulting filter for your convolution?
A No. The filter is the convolution.
Q Okay.
A That's where I'm getting mixed up with your question.
Q Is the filter the kernel you use for the convolution process?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would reverse those words. The convolution process is what I might use in some circumstances to create a digital filter.

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BY MR. HENRY:
Q Can you describe for me how you would use HRTFs in a convolution process?
A I would use them possibly, not exclusively. By -- and, again, there's many ways to represent a head-related transfer function. But one way of doing it would be using the convolution process that we just described.
Q So if you wanted to convolve an audio signal with a HRTF, how would you do that?
A I have already answered that question for you. You could do it via a feedforward FIR filter.
Q How else could you do it?
A You could do it with any of the other types of filters that I mentioned. Could represent the frequency domain characteristics.
Q Dr. Begault, do you understand that the parties have disputes in this case about the terms electronic call, electronic phone call, and telephone call?
MR. ELLIOTT: Objection to form.
THE WITNESS: I addressed those topics within my declaration. So that's the limits of my understanding of that dispute.
BY MR. HENRY:
Q But the terms electronic call, electronic phone

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call, and telephone call are terms that you addressed in your May 3rd, 2023, declaration, right?
A That is correct.
Q Dr. Begault, before we talk about those terms, how much time did you spend reviewing Dr. McMullen's declaration?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't recall.
BY MR. HENRY:
Q Give me your best guess, Dr. Begault.
A Is her declaration the one that she had authored, as opposed to the... sorry. I sometimes don't know the legal terms for these documents. There were two documents that I mentioned earlier, that I had reviewed briefly. One was a document provided by defense that might have quoted Dr. McMullen. I'm not certain about that.
And then there's a much longer document by Dr. McMullen. I think I spent a few hours on the longer document of approximately 130 pages of Dr. McMullen's. But I didn't spend a lot of time looking at that one. I was mostly looking at the one with the 30 pages.
Q I was referring to the declaration from Dr. McMullen, just like you submitted a declaration in this case. With respect to the declaration from Dr. McMullen, please give me your best guess on how much

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time you spent reviewing that.
MR. ELLIOTT: Objection to form.
THE WITNESS: No more than --
Sorry.
If we are indeed talking about a document that's approximately 130 pages, I think I put less than five hours into it.
BY MR. HENRY:
Q Dr. Begault, what is an electronic call?
MR. ELLIOTT: Objection to form.
THE WITNESS: An electronic call is a communication between two parties.
BY MR. HENRY:
Q What is an electronic phone call?
MR. ELLIOTT: Objection to form.
THE WITNESS: An electronic phone call is a communication between two parties that is facilitated by electronic means.
BY MR. HENRY:
Q Any electronic means?
A Yes. I'm excluding semaphore, smoke signals, and acoustic communication. But any means involving electrical communication.
Q What is a telephone call?
MR. ELLIOTT: Objection to form.

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THE WITNESS: Same answer.
BY MR. HENRY:
Q That answer being, a communication between two parties that is facilitated by electronic means?
A Yes.
Q Any electronic means?
A Yes.
Q Do you draw any distinction between the terms electronic call on the one hand and electronic phone call and telephone call on the other?
MR. ELLIOTT: Objection to form.
THE WITNESS: I draw no distinctions between those terms.
BY MR. HENRY:
Q Even though the latter terms recite phone and telephone?
A I'm sorry. The latter terms recite what?
Q Phone and telephone.
A I think the question you originally asked was are those equivalent, and I said yes.
Q And I'm asking you, that's your opinion despite the fact that electronic call does not recite phone or telephone, and the other terms do.
MR. ELLIOTT: Objection; form.
THE WITNESS: Correct -- oh, correct.

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BY MR. HENRY:
Q In your May 3rd, 2023 declaration, did you set out any legal understandings that govern the formation of your opinions?
A Well, I'm not an attorney. So... I don't understand what you mean by legal. If you mean that I put it in a legal declaration, then I set out my understanding in my declaration.
Q Did you write in your declaration any rules governing claim interpretation or legal understandings of any other applicable rules for claim construction?
A I know I gave you my understanding as an expert or as a person skilled in the art regarding these issues. And as far as -- yes, so that's what I offered. To the degree that they might be legal tests, I'm not exactly sure. But it seems that the interpretation of a person skilled in the art, such as myself, matters legally.
Q I'm actually asking you if you set forth -- out in your declaration sort of the rules that a court would apply or that -- that the court will apply in interpreting these claims.
MR. ELLIOTT: Objection to form.
THE WITNESS: I know I defined -- no, I didn't define any rules, no. I did not use the word rules or I did not think about this in terms of rules.

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BY MR. HENRY:
Q If you -- if it's your opinion that electronic call, electronic phone call, and telephone call all mean the same thing, then isn't your opinion rendering meaningless the terms phone and telephone?
MR. ELLIOTT: Objection to form.
THE WITNESS: No.
BY MR. HENRY:
Q If not, how is your interpretation of the terms electronic phone call and telephone call any different from your interpretation of the term electronic call?
MR. ELLIOTT: Objection to form.
THE WITNESS: There's three different ways of saying the same thing, a communication between two parties facilitated electronically.
BY MR. HENRY:
Q And since you're telling me that they all mean the same thing, aren't you telling me that the terms phone and telephone have no impact on the interpretation of those terms?
MR. ELLIOTT: Objection to form.
THE WITNESS: It seems like a hypothetical that's hard to answer because, I mean, we have to read these terms within the context of the patent. They seem to be referring to the same thing, when I read them.

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BY MR. HENRY:
Q Dr. Begault, what patents do these terms appear in?
A I don't recall.
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't recall which ones exactly.
BY MR. HENRY:
Q As we have established, Dr. Begault, we're conducting this deposition over Zoom, right?
A I hope that's what this is.
Q Is this Zoom meeting an electronic call?
A Yes.
Q Is it an electronic phone call?
A Yes.
Q Is it a telephone call?
A Yes.
Q Do you believe that the computers we're using for this Zoom deposition are phones?
MR. ELLIOTT: Objection to form.
THE WITNESS: I do. The word tele means distant. Phone means sound. And so we are communicating sound over a distance.
BY MR. HENRY:
Q So my computer is a phone?
MR. ELLIOTT: Objection to form.

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THE WITNESS: It's exactly equivalent to the use of a phone. If you mean by a phone, a landline with a piece of plastic encasing it, that goes over a landline communication or you're referring to a handheld device that's using radio communication, et cetera, it's basically the functionality of the three terms involves communications between two parties using electronic means.
BY MR. HENRY:
Q Is my computer a phone?
MR. ELLIOTT: Objection to form.
THE WITNESS: Your computer is being used to transmit sound. So when you use a computer to transmit sound between two or more parties electronically, then you're using a computer as a phone in our sort of old-fashion way of thinking of a phone as a landline device. But it has the exact same functionality as a phone.
So in essence, it is a phone.
BY MR. HENRY:
Q Is your computer a phone?
MR. ELLIOTT: Objection to form.
THE WITNESS: Can you hear my voice?
BY MR. HENRY:
Q Please answer the question.
A Sorry for the rhetorical answer. Yes, I'm using it as a phone.

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Q If you and I were talking over walkie-talkies, would we be using a telephone?
MR. ELLIOTT: Objection to form.
THE WITNESS: We would be communicating sound over a distance. So telephone, yes. We would be using a walkie-talkie as a telephone.
BY MR. HENRY:
Q So is a walkie-talkie a telephone?
MR. ELLIOTT: Objection to form.
THE WITNESS: You can use a walkie-talkie as a telephone form of communication. You can also use a walkie-talkie as a hammer. But people use it for voice communication between two parties.
BY MR. HENRY:
Q Is it a phone?
MR. ELLIOTT: Objection to form.
THE WITNESS: I have to give you the same answer. If you beam by a telephone or a phone, I'd have to know what you mean exactly by a phone. I've given you my definition of what a phone is. A phone is a device that enables electronic communication between two parties because it uses the word sound.
And if we talk about telephone, we're talking about transmitting sound between a distance, which phone implies.

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BY MR. HENRY:
Q So applying your definition, Dr. Begault, is a walkie-talkie a phone?
A Yes, we are using it that way. If on the, other hand, we wanted to point to a specific piece of hardware, like a Western Electric telephone that was used by Ma Bell in the 1960s, then you could say, well, that's a phone. And that implementation in that specific form of hardware is a phone.
Q Dr. Begault, if we were conductors on trains communicating through the consoles of our trains, would we be using telephones?
MR. ELLIOTT: Objection to form, asked and answered. Argumentative.
THE WITNESS: Yes. You would be -- that would be a form of phone. I think they're even referred to as phones.
BY MR. HENRY:
Q Would that make the trains telephones in your view?
MR. ELLIOTT: Objection to form.
THE WITNESS: No. The communication system itself is the phone.
BY MR. HENRY:
Q The train's radio is a telephone?

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MR. ELLIOTT: Objection to form.
THE WITNESS: The train's radio communication can be one component of the train is a telephone communication system, just as my computer has one component to it. Which allows us to communicate via voice and video.
BY MR. HENRY:
Q If we were members of the coast guard on boats communicating over our radios, would we be making a telephone call?
MR. ELLIOTT: Objection to form, argumentative.
THE WITNESS: Yeah. That would be a form, would be called a radio telephone perhaps in the coast guard or a ship-to-shore phone is another word that is sometimes used to refer to the specific hardware. But, again, my use of the word phone has to do with the idea of sound communicated between two or more parties electronically.
BY MR. HENRY:
Q So would the boat radios be making telephone calls?
MR. ELLIOTT: Objection to form.
THE WITNESS: It would be the equivalent of a telephone call, yes. Exactly the -- it's another way of referring to it. The term of art might be radio communication over a radiofrequency. But, of course, that's now much more ambiguous distinction since cellular

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telephones are using radio communication as well.
BY MR. HENRY:
Q What if we were airplane pilots communicating over radios, would we be making telephone calls then?
MR. ELLIOTT: Objection to form.
THE WITNESS: In a sense, yes, by the definition I've given you of what a phone call is.
BY MR. HENRY:
Q Can you identify for me any type of electronic voice communication that is not, in your view, a telephone call?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm trying to think if sound weren't involved. So if we were communicating by video phone, and we were both deaf, and so we might use hand signals. Then I'd have to remove the audio component there and say that we were just having a video phone call.
But I was using the word phone to apply to sound. So, no, it's hard for me to think of any electronic communication between two persons that couldn't be referred to as an electronic call or as an electronic phone call or a telephone call that would be absolutely clear that these mean the same thing.
BY MR. HENRY:
Q So sitting here right now, can you identify for

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me any electronic communication between two people that you believe would not qualify as a telephone call?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm not certain if telegraph would necessarily qualify if there was no sound involved. But, no, I think -- that essentially translates into a communication. But sound's not involved in that one. I gave you another example of a video phone call, but where two people have the sound turned off. And so they were communicating by hand signals.
So would that be a video call without a video telephone call, although the system was capable of it if the sound were turned on or if both people were able to use audio and speech to communicate? Then, yes, then it becomes a phone call or telephone call and an electronic call.
BY MR. HENRY:
Q Dr. Begault, sitting here right now, can you identify for me any electronic voice communication between two people that, in your view, would not be a telephone call?
MR. ELLIOTT: Objection to form.
THE WITNESS: No.
MR. HENRY: Why don't we take a ten-minute break, please. Let's go off the record.

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THE WITNESS: Sure. See you in ten.
MR. ELLIOTT: Okay.
THE VIDEOGRAPHER: The time is 11:13. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 11:26. We're back on the record.
BY MR. HENRY:
Q Dr. Begault, you said you were in Muir Beach, California today, right?
A That's correct.
Q And did you say you were in your home office or a building?
A Home office, home office, yes.
Q Okay. Dr. Begault, is Boston, where I am, a distance from Muir Beach?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Is Paris, France a distance from Muir Beach?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Is Tokyo, Japan a distance from Muir Beach?
MR. ELLIOTT: Objection to form, argumentative.

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THE WITNESS: Yes.
BY MR. HENRY:
Q Is the moon a distance from Muir Beach?
MR. ELLIOTT: Objection to form, argumentative.
THE WITNESS: Yes.
BY MR. HENRY:
Q Is Mars a distance from Muir Beach?
MR. ELLIOTT: Objection to form, argumentative.
THE WITNESS: Yeah.
MR. ELLIOTT: Badgering the witness.
THE WITNESS: Yes.
BY MR. HENRY:
Q If I used an air horn in Boston right now, would the sound of that air horn be a distance from you in Muir Beach?
MR. ELLIOTT: Objection to form, argumentative, badgering the witness.
THE WITNESS: Hypothetically, all things are at a distance from me.
BY MR. HENRY:
Q So if I used an air horn in Boston right now, would the sound of that air horn be a distance from you in Muir Beach?
MR. ELLIOTT: Objection to form.
THE WITNESS: I just gave you an answer. All things,

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hypothetically, are a distance from me. And you can include air horns in Boston.
BY MR. HENRY:
Q Could we also include air horns on the moon if I could use an air horn on the moon?
MR. ELLIOTT: Objection to form, argumentative, and badgering the witness.
THE WITNESS: Well, I did answer that. I said all things are essentially at a distance from me.
BY MR. HENRY:
Q So any sound anywhere in the galaxy would be a distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: The only types of sounds that I think of as not being distant from myself would be sounds that we refer to in the literature as inside the head localization. So there is a phenomenon that is sometimes experienced where sound is not externalized. So all sounds are external to me when you talk about physical sounds.
It is possible that sounds can sound inside of your head, though or be localized inside of your head. It's not even clear if your own physical sounds like breathing are located inside your head or inside your body. But outside -- but those are the sounds that are

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located where I am, as part of my physical corporal being. Everything else is external.
BY MR. HENRY:
Q So then would you agree that any sound that's external to your inside the head hearing is a distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: With the exclusion of sounds generated by my own body. Certain sounds, I guess I should say too because if I snap my fingers outside of my head, that sound -- I generated that sound with my body, but it is located outside of me. The sound source is outside of me. I guess what I'm referring to are sound sources that are inside of me. Like my lungs, my own voice.
BY MR. HENRY:
Q Dr. Begault, putting aside sounds from inside your corporal body and sounds that you hear inside the head as you've described, would you agree that all other sounds are a distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's more or less the essence of my answer that I gave you earlier, that all sounds or all things are external to me.
BY MR. HENRY:
Q Dr. Begault, is a sound in Tokyo, Japan right now

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a distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I think you asked that earlier. And I think the answer was yes.
BY MR. HENRY:
Q Is the answer yes?
A A sound in Tokyo would be at a distance from me.
Q And would a sound on Mars be a distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Dr. Begault, is your computer proximate to you right now?
A How do you define proximate?
Q Well, Dr. Begault, you recall opining about the term proximate, right?
A Right, I used the term proximate to refer to a normal conversational distance.
Q Let me ask you this, Dr. Begault, is your computer proximate to you?
A It can be made --
MR. ELLIOTT: Objection to form.
THE WITNESS: Okay. In terms of the physical object, it's within about... oh, I don't know how many inches. I'd have to estimate. It's whatever was recommended

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ergonomically. Maybe 20 inches.
BY MR. HENRY:
Q Is that proximate to you?
A If we define proximate for a computer as the distance that we would want that computer to be, in order to reasonably see visual objects on that computer, yes. If we define proximate in that way.
Q Dr. Begault, what does proximate to mean to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It would depend on what we're talking about.
BY MR. HENRY:
Q Okay. Is the back wall of your home office proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would need to qualify that somehow. I don't know what that would mean.
BY MR. HENRY:
Q Is the chair you're sitting on proximate to you?
A Again, I've never used the word proximate in connection with a chair.
Q Is it proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It's in proximity to me.

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BY MR. HENRY:
Q Is the chair you're sitting on proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: The idea of a chair being proximate to me seems strange and difficult for me to answer. I could say that I'm sitting on it. I could say that it's not at a far distance from me. So if I'm sitting on it, I guess by that definition, it's in a proximate relationship to me.
BY MR. HENRY:
Q Is there a coffee cup next to you, Dr. Begault?
MR. ELLIOTT: Objection to form.
THE WITNESS: No.
BY MR. HENRY:
Q What's the brown and blue cylinder next to you in your home office?
A It's a water cup.
Q Dr. Begault, is the water cup next to you, proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It's in a proximate location to me because it's not inside of me.
BY MR. HENRY:
Q Is anything that is not inside of you proximate to you?

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MR. ELLIOTT: Objection to form.
THE WITNESS: No. I wouldn't say... it would depend on the particular context. Maybe for a cup, for instance, you might define proximate as something that I could physically grab. So like, you know, I can grab my water cup now, and I can take a drink from it. (Indicating.)
If the cup were so far away as I could not grab it, then I would maybe say, oh, that's not really proximate to me. I'd like to move my cup so it is more proximate to me.
BY MR. HENRY:
Q So do you define proximate to as being within a distance that you can grab it?
MR. ELLIOTT: Objection to form.
THE WITNESS: No. Only for the case of the water cup as we sit here and explore hypothetical applications of the term proximate. I have a specific meaning for proximate, for -- in my declaration.
BY MR. HENRY:
Q What if there was coffee in the cup, Dr. Begault, would your answer change?
MR. ELLIOTT: Objection to form, argumentative, badgering the witness.
THE WITNESS: It's the cup itself, not the contents of the cup.

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BY MR. HENRY:
Q Is there a house next to yours, Dr. Begault?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Is that house proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, it would depend on what we might define as proximate. That might be a subjective term. Some people might think that the house was too close, and that would be a proximate house, versus somebody who might say, oh, maybe that's not proximate to.
Somebody else might use the criteria of, can I see that house next to me. So it would depend on, in your hypothetical, what criteria I would use for that specific hypothetical, like seeing houses or finding coffee cups. You would adopt a kind of criteria.
BY MR. HENRY:
Q Based on what, Dr. Begault?
A Well, on the cup --
MR. ELLIOTT: Objection to form.
THE WITNESS: -- we discuss --
Sorry. I'm going to slow down my answers a bit.
So in relationship to the cup, I use the proximate to explore the idea of proximate meaning that I

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could grab it with my hand. It's not -- somebody else might use a different criteria and say, well, it's proximate if I can see it.
Maybe with a house example that you gave, proximate might have to do with a completely different kind of criteria, whether or not I can see it or not. If my neighbor was far, far away, and I could not see the house, then I might use that as my criteria. But these are hypotheticals and odd examples when we're talking about these different kinds of visual objects because it's not typically used.
I don't think of a chair in terms of proximate. I would say it's in proximity to me. But I don't think of it, is it proximate.
BY MR. HENRY:
Q When would your chair stop being in proximity to you if it were to gradually increase its distance from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, it depends on the criteria you would use.
BY MR. HENRY:
Q Dr. Begault, do you believe proximate is a subjective term?
A Not when applied to speech communications.

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Q In speech communications, what does it mean, Dr. Begault?
A Proximate --
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, proximate to me means that communication -- wait, can you restate your question? I want to make sure I answer it exactly.
BY MR. HENRY:
Q Sure.
I asked you, do you believe proximate is a subjective term. And you answered not when applied to speech communications. Do you recall that?
A Yes.
Q Okay. All right. Then I asked you, in speech communication, what does it mean.
A Proximate means at a distance at which speech intelligibility between two talkers can be maintained without necessitating the use of shouting or a megaphone or something of that sort. In other words, it has to do with the normal distances or the distance range, I should say, at which face-to-face communications occur.
Q What criteria do you apply to determine whether someone is speaking normally versus shouting?
A I use the criteria of -- well, two kinds of criteria. One would be vocal effort. And then that vocal

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effort could be objectively measured using a sound pressure level meter and so that we could measure vocal effort in terms of average speech levels and know when someone is communicating in a voice level that's intelligible.

Q And what vocal effort levels or sound pressure levels do you identify as where speech changes from normal speech to shouting?

MR. ELLIOTT: Objection to form.

THE WITNESS: Normal --

I apologize.

Normal speech levels are roughly about 58 decibels A-weighted at a distance of about a meter. It drops to maybe 52 decibels at 2 meters. At such levels, those are the levels that we typically communicate with one another at. One might raise one's voice a little bit as the distance increases. By the time we get to a shouted level, I believe we're getting into the high 60s in terms of decibel levels. I'd have to check some references on that. But that's my recollection or higher.

BY MR. HENRY:

Q What do you call the level of speech that would be below normal speech level on your -- with these standards you just mentioned?

A Oh, maybe 52, 53. You're starting to get into a

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quiet voice there.

Q And then below that, you get to a whisper or what would you call it at an even lower decibel level?

MR. ELLIOTT: Objection to form.

THE WITNESS: At a fixed distance, it becomes a lower decibel level. I don't get your question.

BY MR. HENRY:

Q Oh, my question was, we sort of went shouting, normal, quiet level. Is there something below quiet level in your view?

MR. ELLIOTT: Objection to form.

THE WITNESS: I guess there's gradations within each of these categories I'm giving you. There's a lot of literature where people were asked to speak or shout at different levels, and then that's used as the scientific basis for evaluating speech communication.

BY MR. HENRY:

Q So I'm asking, so is there a gradation below what you refer to as quiet level?

MR. ELLIOTT: Objection to form.

THE WITNESS: No. I mean, I don't know of anything that's in the literature that goes below quiet speech. As we get quieter and quieter, you know, if one is -- well, it's difficult to produce articulate speech very quietly. And then, yes, you are getting into inarticulate speech

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perhaps. I don't know. It's -- I don't know of levels that are measured for that in the literature.

BY MR. HENRY:

Q Do you know what asserted patent uses the term away from and proximate to?

A I don't recall which patent uses that phrase.

Q Do you know if any of the asserted patents discuss decibel levels at which one might characterize voices as normal or shouting or quiet?

MR. ELLIOTT: Objection to form.

THE WITNESS: I don't know of any patents. Although, I haven't reviewed them all carefully, but I don't recall seeing anything where a specific decibel level was mentioned.

BY MR. HENRY:

Q Do you recall having seen anything in any of the asserted patents where they actually talk about a normal conversational level?

MR. ELLIOTT: Objection to form.

THE WITNESS: I know from the patents that there is a discussion of speech communications, and I believe there is reference to distances that seem equivalent to proximate talkers.

BY MR. HENRY:

Q What distances are those, Dr. Begault?

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A In the range of 1 to 3 meters, I believe. Somewhere in there.

Q Is that how you define proximate, 1 to 3 meters?

MR. ELLIOTT: Objection to form.

THE WITNESS: I haven't thought about how to define it exactly, but what I think about it, if a normal voice as 58 decibels at a meter and goes down to about 52 decibels at 2 meters, and that's at a normal conversation. And that's typically what's used -- well, I'm sorry, that's typically what's measured, right, in normal speech communications, then those would be the levels, if you will, that would be equivalent to a proximate talker in the real world -- or in reality, right?

BY MR. HENRY:

Q Do you know if the asserted patents discuss those levels at all that you just mentioned?

A I don't know one way or the other at this point. I know that they discuss speech communication in a range of 1 to 3 meters. I think there's also discussion of people farther away, like for instance, in another room or something of that sort. I don't recall exactly. But there is a -- there are what appears to be proximate conditions for another talker based on my definition here, having to do with normal speech levels.

And then there are distant sounds beyond a

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proximate distance.
BY MR. HENRY:
Q What's your definition for proximate distance?
A My definition for proximate distance would be normal speech levels, the levels at which those -- normal speech level would be intelligible.
Q I'm sorry. I think you said my definition for proximate distance would be normal speech levels, the levels at which those normal speech level would be intelligible. I'm not --
A Right, as a function of distance --
Q So --
A So speech changes its level as a function of distance to the receiver, between a source and a receiver. And I would say that you are still proximate to the degree that a normal talker -- I'm sorry, a talker speaking in a normal level of voice or a virtual talker speaking at a normal level of voice would be intelligible, that equivalent distance. And that equivalent distance is roughly between 1 and 3 meters, if I recall.
Q Do you know if any of the asserted patents discuss or mention intelligibility as a demarcation of when something is proximate?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't recall the word demarcation

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appearing in any of the patents.
BY MR. HENRY:
Q Do you recall the asserted patents in any other way referring to intelligibility as a way to judge whether a sound is proximate to a listener?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would have to review the patents to give you an accurate answer to that.
BY MR. HENRY:
Q So without doing that and sitting here right now, you can't remember any of the asserted patents discussing intelligibility as a way to determine whether something is proximate to something else?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't recall exactly where I believe I saw something along those lines, having to do with intelligible speech. And maybe the word intelligible wasn't used, but it did use the word speech communication which would infer somebody talking at a proximate distance equivalent to a level for a normal speaker, which is in that range of 1 to 3 meters. So that's what I recall.
BY MR. HENRY:
Q Do you remember any of the asserted patents even mentioning intelligibility?
MR. ELLIOTT: Objection to form.

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THE WITNESS: I don't remember the specific word intelligibility.
BY MR. HENRY:
Q Now, Dr. Begault, is the water cup next to you away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. It is not inside of me.
BY MR. HENRY:
Q Is the house next to your house away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes, it is not inside of me.
BY MR. HENRY:
Q Is that your definition of when something is away from you, that it's not inside of you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I think 20 minutes ago to half an hour ago, I gave you a definition -- or not a definition. I said a statement that all things are essentially outside of me except for physical sounds that occur from within inside my body or certain audio sounds that I might hear inside of my head.
BY MR. HENRY:
Q And when we were having that discussion earlier, we were talking about sounds being a distance from you, and now I was asking you about things that are away from

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you. Do you distinguish between those at all?
MR. ELLIOTT: Objection to form.
THE WITNESS: I guess it depends on what we're talking about and the context away and distant. And I don't know. It could mean different things in different contexts. You'll have to be more specific.
BY MR. HENRY:
Q Sure.
Is the house next to your house away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, in discussing houses, I think we decided that that was a -- we didn't decide. I should say I stated that the judgment of a house being away from me might be subjective in terms of distance. Right?
So it's clearly away from me because it's not inside my body. So it is away from me at some distance.
BY MR. HENRY:
Q When is a sound away from you?
A When it is externalized.
Q If there's a distance of five feet between you and a sound, is that sound away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: A sound that is 5 feet away from me, is that away from me? Is that what you said? So your question -- you answered your own question, right? Is the

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sound away from me away from me.
BY MR. HENRY:
Q I can repeat the question.
A Or phrase it differently.
Q I'll ask it again.
If there's a distance of 5 feet between you and a sound, is that sound away from you?
A Oh, I apologize. I didn't hear --
MR. ELLIOTT: Objection to form.
BY MR. HENRY:
Q I don't mind repeating questions, Dr. Begault. Go ahead.
A Well, and I apologize for mishearing. Yes, that sound is away from me.
Q If there is a distance of 5 feet between you and a sound, is that sound proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It depends on what kind of sound we're talking about. If we're talking about, you know, dropping a pin on a desk, then that might be not very proximate to me. Because I was trying to hear the sound of the pin dropping on the desk.
If it's a talker, of somebody speaking at a normal tone of voice, 5 feet might be proximate.

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BY MR. HENRY:
Q Why do you draw the distinction between the pin and the talker?
A Because speech intelligibility is a well-studied subject where -- and speech communication as well between people, where distance for normal speech communication is well-understood. I draw the distinction because of the pin dropping, it's a very, very tiny sound. And to hear that sound, let's assume that it's 20 decibels or something like that, peak, you'd have to be very close to that sound to be able to hear it.
So it might be, quote/unquote, unintelligible at that 5-foot range.
Q And your view that the speaker sound at 5 feet would be proximate to you, is that also dependent on the intelligibility of that sound?
A The 5-foot distance corresponds to intelligible speech or intelligible talker, to a normal hearing listener speaking at a normal tone of voice.
Q So would the quiet tone of voice we discussed earlier at that same distance be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It could be.
BY MR. HENRY:
Q It's not necessarily?

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A Depends how quiet we're talking about -- sorry. I can understand most talkers at 5 feet distance.
Q At a certain decibel level a talker at 5 feet, in your view, would cease to be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Hard to imagine unless the person were doing something unusual to make their speech incredibly quiet, like maybe put their hand over their mouth or something of that sort.
BY MR. HENRY:
Q But that would do it in your view, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's a hypothetical. I'd have to really think about that. I'm not even sure. I mean, I'd probably -- you still would hear something at that distance. But clearly the levels that we can hear at 5 feet from a vocal apparatus from a human are pretty wide, right? We can hear a fair amount of speech at that level.
It's as that distance increases, that the speech will become less intelligible.
BY MR. HENRY:
Q Would a speaker who shouted at 5 feet away from you be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. They would be proximate.

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BY MR. HENRY:
Q If there were a distance of 10 feet between you and a sound, would that sound be away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: What kind of sound are we talking about?
BY MR. HENRY:
Q Does it matter?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Why?
A If you are 10 feet away -- was that the distance you would use, 10 feet? Can you say yes or no?
Q I can say it. It was 10 feet.
But let me ask you this question again, Dr. Begault.
A Okay. I just want to answer you accurately.
Q If there were a distance of 10 feet between you and a sound, would that sound be away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I restricted my answers to talking about speech. If it were a trombone blasting away at, you know, triple forte, then 10 feet might seem too close. Right? Because the trombone sound would be very intelligible not only at 10 feet but maybe even 20 feet or 30 feet.

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Whereas speech at 10 feet or maybe a quiet talker, you might start to lose certain consonants due to the reduction in level. So it depends really on the type of sound.
BY MR. HENRY:
Q So are you using intelligibility as a measurement or criteria for a sound being away from you in addition to using it as criteria for determining when sound is proximate to you?
MR. ELLIOTT: Objection; form.
THE WITNESS: No. You've mixed up the criteria.
BY MR. HENRY:
Q My question was about whether the sound would be away from you if there was a distance of 10 feet between you and a sound. Would it be?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, anything that is not inside of my body or inside of my head is technically away from me.
BY MR. HENRY:
Q And so if there was a sound that was at a distance from you of 20 feet, would that sound be away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. Yes. Anything, again, that is not inside my body or inside of my head is technically at a

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distance or away from me.
BY MR. HENRY:
Q And if there were a distance between you and a sound of 30 feet, would that sound be away from you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Now, if there were a distance of 10 feet between you and a sound, would that sound be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: It depends on the type of sound. We went through that exercise discussing the pin drop versus speech.
BY MR. HENRY:
Q If there were a speech sound, at a distance of 10 feet from you, would that speech sound be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: That might be around -- yeah, we're getting close to the limit, but yeah, I would still consider a speech sound at 10 feet, that would probably be proximate, or we're within the range of 3 meters.
BY MR. HENRY:
Q If there were a speech sound at a distance of 15 feet from you, would that speech sound be proximate to

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you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I think we are getting past 3 -- the 3-meter approximation I was making. It could be. It might not be. I think we're getting towards the edge of that. I think the example I used in my declaration was something around 20 feet being the edge. I said a long distance of 20 feet or more.
BY MR. HENRY:
Q So we were just talking about speech sound at 15 feet, and you said it might be proximate or it might not be proximate. When would it be and when would it not be?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well -- so I would say you're getting at the edge of proximate, and it kind of depends on the context. You can be 15 feet away from somebody in a conference room, for instance, and having intelligible speech communication because the background sound is low. So that might qualify as proximate to -- or at the edge of it because a person could speak in a normal tone of voice. And for most talkers, would be intelligible at 15 feet because we would have the absence of other sounds in the background.
But in most everyday conversation, people use

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visual cues as well as audio cues to understand speech. We're all doing some form of lip reading, and so when you get out to about 15 feet or so, it's harder to see the details in people's faces as they talk. So there's a diminution of, intelligibility I would think, at that range.
BY MR. HENRY:
Q So --
A So it's a gray area, I would say, to follow up on this. But I've been using an example. I gave a far distance of 20 feet in my declaration.
Q So if there were a distance of 20 feet between you and a speech sound, would that sound be proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: I think that's where I would draw the line. I would say at 20 feet, you are no longer proximate to somebody, from a speech communication standpoint. I'd have to look -- yeah.
BY MR. HENRY:
Q Okay. Were you finished?
A Yeah, I'm finished.
Q Okay. And, Dr. Begault, you draw that line because that's the line at which intelligibility drops below the level of normal speech in your view?

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A Under certain background sound conditions.
Q So you draw that line because that's the line at which intelligibility drops below the level of normal speech under certain background conditions; is that fair?
MR. ELLIOTT: Objection; form.
THE WITNESS: I use 20 feet because that's about the distance at which normal speech you might start getting a reduction in intelligibility under specific background conditions -- background noise conditions, I should say.
BY MR. HENRY:
Q What background noise conditions are those?
A I'm not sure. There are --
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm not sure exactly which ones, but I think those correspond to normal background levels in rooms. So it wouldn't apply to let's say, a noisy day outdoors with lots of wind in the trees, the wind at 30 miles an hour, and so the background noise increases.
Or let's say you're near a freeway, busy freeway, then that proximate point would need to be closer because speech intelligibility would be degraded. You'd need to be closer to somebody with a large -- with a high background noise level.
BY MR. HENRY:
Q So if you were out in your backyard under windy

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conditions, then, a speech sound at 20 feet from you might not be proximate to you, because of those conditions; is that fair?
MR. ELLIOTT: Objection to form.
THE WITNESS: Speech intelligibility might be degraded at that level of background noise.
BY MR. HENRY:
Q And then in your view, that would affect whether the speech sound is proximate to you or not proximate to you?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, this is a highly specialized situation you're describing where we're kind of out at the limits here. Again, I said there's a kind of a gray area. But in normal speech communications, let's say if you and I were speaking to one another over a conference table, we would probably be at a different -- at a distance, I'm sorry, of 2 to 3 meters approximately so that we wouldn't need to raise our voices to be heard and that we could make eye contact and also use visual cues, lip reading and other things to augment speech intelligibility.
BY MR. HENRY:
Q And those factors that you just mentioned are factors that in your view go into determining when a speech sound is proximate to a listener or not proximate

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to a listener?
MR. ELLIOTT: Objection to form.
THE WITNESS: Generally speaking, yes.
BY MR. HENRY:
Q Dr. Begault, what is a spatial acoustic image?
A Well, that's a phrase that I don't think I use typically. So I could speculate as what is meant by that. Did a specific person make that phrase? Or did I? Or somebody else? I can give you my best guess as to what it means.
Q Sure, you did use it.
I won't hide the ball from you, Dr. Begault. I asked because you used it in paragraph 11 of your declaration. If you want to go ahead and --
A Sure.
Q -- look at paragraph 11 of Begault Exhibit 1.
A Sure, sure, I did use it. Okay. Well a spatial acoustic image means the virtual position of a sound object.
Q And what's a sound object?
A That would be the virtual representation of a talker.
Q Acoustically or visually?
A I'm talking acoustically.
Q So that's not -- you're not actually talking

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about -- when you say spatial acoustic image, you're actually talking about an audio source, not necessarily a visual image, right?
A Correct. Acoustic modifies image.
Q Okay. In your experience are acoustic images and visual images often tied together in virtual reality settings?
A Not always.
Q Under what circumstances would they not be?
A Well, the acoustic image can have a different position from the talker. So you could see something visually, and the sound can come from somewhere else. I've done experiments like that.
Q To test what?
A I'm sorry, to test what?
Q Mm-hmm.
A Oh. So there was a device that I developed once, so that you would hear your voice -- well, basically, I would shift the sound of your voice from inside your head, to outside your head because I would put microphones in my ears. And so you would wear a pair of headphones and hear my microphone, and so my voice becomes internalized in your head. And then you hear your (indecipherable utterance) voice outside of your head. We humorously refer to this as to --

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THE STENOGRAPHIC REPORTER: I'm sorry. Doctor, you cut off for me. Hello?
THE WITNESS: The court reporter is having a problem.
MR. HENRY: Yeah, why don't we go off the record and fix that.
THE WITNESS: Yes, then I'll continue my example.
THE VIDEOGRAPHER: The time is 12:14. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 12:46. We are back on the record.
BY MR. HENRY:
Q All right, Dr. Begault. Before we took a break, you were describing an example experiment you did. If you'd like to continue, I'd like to give you the opportunity to finish your explanation of that experiment.
A If you'd like, I was basically giving you an example where -- maybe you could restate your question. You were asking for an example of something. And so... if you could just restate that, yeah.
Q No worries. We can come at it a different way too. I'm just wondering if -- can we agree that most sounds in virtual reality are (indecipherable utterance) connected to visual events?
MR. ELLIOTT: Objection to form.

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MR. HENRY: Sorry. Somebody's got an open mic, and we're getting echoes.
THE STENOGRAPHIC REPORTER: Mr. Henry, can you repeat your question, and then I'll mute myself.
MR. HENRY: Sure.
BY MR. HENRY:
Q Dr. Begault would you agree that most sounds in virtual reality applications are connected to visual events?
MR. ELLIOTT: Objection to form.
THE WITNESS: And now Kyle has an echo, but I think I can understand his objection sufficiently. It's like you might have a speaker on and -- I don't know. Something's feedbacking.
In any event, let's get to your question. No, there are -- there's not necessarily a connection between sounds and visual objects in virtual reality, if I stated your question correctly. There's not necessarily a connection for most. I don't know how I would quantify most versus -- and times, but I can imagine many situations where there are many sounds involved in virtual reality that are not connected to a specific visual object.
BY MR. HENRY:
Q Would you agree that most sounds in virtual reality applications are somehow connected to visual events?

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MR. ELLIOTT: Objection to form.
THE WITNESS: No, not necessarily.
BY MR. HENRY:
Q What is monaural sound, Dr. Begault?
A Monaural is usually a term used in audio reproduction to refer to a single channel of recorded audio information.
Q What is stereo sound?
A Same answer, but two channels of information.
Q Do you draw any distinction between monaural sound and binaural sound?
A Between monaural and binaural?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes, I do draw a distinction.
BY MR. HENRY:
Q What distinction do you draw between monaural sound and binaural sound?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, I'm focusing my answers here on the way that something is recorded, not necessarily reproduction method. But usually monaural sound involves one channel of recorded sound, and usually binaural sound -- no, binaural sound always involves two channels

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of sound recorded typically either through the ears of a dummy head or using some sort of 3D audio technique.
BY MR. HENRY:
Q Do you draw any distinction between stereo sound and binaural sound?
A Yes, I do.
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes, I do.
BY MR. HENRY:
Q What distinction do you draw between stereo sound and binaural sound?
A Stereo sound can include recording techniques that is two microphones, for instance, arranged in coincident pairs or two microphones spread apart without any reference to the anatomy of the head or the outer ear. Binaural sound usually includes some anatomical feature of the human head.
Q I'd like to talk a little bit about head related -- a little bit more about head-related transfer functions, Dr. Begault. Okay?
A Yes.
Q And if you look at your declaration, which is Exhibit 1, in paragraph 13.
A Yes.
Q Okay. And you have a subparagraph there of 1 --

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well you have three subparagraphs, 1, 2 and 3. Do you see that?
A I do.
Q Okay. In the first subparagraph of paragraph 13 in your declaration, you wrote, Many factors other than HRTFs are responsible for how sound reaches the ears of a listener, such as room acoustics, head movement, intensity of the sound source, et cetera.
Do you see that?
A I do.
Q So can we agree that in processing sound with HRTFs to generate binaural sound, there are many factors other than HRTFs that must be considered?
MR. ELLIOTT: Objection to form.
THE WITNESS: Repeat the question?
BY MR. HENRY:
Q Sure.
Can we agree that in processing sound with HRTFs to generate binaural sound, there are many factors other than HRTFs that must be considered?
MR. ELLIOTT: Objection to form.
THE WITNESS: It's very vague the way you put that. I mean, one could imagine a situation where we didn't consider anything else but HRTFs.

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BY MR. HENRY:
Q Typically --
A Like it's -- but you might consider other factors.
Q I thought you were done.
A Sorry.
Q Sure. Typically in your work in (indecipherable utterance) audio, do you consider more than just HRTFs when you're working the process --
THE STENOGRAPHIC REPORTER: I'm sorry. Mr. Henry, there was talking over one another, and I have to take some seconds to unmute myself for the audio. So I didn't hear. Can you restart your question?
MR. HENRY: That's fine, totally fine.
BY MR. HENRY:
Q Let's start again.
Typically in your work, Dr. Begault, in the industry when you're working to render spatialized audio, do you consider more than just HRTFs?
MR. ELLIOTT: Objection to form.
THE WITNESS: From the processing standpoint, it depends.
BY MR. HENRY:
Q Okay. When -- in paragraph 13 when you refer to room acoustics, what did you mean?

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A Well, in this paragraph, what I'm addressing is defendant's claim construction. And defendant's claim construction added this phrase about how sound reaches the listener. And I was making a counterargument to that, that a head-related transfer function is not defined as how sound reaches a listener because many things can affect a sound as it reaches the listener, for example, the things I have mentioned here.
But that's not a definition of a head-related transfer function.
Q Okay. What I'm asking you, Dr. Begault, is how do room acoustics then affect how sound reaches the listener?
A There can be the addition of reverberation.
Q What else?
A There could be attenuation.
Q What else?
A Those are two things I think of. And I don't know if that's what was meant in defendant's claim construction or not. I'm just giving you some examples of two ways of the way sound can be affected by how it reaches a listener.
Q Sure, and, Dr. Begault, I'm asking about this because you wrote room acoustics, that's not in defendant's construction. So I want to know what you

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meant by that term.
A Well, okay. So I meant reverberation, and in primarily, but I could have been more specific and said things such as defraction, absorption, things of that sort, reflection. I could have gone into greater detail on the characteristics of room acoustics if you will.
Q Okay. And all those factors that you just mentioned affect how sound reaches a listener's ear?
MR. ELLIOTT: Objection to form.
THE WITNESS: It -- it can.
BY MR. HENRY:
Q Okay. How does head movement affect how sound reaches a listener's ears?
A Head movement can change the orientation of a sound source to a listener.
Q And how would that affect how the sound actually reaches the ears of a listener?
A It would change the spectrum and time of arrival of the sound to the two ears.
Q What's attenuation?
A It's a fancy way of saying a reduction in sound pressure level.
Q You use the term gain. What does that mean?
A That's a simplified way of saying an increase in sound pressure level.

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Q Is it different than intensity, sound pressure level?
A From a lay standpoint, people would interchangeably use the word intensity, and sometimes I've even used the word intensity to mean volume or sound pressure level. But there's a technical term. There's a technical definition of intensity that has to do with particle velocity of a sound, which I'm not really considering. So if I used the word intensity, I probably should have just used sound pressure level or gain.
Q But when you are speaking in those terms, you're talking about the volume of sound. Is that fair?
A In a lay way, you could say volume as far as when we adjust what's called a volume knob on our receiver or car radio.
Q What's an ILD?
A Interaural level difference.
BY MR. HENRY:
Q And for the court reporter, that's inter a-u-r-a-l, right?
A Yes.
Q And what is an ILD?
A An interaural, a-u-r-a-l, level difference.
Q Right. What does it mean?
A Oh, the difference in level at the two ears.

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Q What's an ITD?
A Interaural time difference.
Q And what does that mean?
A Simply the difference in time of arrival of a signal in two ears.
Q Any environmental factors affect how sound reaches the ears of a listener?
A Room acoustics.
Q Any other types of environmental factors besides room acoustics?
A Sure, I guess you could say background noise might influence the way a sound reaches a listener. Under certain conditions maybe even temperature could affect how sound reaches a listener.
Q What about familiarity with a sound. Does that have an effect on how sound is perceived by a listener?
A Well, that's different than how it reaches the listener. Now you're talking about perception. So, yeah, you can -- familiarity will affect the way somebody perceives a sound.
Q And what about associated visual cues? How does that affect how listeners might perceive sound?
A I gave you an example --
MR. ELLIOTT: Objection; form.
THE WITNESS: I gave you an example earlier how speech

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intelligibility is enhanced by lip reading.
BY MR. HENRY:
Q What's the ventriloquism effect, have you heard of that?
A Oh, yes.
Q What is it?
A The ventriloquism effect is where sound emanates from one location, and it's perceived to be at another location.
Q Is it like a ventriloquist dummy, where the ventriloquist is behind the dummy?
A I wouldn't know specifically, but I think they are referred to as ventriloquists, where the idea is to throw one's voice. I think in the back of comic books from the 1950s or something, there used to be ads for throw your voice. But really what it is is it's a decoupling of visual stimuli from audio stimuli. And sometimes you can shift the audio stimulus to correspond with the visual stimulus.
Q And you said you would shift it to correspond with the visual stimulus, but I think you mentioned sort of injecting some incongruity there. Am I not following correctly?
MR. ELLIOTT: Objection to form.
THE WITNESS: I didn't use the word incongruity.

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BY MR. HENRY:
Q No, I know. But you mentioned you could put them in different locations.
A One might be able to. I mean, I did speak earlier that not in all cases, is there a corresponding visual and auditory cue that are collocated. One can manipulate those things independently.
Q Okay. And you talked just a moment ago talked about decoupling visual and audio stimuli, right?
A Yes.
Q And is that what the ventriloquism effect refers to?
A I don't know exactly how it's used in all cases, but when I've referred to it in the past, I've referred to the decoupling of an auditory stimulus to a visual stimulus. So, for instance, you could be watching a music video, for instance, and the loud speaker might be several feet away from the performers on the screen or on your home television, for instance. But one tends to localize the sound to correspond to the visual image.
Q How long has the ventriloquism effect been studied in the industry?
MR. ELLIOTT: Objection to form.
THE WITNESS: In which industry? I wouldn't know the answer to that question.

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BY MR. HENRY:
Q When did you first learn of the ventriloquism effect?
A Oh, I don't recall. I know I mentioned it in my book in 1994 which I probably wrote in 1992.
Q Why would you decouple audio and visual stimuli?
A I don't know of a specific reason, other than you may want to increase speech intelligibility or sound quality, or sometimes they call it the user experience. You might want to enhance that somehow by having a different location for the audio stimuli or the visual stimuli. So, for instance, in film sound, oftentimes sounds are generated from locations other than the visual stimuli because obviously you can't have the two corresponding to one another, unless you had a loud speaker following the person behind the screen.
And so often those are decoupled for the purpose of increasing either speech intelligibility or for an emotional effect or for some other enhancement of the user experience.
Q You mentioned HRTFs being recorded for the use of dummy heads earlier. Do you remember that?
MR. ELLIOTT: Objection to form.
THE WITNESS: Not specifically, but I don't think we talked about HRTF measurement.

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BY MR. HENRY:
Q Do you remember -- either way, do you know that HRTFs are measured with dummy heads?
A They can be. I've done it myself.
Q Okay. Are you familiar with KEMAR, K-E-M-A-R?
A Yes.
Q What is KEMAR?
A It is a dummy head that was originally developed by Knowles, K-n-o-w-l-e-s Electronics. And I believe now is distributed by GRAS, g-r-a-a-s, Acoustics.
Q Was the KEMAR dummy used to develop a database of HRTFs?
A Yes. It's been used many times to develop HRTFs databases. It has interchangeable ears. So there's many varieties of KEMAR HRTFs, and the KEMAR itself has gone through several phases of modification.
Q And how are the measurements taken around a KEMAR dummy to collect HRTFs?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, I'll tell you a typical way that it's done, is that an anechoic chamber is used, and the dummy head is located centrally. And then a sound source is located 1 to 2 meters away from that dummy head, sometimes farther away depending on the side of the anechoic chamber.

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And then an analytic impulse is sounded from the loud speaker and then a measurement is made at the ears of the dummy head, et cetera, for different locations of where the sounds are.
BY MR. HENRY:
Q And you mentioned the HRTFs being collected through use of a sound source located at 1 to 2 meters or sometimes farther away. Is there any particular distance that's typically used or usually used?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. Ideally, you want to get out to at least a wavelength of interest from the dummy head when you make these measurements.
BY MR. HENRY:
Q And what distance would correspond to a wavelength of interest?
MR. ELLIOTT: Objection to form.
THE WITNESS: Depends on your --
Sorry.
Depends on your application, but in most applications, you would want to be out to something -- if we're talking about speech, you might want to be -- let's see, just doing a calculation in my head.
So I think if you get out to about two and a half feet from the dummy head, you're capturing most

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frequencies of speech.
BY MR. HENRY:
Q Do you know if measurements have been made with a KEMAR dummy at a distance of 1.4 meters to create a database?
MR. ELLIOTT: Objection to form.
THE WITNESS: It would -- sure. I believe that maybe that has occurred. I don't recall the exact measurement distances. People are frequently constrained by the size of their anechoic room when they do these kinds of measurements.
BY MR. HENRY:
Q But you could measure HRTFs at different distances; is that fair?
A Well, you can measure all kinds of crazy things, but you definitely want to be able to have a planer wave form for the distance that you're measuring so that you're avoiding the effects of what we would call a near field measurement where you're closer than a wavelength of interest, and therefore, some different things occur that aren't translatable over to the use of the HRTF in most applications.
Q Do you dispute that HRTFs could be collected with a KEMAR dummy head at a spherical -- with a -- strike that.

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Do you dispute that you could collect HRTFs with a KEMAR dummy head at a radial distance of 1 meter around that dummy head?
A You can collect the measurements at any distance you want.
Q Are you familiar with the CIPIC database?
A Yes, I am.
Q And that's C-I-P-I-C, CIPIC, right?
A I believe that's the correct acronym, yeah.
Q Do you know what it stands for?
A I used to know. I'm sorry, I don't remember.
Q Center for Image Processing and Integrative Computing. Does that ring a bell?
A Yeah, is that the UC Davis database?
Q It is.
A Yes, so those were collected fairly near field.
Q Do you know the distance at which those HRTFs were measured?
A I don't recall.
Q Would you be surprised to learn that they were measured at a radial distance of 1 meter?
A Not at all. Because most of the effects of HRTFs that people are concerned with have to do with where the acoustical effects of the pinnae are most influential.
Q And where are the acoustical effects of the

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pinnae most influential?
A Six kilohertz and above.
THE STENOGRAPHIC REPORTER: I'm sorry. You said pinna?
THE WITNESS: P-i-n-n-a-e.
THE STENOGRAPHIC REPORTER: Thank you.
THE WITNESS: Did I say that right? P-i-n-n-a-e, that's two, and one is a p-i-n-n-a.
THE STENOGRAPHIC REPORTER: Thank you.
BY MR. HENRY:
Q How does that -- how does that correspond to the distance at which HRTFs were measured?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't understand your question.
BY MR. HENRY:
Q Sure. I asked you would you be surprised to learn that the CIPIC database collected HRTFs at 1 meter, and you said not at all because most of the effects of HRTFs that people are concerned with have to do with where the acoustical effects of the pinnae are most influential. Do you remember that?
A Yeah, I do.
Q And then I basically asked you where is that, and you said 6 kilohertz and above. Right?
A Yes. That's where the pinnae is most influential.

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Q So my question for you is so then how does that relate to your lack of surprise in the CIPIC database having collected HRTFs at 1 meter?
A Well, because 1 meter is so much longer wavelength than 6 kilohertz.
Q Okay. Are you aware of people using near field HRTFs?
A It is a term that has been used or explored. For instance, I know that it is used in the patents as a kind of category, and I've heard it used with relationship to Dolby Atmos, where there isn't a precise definition.
THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. You said Dolby at most?
THE WITNESS: A-t-m-o-s. Dolby, like the movie theatre, and then Atmos, A-t-m-o-s.
THE STENOGRAPHIC REPORTER: And then you said where there is not a precise definition or where there is a precise definition?
THE WITNESS: Where there is not a precise definition.
THE STENOGRAPHIC REPORTER: Thank you.
THE WITNESS: You're welcome.
BY MR. HENRY:
Q What would constitute -- sorry. Were you talking? I got some feedback. Strike that.

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What would constitute a near field HRTF in your view?
A Well, my answer to that would depend on the frequency of interest.
Q Why?
A Because it has to do with the sound source that's being used as either radiating a plane wave or a spherical wave.
Q How would that change the meaning that you would have strived to near field HRTF?
A At the point at which the sound source is no longer producing a plane wave and becomes spherical, the HRTF would modify from being a -- from being constant across different farther distances, except for a gain term, as I described in my declaration.
So when you get very close to the device you're measuring, and the sound source that you're using is no longer producing a plane wave, then there can be certain distortions or changes in the... particularly, the low frequencies and maybe the time domain of some of the measurements.
But that's one -- that's my definition, and I don't know if that's necessarily the definition that's used in the patents. I believe the definition in the patents is more categorical.

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Q Is it your opinion that all 3D audio systems use HRTFs that are only measured at one distance?
MR. ELLIOTT: Objection to form.
THE WITNESS: I can't answer a question that has the superlative all in it. But I can tell you that most HRTFs are measured at one distance, and then those HRTFs are scaled. There could be exceptions. Maybe somebody was doing some experiments trying to find this effective on low frequencies for very close distances. There could be some experimental data that way.
I can tell you from experience that it doesn't make a lot of difference in many applications. I've heard -- well, some of the literature's reported it as being a very weak effect.
BY MR. HENRY:
Q You said that most HRTFs are measured at one distance. What is that distance?
A Usually, the distance of the wavelength of interest and where the sound source is capable of putting out a plane wave.
Q Is it 1 meter, is it 1.5 meters, is it 2 meters? What distance?
A Depends --
MR. ELLIOTT: Objection to form.
THE WITNESS: I didn't hear your objection.

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MR. ELLIOTT: Objection to form.
THE WITNESS: Oh, form.
It depends on the wavelength of interest and depends on the sound source that you're using.
THE STENOGRAPHIC REPORTER: Doctor, you said is capable of putting out. Did you say a plane wave?
THE WITNESS: Yes. P-l-a-n-e wave.
BY MR. HENRY:
Q So you're not saying that all systems use HRTFs that were measured at the same distance, and then used for example, just HRTFs measured at 1 meter and then those are used in every single 3D audio system, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: Many -- I could think of -- strike that.
I know that some 3D audio systems allow you to switch between different HRTF measured sets that have been measured at different distances. I know of HRTFs sets, where only the high frequencies were measured and then the low frequencies were synthesized at a later time or otherwise assumed through an equalization process to have a constant frequency response so that the main interest was to capture the effects of the head shadow and the pinna. But it's not a constant distance that is used in all systems.

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BY MR. HENRY:
Q That's what I was getting at. It's not a constant distance for HRTFs across all 3D audio systems, fair?
A That's fair.
Q Okay. In your own patents, you've described processing sound with HRTFs, right?
A Correct.
Q Including in patents from before 2014, right?
A That is correct. All of my patents, I believe, are from before 2014.
Q And you've also disclosed in your own patents from before 2014 processing sound to move virtual sound images to different locations, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's correct.
MR. ELLIOTT: And relevancy.
THE WITNESS: Yes. That's correct. I have described that in at least one of my patents.
BY MR. HENRY:
Q And you've also described in your own patents from before 2014, generating binaural sound through digital signal processors processing HRTFs, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: That is correct.

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BY MR. HENRY:
Q I'd like to look at your declaration again, which is Begault Exhibit 1. Okay?
A Yes.
Q Okay. And specifically, why don't you look at paragraph 8, please.
A Okay.
Q Okay. The second sentence of paragraph 8 from your declaration reads, These three terms are used interchangeably in the specifications to describe the use of any type of medium to enable communication between two or more locations. Right?
A Yes, that's what it says.
Q Okay. After that sentence, you did not cite to any disclosures from any of the asserted patents, right?
A If you are saying that I didn't point out specifically where these interchangeable usages occur, I didn't cite them, no.
Q And do you know what specifications you're referring to in that sentence?
A I recall seeing some specifications that were like that. But I don't recall which ones.
Q Looking at paragraphs 9 to 11 now, those relate to the term away from and proximate to, right?
A Yes, sir.

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Q Okay. Looking at paragraph 10, in the last sentence, are you there?
A Yes.
Q Okay. The last sentence of paragraph 10 of your declaration reads, There are a plethora of examples in the specifications where proximate to indicates two people having a conversation in the same room. Do you see that?
A I do.
Q In your view, what qualifies as a plethora?
A Many.
Q How many examples would there have to be to qualify as a plethora?
A I can't put a number on it. I think I saw it at least twice, if not more.
Q It's your declaration. Is that the best you can give me for what a plethora means?
MR. ELLIOTT: Objection; argumentative.
THE WITNESS: At this point that's the best I can give you.
BY MR. HENRY:
Q Okay. And at the end of the sentence, you did not cite to any of the asserted patents; is that correct?
A If what you're saying is did I give any specific references to -- I'm sorry, if I -- if what you're saying is did I give any citations to specific examples, I did

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not provide that.
Q I'd like to look at paragraph 16, and then we'll circle back to some others. Let me know when you're there.
A Yes.
Q Okay. Paragraph 16 in your declaration is the only paragraph in which you offer any opinion regarding algorithmic support for functions recited in the asserted claims of the asserted patents, right?
A No, that's not true.
Q Okay. In what other paragraph did you identify algorithmic support for the functions that are cited in the asserted claims of the asserted patents?
A In the paragraph above it, I refer to common industry programming techniques or software libraries for audio processing.
Q And is it your testimony now that those are disclosed in the asserted patents?
A In my declaration I was saying that the citations that I give above, such as process sound to generate binaural sound, et cetera, are known audio DSP structures understood by a POSITA -- or I'm sorry, PHOSITA.
Q All right. And we're going to talk about that. But I'm asking you if you identify or you opined in any other paragraph besides 16, where algorithmic support for

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the functions were cited in the asserted claims of the asserted patents can be found in the asserted patents?
MR. ELLIOTT: Objection to form.
THE WITNESS: Same answer from the standpoint that known audio DSP structures within the art is referring to functional recitations in the patent. And so those can be viewed as kind of descriptors, if you will, to functional recitations of algorithmic steps.
BY MR. HENRY:
Q Are you saying that you analyzed the asserted patents and found known audio DSP structures within the art and common industry programming techniques and software libraries for audio processing in the asserted patents?
MR. ELLIOTT: Objection to form.
THE WITNESS: I -- I found references to processes. And these processes, to me as a PHOSITA immediately suggested certain algorithmic techniques that one would use.
BY MR. HENRY:
Q And I'm asking you if in any of the paragraphs of your declaration other than paragraph 16, did you identify any algorithmic techniques from the asserted patents?
MR. ELLIOTT: Objection; form.
THE WITNESS: Paragraph 15.

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BY MR. HENRY:
Q What is it in paragraph 15 that you believe identifies algorithmic support or functions recited in the asserted claims that appears in the asserted patents?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, it's the recited functions that define the structure, such as providing binaural sound to a PHOSITA, that points me to my toolbox of techniques by which a signal processing and algorithmic kinds of structures would exist.
BY MR. HENRY:
Q Are you referring to just the recited functions themselves in the claims there?
A I don't know if that's all I'm referring to. I'm referring kind of holistically to reading these patents.
Q Well, what I'm asking you, Dr. Begault, is if in your declaration, anywhere, you actually identified algorithmic disclosure for the functions recited in the asserted patents that appears in the asserted patents other than what you state in paragraph 16?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, I have found the processor terms in paragraph 15, to indicate to me the equivalent of what I discuss in 16. So there we're talking about convolution operations, is what is typically used.

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BY MR. HENRY:
Q I'll ask again, Dr. Begault, because that wasn't responsive to my question.
In your declaration is there anywhere where you actually identified algorithmic disclosure for the functions recited in the asserted patents that appears in the asserted patents other than what you point to in paragraph 16 of your declaration?
MR. ELLIOTT: Objection, argumentative and form, including argumentative.
THE WITNESS: I have to give you the same answer, that in paragraph 15 I feel that the processor terms that are given here are indicative of algorithmic structures.
BY MR. HENRY:
Q What do you mean by they're indicative of algorithmic structures, Dr. Begault?
A As a solid example, process sound to -- process sound to generate binaural sound is indicative to me as a PHOSITA for certain algorithmic procedures by which that sound might be rendered.
Q What algorithmic procedures, Dr. Begault?
A Well, we mentioned convolution in 16. We've discussed that -- excuse me. The literature commonly available as of the disclosure date, is well-known to a POSITA as a way to implement these algorithmic structures

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that we're discussing, like processing sound to generate binaural sound.
THE STENOGRAPHIC REPORTER: I'm sorry. It sounded like you're saying POSITA with a P and then PHOSITA with an F. Which one is it?
THE WITNESS: So I apologize. The word that is used in the declaration is P-H-O-S-I-T-A, and I've been pronouncing it POSITA, because in a prior case I was involved with, that's what it was called. And then another case I was involved in, it was called a POSA. I might in the future just start calling it a person of skill in the art, and with everybody's understanding that I also mean what a PHOSITA, P-H-O-S-I-T-A, is.
Is that acceptable to you, Mr. Henry?
BY MR. HENRY:
Q I know what you're talking about. So I'm fine.
A Okay.
Is that acceptable to you, Kyle.
MR. ELLIOTT: Yes.
THE WITNESS: Good. Okay. So I will try to say person of skill in the art. And if I slip, and I say PHOSITA, or et cetera, et cetera, Court Reporter, you'll know I'm spelling that P-H-O-S-I-T-A.
BY MR. HENRY:
Q Dr. Begault, let me ask you this. In

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paragraph 16, do you cite any disclosures from any of the asserted patents?
A In paragraph 16?
Q That's right.
A You can see that there's an absence of any citation.
Q Okay. And in paragraph 15, you have some citations to the asserted patents, and here I'm including the citations that you corrected via errata served today. Okay.
A Correct.
Q Okay. Outside of the citations that you provided in paragraph 15 as corrected by your errata, did you in any place in your declaration, other than paragraph 15, cite any other disclosures from the asserted patents?
A Give me a second here.
Well, I believe paragraph 14 could be seen in that view because we're talking about DSP transformation involving HRTF filtering. So there we're talking about hardware structures that might be used.
Q Sorry, Dr. Begault. I -- is it your testimony that paragraph 14 has citations to any disclosures from the asserted patents? That's my question.
A Oh, I understand.
So let's see. 14. I don't have specific

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citations.
Q Do you have any citations to the asserted patents in any paragraph in your declaration other than paragraph 15?
A One moment.
I think paragraph 15 and 16 are the main ones within the topic area you're asking me about.
Q Well, we already covered that paragraph 16 doesn't have citations in it, Dr. Begault. So I'm going to ask you again.
Does -- do you anywhere in your declaration other than paragraph 15, cite any disclosures from any of the asserted patents?
A Not specifically.
MR. ELLIOTT: Objection to form.
THE WITNESS: Oh, sorry.
MR. ELLIOTT: Objection to form.
THE WITNESS: Sorry. You want to restate your objection? I'm sorry.
MR. ELLIOTT: No, you can go forward and answer.
THE WITNESS: Paragraph 15 is the only place where you will find specific references to a particular line number and column number, et cetera.
BY MR. HENRY:
Q Okay. Dr. Begault, let's -- we're going to put

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another document into the chat now.
A Okay.
Q And this is going to be Begault Exhibit 3.
(Whereupon Deposition Exhibit 3 was marked for identification.)
BY MR. HENRY:
Q And the file name for this one, the PDF file name, is US 9226090.
A I am waiting for it to arrive.
Q Yeah, and once it's circulated, just let me know when you've had a chance to download it locally so you have it and can open it and view it.
A Still not seeing it.
Oh, it has arrived. Okay. I have Exhibit 3 open.
Q Great. Dr. Begault, what is the document that's been designated Begault Exhibit 3?
A It is United States Patent 9,226,090 B, as in boy, 1.
Q If I refer to it as the '090 Patent, will you know what I'm talking about?
A As per our earlier agreement.
Q Do you know which claims of this patent are asserted in this case?
A Oh, off the top of my head, I don't remember the

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specific numbers.
Q Remember any of them?
A I don't remember any specific numbers.
Q Do you know what claim terms about which you opined in your May 3rd, 2023, declaration are recited in the claims of the '090 Patent?
A If I looked at my declaration, then I would be able to recall that. May I?
Q Sure.
A Okay. I'm going to give you a five-minute warning for a bathroom break. But in the meantime, the '090, you asked me which... the specifications or claims?
Q Which terms that you offered opinions about are recited in the claims of the '090 Patent?
A Adjust the binaural voice, and yeah, that's it.
Q Why don't we look at claim 15, Dr. Begault.
THE STENOGRAPHIC REPORTER: Doctor, you said adjust or just the binaural voice.
THE WITNESS: Adjust.
THE STENOGRAPHIC REPORTER: Thank you, that's what I thought.
THE WITNESS: I'm going to take a three-minute break. Can we do that?
MR. HENRY: Sure, we can go off the record. No problem.

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THE WITNESS: Okay. Three minutes. I'll be right back.
MR. HENRY: Well, let's take ten. So we'll be --
MR. ELLIOTT: Ten? Ten, wow. Okay.
MR. HENRY: Or five, whatever. I don't care. Ten is fine. We'll be back in ten.
THE VIDEOGRAPHER: The time is 1341. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 1358. We are back on the record.
BY MR. HENRY:
Q Okay. Dr. Begault, let's look at claim 15 of the '090 Patent, which is Exhibit 3.
A Very good. I am there.
Q Okay. This is one of the claims about which you opined in your declaration, right?
A That is correct.
Q I'd like to look at the last limitation of the claim which begins with the language, A processor that executes the instructions. Do you see that limitation?
A I do.
Q And that limitation, the last limitation of claim 15 recites, a processor that executes the instructions to adjust the binaural voice of the second person during the

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electronic phone call in order to position the sound localization point of the binaural voice to a location that is away from and proximate to the first person, wherein the second localization point represents an origin of the binaural voice of the second person to the first person. Right?
A Except where you said second localization point, you meant to say sound localization point, but otherwise, you're correct.
Q All right. Thanks.
And when you read this term, do you understand the term to mean that there is a processor that's programmed in some way to achieve or perform the function that's recited in the rest of this limitation?
MR. ELLIOTT: Objection to form.
THE WITNESS: I see a statement that says a processor that executes the instructions.
BY MR. HENRY:
Q So then perform or achieve the function that's recited after that, right?
A Yes, that's correct.
Q Okay. And do I understand correctly that in your view, a person of skill in the art would have known how to implement the system or method performing the processing recited in the last limitation of claim 15 because a

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person of skill would have been able to resort to known audio DSP structures within the art and common industry programming techniques or software libraries for audio processing?
MR. ELLIOTT: Objection to form.
THE WITNESS: I believe you more or less read my declaration literally. And so, yes, that is my assertation.
BY MR. HENRY:
Q And is it your opinion that a person of skill would have known how to do that before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes, it would my opinion somebody might know that before 2014.
BY MR. HENRY:
Q What software libraries were available before 2014 that a skilled artisan could have used to adjust the binaural voice of a person during an electronic phone call to position an SLP to a location that's away from and proximate to a listener?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, an earlier version would have been -- or I'm sorry. An early example would have been the Convolvotron, 1987 or '88.

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BY MR. HENRY:
Q Okay. Do you know of another example?
A I can think of different hardware that existed that could be configured to accomplish this same task, yes.
Q Like what?
A Well, different spatial audio processors. There was one made by Roland, for instance. That Roland, I think it's called an S360. There were a number of convolution engines out there, for instance, or processors, and by the time you get to -- what dates you're talking about? Prior to 2014? Yeah, by -- after 20 -- I don't know the exact date, but as one progresses from the 1990s up to 2014, there's multiple hardware, software processes to accomplish these things.
Q And you mentioned the Convolvotron and the S360 by Roland. Was -- can you identify any others?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, you could have used, for instance, Max/MSP by Cycling '74, which is a software-based system.
BY MR. HENRY:
Q And --
A And --
Q Oh, sorry. I was asking for clarification. You said Max, are you referring to computer, M-a-c-s, or are

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you referring Max, M-a-x?
A M-a-x. It's a software program that allows real-time signal processing.
Q And I'm sorry. Could you identify any others that could be used before 2014 to perform a -- recite a function of claim 15?
MR. ELLIOTT: Objection --
THE WITNESS: Go ahead, Kyle.
MR. ELLIOTT: Objection to form.
You can go ahead.
THE WITNESS: Well, again, if we're talking about a processor that executes instructions to adjust the position of a binaural voice to a new location, I believe there were several software libraries out there, that would allow you to do that.
BY MR. HENRY:
Q Can you identify one?
A Sure, so another one is called Slab, S-l-a-b, and that was a software distributed by NASA at one point. It was basically a software version of a Convolvotron. And I think the gaming industry probably had many solutions prior to 2014, for doing this kind of manipulation that's outlined here.
I don't know if specific software libraries -- I can't remember the name of it, but there was projects for

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implementing 3D audio into software libraries at that time too for program mers. And, again, the name is escaping me, but there were a number of projects that had been going on for more than ten years for sure.
Q For more than ten years before 2014?
A Yeah, I think they -- yeah, could be a 20-year legacy. I'm not sure of the exact date. And it was for doing things like implementing 3D audio processing, as part of game developer kits or software. But I can't recall the exact names of them or the efforts.
Q Do you know of Unity?
A I've heard of it. I never had a personal experience with Unity.
Q Can you identify by name any of the solutions from the gaming industry from prior to 2014 that you believe could do the kind of SLP manipulation that's recited in 15?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, not by name. I'm not super familiar with the world of gaming. But there was -- I might have even given a talk to this group. I don't recall. But something along the lines of standardizing 3D audio manipulation and presentation and processing in standard software libraries if I'm recalling correctly. That's as specific as I can give you.

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BY MR. HENRY:
Q You don't recall the group that you gave a talk to?
A No. I can't even recall if I actually gave a talk to that group or if I was just invited to go, even if I did go. I just heard a lot about it, and there was a lot of interest in the time. And I know that that was... oh, maybe at least 15 years ago.
And I think it's evolved, and it might still exist.
Q What audio DSP structures from before 2014 are you aware of that could accomplish or perform the function recited in the limitation of claim 15 that we're talking about?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, the same.
BY MR. HENRY:
Q Do they all use DSPs for their spatialized audio processing?
A Some might use software DSP based on the native CPU. Some might use an external DSP. Some of the earlier versions I know did.
Q Do you distinguish between a digital signal processor and digital signal processing?
MR. ELLIOTT: Objection to form.

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THE WITNESS: I don't know if I necessarily would in the terms that you used. One's a noun and one's a verb, I think.
BY MR. HENRY:
Q Now, you can look, I'm going to ask you about paragraph 15 of your declaration, which talks about all the processor terms, not just the limitation that we're looking at in the '090 Patent.
A Sure.
Q Okay. Is it fair to say that you believe that persons of skill in the art would have known before 2014 how to use audio DSP structures or common industry programming techniques or software libraries for audio processing to implement systems performing all of the functions recited in the processor terms that you address in paragraph 15 of your declaration?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes, as stated in my declaration.
BY MR. HENRY:
Q If you look back at the -- and sorry to jump, but if you look back at paragraph 15 of -- strike that.
Looking at claim 15 of the '090 Patent.
A Yes.
Q If you're looking at that limitation we were discussing, that begins, The processor that executes the

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instructions, how would a person of ordinary skill in the art know if something is a processor as that term is used in this claim versus not being a processor as claimed in claim 15?
MR. ELLIOTT: Objection to form.
THE WITNESS: Can you rephrase your question? It seemed oddly put.
BY MR. HENRY:
Q Sure. Yeah, no worries. I'm trying to -- I'll come at it a different way.
To determine -- if you're looking at a system with a processor and you want to try to figure out if it's practicing what's recited in this limitation, in your view, do you have to assess how that processor is implemented?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, I'm a little fuzzy on what you are asking. So, yeah, I'm sorry. I kind of lost you.
BY MR. HENRY:
Q No problem.
A I mean, we were talking about a processor --
Q Yeah, we'll try another one.
If you just look at a processor -- you just look at any processor?
A Yes.

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Q You don't yet look at how it is -- what it's programmed to perform. Can you make a determination of whether or not that processor meets the limitation of claim 15 that we're talking about?
MR. ELLIOTT: Objection to form.
THE WITNESS: So I look at a processor, and what don't I know about the processor in your assumption, your hypothetical?
BY MR. HENRY:
Q You don't know what it's yet programmed to perform or do.
A So... if I'm looking -- oh. So is your question -- can I rephrase it? Is your question if I look at a, quote/unquote, processor, how do I know it can perform the actions shown here?
Q It's -- it's a little different. I'm saying if someone gives you a system and you determine that the system uses a processor, right, are you with me?
A So far.
Q Okay. How would you determine if the processor then after that, is capable -- not capable, actually executes the instructions to adjust the binaural voice as recited in this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, you would know from examining

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software. You would -- and I guess, you're adding the limitation that we can't actually test it with a signal.
BY MR. HENRY:
Q No, you could. I'm just asking you if you would have to look at what the processor is programmed to do in order to determine if the processor you're evaluating executes the instructions to adjust the binaural voice as recited in claim 15?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would know the result of the processor, if I tested it with a signal. If I were looking at the software for that processor, then I would know how it was doing it. And I would have a reasonable expectation of what it's output might be.
BY MR. HENRY:
Q If you just bought an off-the-shelf processor without any programming, would it execute instructions to adjust the binaural voice as claimed in claim 15 of the '090 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, processors usually execute instructions. Right? So the execution of those instructions are informing the processor, for instance, where to place (indecipherable utterance) a sound. And so this limitation here calls out --

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THE STENOGRAPHIC REPORTER: I'm sorry. Doctor, I didn't understand what you said. You said the processor, for instance, where to place what?
THE WITNESS: Let's start again.
THE STENOGRAPHIC REPORTER: Okay. You said so the execution of those instructions are informing the processor, for instance, where to. And it sounded like you said place. But I couldn't understand what you said.
THE WITNESS: Place is right. Where to place the sound localization point to a different position.
THE STENOGRAPHIC REPORTER: Thank you.
BY MR. HENRY:
Q Okay. We agree processors can execute instructions. I think that's pretty straightforward.
What I'm asking is, if you just bought a processor, an off-the-shelf processor, right, would it be able to adjust the binaural voice of a second person during an electronic phone call to position an SLP to a different location without any programming?
MR. ELLIOTT: Objection to form.
THE WITNESS: So some of the examples I gave you earlier, would adjust the position of a binaural sound because the design of the device was specifically to accomplish that. So it could be through the turning of a knob or writing an instruction.

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If your processor, let's say, were a computer, and you were writing an algorithm to take advantage of a built-in library that did signal processing for you, then that would be another way to accomplish the goal. So it kind of, it's a very general -- when you say a processor, we could be talking about many different things.
BY MR. HENRY:
Q Sure. The examples that you give, you referred to devices that were designed to adjust SLPs as recited here and then software libraries that were designed to have that capability, right?
A Well, that's true. But you could also have something that's very generic that is basically a sound processing library, or even a digital signal processing library for which a PHOSITA would come and say, Okay, I want to manipulate the actions through instructions of this particular processor to accomplish the goal that I want to do.
Q And then how would they go about affecting that manipulation?
A By executing instructions.
Q Would they have to write and develop the software having the correct instructions?
MR. ELLIOTT: Objection to form.
THE WITNESS: Maybe and maybe not. Depends if it was

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the extent of the libraries that are available.
BY MR. HENRY:
Q Because some libraries already might have the design to adjust an SLP as recited?
A It is true that some sound developer programs -- or should I say sound developer environments allow manipulation of the spatial attributes of sound.
Q Through their programs -- through their programming, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, programming can mean a lot of different things. It could mean a series of instructions to move the sound. And it's a very high level like that. It could be of the level of you need to design the convolution algorithms, but there are available filtering methods by which to do that.
BY MR. HENRY:
Q Do you write code, Dr. Begault?
A I am a total hack. I don't write in anything that a coder would consider viable. But I do process sound using Max MSP, for instance. So I do binaural and 3D audio experiments using that program. What else have I programmed lately?
And then I have specialized software written for me for my psychoacoustic experiments where I interact with

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it on a programming level to make certain stimuli occur.
THE STENOGRAPHIC REPORTER: Sorry. What was your original question? Was it do you code or something? It was garbled, your question --
MR. HENRY: Do you write code, I think was my question.
THE STENOGRAPHIC REPORTER: Thank you.
MR. HENRY: Yeah, no worries.
THE WITNESS: That was why you question, do you write code.
BY MR. HENRY:
Q Thank you, Dr. Begault.
A Yeah. Now I've forgotten where we are.
Q That's okay. I'll pick up.
The specialized software that you mentioned being written for psychoacoustic experiments, who writes that, you or a colleague or someone else?
A Oh, no. They will -- I'll have somebody else, like a hired programmer, write the structure, if you will. And then I'm given hooks into that structure so that I can then manipulate things like the spatial location of sounds.
Q And were you working on those types of applications before 2014?
A Well, for instance, we discussed the Ames Spatial

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Auditory Display, and there I had to work with assembly code to ask the program to do the convolution that I needed to perform to do the spatial rendering with that particular device.
Q Now, Dr. Begault, if you look at the limitation we're discussing in claim 15, which is the fourth limitation again. Okay?
A I'm with you.
Q Okay. Now, would you say that any computer device that performs the function of this limitation adjusting the binaural voice of a second person during an electronic phone call in order to position an SLP with a binaural voice to a location that is away from and proximate to the first person, would constitute the processor that's recited by this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: So what was -- the first part of your question was... would any what?
BY MR. HENRY:
Q Computer device that performs the function of this last limitation constitute the processor required by this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: So if your question is, is a computer device, could it be used as a processor, then, yes.

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BY MR. HENRY:
Q Oh, that wasn't exactly my question. My question is, the one that I asked you, would you say that any computer device that performed this function would constitute the processor that executes the instructions recited in this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm not sure how to exactly answer that. It seems to me that any computing device that could constitute a processor that could execute instructions would be valid to enable what is stated in this particular limitation.
BY MR. HENRY:
Q Can you think of a computing device that would perform the function recited in this limitation and yet still not be a claim 15 processor?
MR. ELLIOTT: Objection to form.
THE WITNESS: So are you asking can I think of a processor that could accomplish what is put out -- or I'm sorry, stated in this limitation that couldn't do what the -- wait. I lost you completely on that.
BY MR. HENRY:
Q No worries. I'm happy to repeat it. Can you think of a computing device that performs the function recited in the last limitation of claim 15 of the '090

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Patent, that doesn't qualify as the processor recited by this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: I can't think of anything like that. I could think of a processor is engendering a computing device.
BY MR. HENRY:
Q Dr. Begault, I'd like to look at column -- strike that.
Dr. Begault, looking still at claim 15 of the '090 Patent, do you see in the fourth line of the claim in the first limitation where the claim recites binaural voice.
A Okay. So 15 and then we're talking about a second wearable electronic device, that paragraph? That limitation?
Q Yeah.
A Okay. I'm with you.
Q Do you see the claim language, Binaural voice?
A Yes.
Q Okay. And now, I want to just go look at claim 1, which is a couple pages up.
A Okay. I'm with you.
Q All right. In the first limitation of claim 1, do you see where the claim recites, Binaural sound?

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A I do.
Q Do you draw any distinction between the terms binaural sound and binaural voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: In one sense, no, you don't need to make a distinction between those things because many sounds are referred to as voices.
BY MR. HENRY:
Q Yeah, didn't really ask you if you have to draw it. I'm asking you if when you read those terms, do you understand that there is any distinction between them or not?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, the distinction is the word sound and voice between what you just pointed out there.
BY MR. HENRY:
Q Yeah, in your mind, are those two things different or equivalent?
MR. ELLIOTT: Objection to form.
THE WITNESS: They're not -- they are not necessarily different, but we are talking about a second person in Number 15. So that seems to be addressing as binaural voice in that particular example, a speech of a person in that particular example.
But the terms themselves might mean other things

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that when it says binaural voice, it does not necessarily mean a person in all context. But in this context, it seems to be a speech context.
BY MR. HENRY:
Q Sure, and you can look at claim 1 and read it if you want. And then I believe that you'll see, and that we'll be able to agree that it also discusses a first and second person talking. But go ahead and review it and let me know if that's fair.
A Well, looking at the first limitation, it says, Capturing binaural sound. So that might be speech. It might be something other than speech.
Q You also see that first limitation talks about a talking person and a listening person, right?
A Where does it say that?
Q In claim 1.
The first limitation recites, Capturing with an electronic earphone located at a head of a talking person, binaural sound that will be provided to a listening person during a telephone call. You see that, right?
A Oh, I do. But it doesn't necessarily mean that it's just transmitting the binaural speech of that talking person. It could be transmitting something else. It could be, for instance, that talking person speaking in a foreign language, and then a speak recognition system

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translating that language into the -- a synthetic voice that then would be heard by the listening person.
And so that listening person is hearing synthetic speech.
Q Dr. Begault, I just wanted to know if -- and I'm not asking you if these things necessarily mean the same thing or not. Just sort of how you responded last time.
In your view, are the terms binaural sound and binaural voice equivalent?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, I address binaural voice in my declaration. And there, I said that voice could refer to many different types of sound, not necessarily actual speech, but synthetic speech, speech-like sounds, auditory icons, signals, any number of types of sounds that convey meaning.
BY MR. HENRY:
Q Are the terms binaural sound and binaural voice equivalent in your view?
MR. ELLIOTT: Objection to form.
THE WITNESS: They can be, as I said.
BY MR. HENRY:
Q Are they always?
MR. ELLIOTT: Same objection.
THE WITNESS: It depends on the context.

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BY MR. HENRY:
Q Sitting here today, can you identify for me any binaural sound that in your view is not a binaural voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: Not necessarily.
BY MR. HENRY:
Q Because I don't know what you mean by that qualification necessarily, which you keep injecting, I'm just going to give you the opportunity now.
If you are able to identify any binaural sound that in your view is not a binaural voice, I ask you to do that now.
A A sound that is an unintentional noncommunicative sound, such as, let's say, electronic noise that inadvertently went into a system, I wouldn't think of that as a binaural voice. I would think of that as a binaural distortion. That would be a type of binaural sound because it's not communicating.
Whereas when we use the term binaural voice, we're talking about the communication using sound, and that infers some sort of vocabulary, either in terms of auditory icons, of speech or synthetic speech. So I gave you an example where there is a sound that's inadvertent and is like a form of distortion or noise.
Q Beyond that example, can you identify for me any

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other binaural sound that in your view, would not be a binaural voice?
A Any sound that is not a form of communication -- or intentional communication, I should say.
Q What is an intentional communication?
A A communication where there's an intention for a sound to be heard by another party.
Q So any sound that is not an inadvertent noise that you characterize as a distortion is in your view a binaural voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: As I said, the word voice can confer many forms of aural communication. If aural communication is not involved, in other words, a message being transmitted from one place to another, then it could be thought of as a form of noise or distortion or inadvertent type of signal. So I'll use that as my categorization for something that is not a binaural voice.
BY MR. HENRY:
Q A message, a binaural message? Isn't that a binaural voice?
A No, that's not what I said.
Q Okay.
A I said that a binaural voice means a communicated message, aural -- well, acoustic message.

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Q In trying to understand the distinction you're drawing between things that could be binaural sounds but not binaural voices, is it just any binaural sound that has meaning, is what you would call binaural voice?
A Meaning in the context of communication.
Q So any binaural sound with meaning in the context of communication is a binaural voice in your view?
A People skilled in the art, POSA, have understood that 3D audio and binaural rendering of different types of sound, speech or nonspeech, or hybrids of the two are effective means of communication and have been frequently implemented as such. I don't rule out the possibility that a binaural sound such as an inadvertent noise that is heard spatially couldn't occur.
But if that occurred, I'm disqualifying it as a binaural voice because voice infers communication.
Q Can you give me an example of a binaural sound that would be an inadvertent noise?
A Sure.
Q That wouldn't be binaural voice?
A Sure. 60-cycle (indecipherable utterance) hum.
THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. Could you repeat that?
THE WITNESS: 60-cycle hum.
THE STENOGRAPHIC REPORTER: H-u-m, hum?

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THE WITNESS: H-u-m, hum.
BY MR. HENRY:
Q What is a 60-cycle hum, Dr. Begault?
A That is the bleed through of an American-based alternating current system into an audio system. So if you go home and turn up your audio system really loud, you might here (indicating.) And that could be accentuated by things like dimmer lights and things of that sort. And I'm sure you've encountered in Zoom, inadvertent noises and stuff that have come in. If Zoom had a binaural capability, then some of those sounds, those noises might be placed in 3D audio space.
Those, I would not consider a binaural voice because those sounds are not an intentional communication from one party to another.
Q Does Zoom have binaural capabilities?
A I don't think so. I've never heard of it.
Q Does it capture binaural sound or voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: Not that I'm aware of.
BY MR. HENRY:
Q Why not?
MR. ELLIOTT: Objection to form.
THE WITNESS: I can't -- I don't know the operations or motivations or engineering staff of Zoom.

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BY MR. HENRY:
Q Why is it that you believe that Zoom does not capture binaural sound or binaural voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: Only through direct experience using a single microphone and listening to monaural sound over my headset. I could be mistaken. There could be something out there that does something beyond my own experience. As I say, I do not follow product development on the part of Zoom.
BY MR. HENRY:
Q Yeah, and that's fine. I'm not asking you about Zoom's product lines beyond what we're using today.
Let's just then talk about today. Why is it that what we're using today, in your view, doesn't capture binaural sound or binaural voice?
MR. ELLIOTT: Objection to form.
THE WITNESS: It doesn't capture that because it's using a single channel communication.
BY MR. HENRY:
Q All right. We're going to put another exhibit in the chat, Dr. Begault. And this one is going to be the file name US9282196.
(Whereupon Deposition Exhibit 4 was marked for identification.)

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BY MR. HENRY:
Q And this will be Begault Exhibit 4.
A I'll let you know when I see it.
Q Thank you.
THE TECHNICIAN: It's uploading now.
THE WITNESS: Okay. There it is.
Okay. I have the Exhibit Number 4 up and ready to discuss.
BY MR. HENRY:
Q Dr. Begault, what do you recognize Begault Exhibit 4 to be?
A United States Patent 9,282,196-B1.
Q Do you know which claims from the '196 Patent are asserted in this case?
A I don't know off the top of my head, which claims are being asserted in this particular matter.
Q Let's look at claim 1 of the '196 Patent.
A Did you intend to give me a yellow highlighted version?
Q I did not.
A I'm happy to use it.
Q Yeah, I think it's fine. These aren't even my highlights. But if it doesn't bother you, we'll just keep going if that's all right.
A That's fine by me.

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Q All right. Looking at claim 1.
A Yes.
Q You see that the preamble of claim 1 reads, A method executed by one or more electronic devices in an electronic system that move a sound localization point, SLP, of a voice of a computer program during a voice exchange between the computer program and a user, the method comprising?
A I see that.
Q What do you understand a voice exchange to be?
A I would -- voice communication.
Q Does an exchange require voice communication between two parties?
MR. ELLIOTT: Objection to form.
THE WITNESS: If the party could constitute a computer or any device capable of recognizing speech or sound and another device capable of recognizing speech or sound.
BY MR. HENRY:
Q And the preamble here talks about a voice of a computer program, and a user on the other side, right?
A It does. I presume the user is human.
Q All right. In the next limitation, do you see the language, Handheld portable electronic device?
A Stand by.
Yes.

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Q What, in your view, is a handheld portable electronic device?
A Obvious meaning. I suppose an example might be a cellular telephone. What do they call those these days? Not the thing with the giant antenna, but an iPhone, for instance, or an Android.
Q So you would agree that a smartphone is a handheld portable electronic device?
A That was the word I was looking for, yes, a smartphone.
Q Do you see before handheld portable electronic device the, limitation, cites providing through an electronic earphone, do you see that language?
A I do.
Q And it goes on to say that you provide through an electronic earphone binaural sound to the user during the voice exchange?
A Yes, I do.
Q How long have people of skill in the industry been providing binaural sound to listeners through earphones?
MR. ELLIOTT: Objection to form.
THE WITNESS: Oh, I don't know the first date of that. But, of course, stereo, by the development of any headphone system that could monitor two microphones, would

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be the origin of that.
BY MR. HENRY:
Q Were people in the industry providing binaural sound to listeners through earphones before 2014?
A Yes.
Q I want to look at claim 15.
A Yes.
Q And this is one of the claims that you opined about in your declaration, right?
A Let me confirm that.
Q Sure?
A Yes.
Q And it's one of the -- the last limitation is one of the processor terms that you addressed, right?
A That's correct, yes.
Q Okay. And when you read this last limitation, do you understand the term to mean that there's a processor that's programmed to achieve the functions that are recited in the rest of this limitation?
MR. ELLIOTT: Objection to form.
THE WITNESS: I read that there's a processor that's executing instructions.
BY MR. HENRY:
Q Okay.
A And it accomplishes the things that are listed

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after that phrase.
Q And those things are receiving a command, moving the SLP in response to a command, and providing binaural sound at the second location for an SLP?
MR. ELLIOTT: Objection to form.
THE WITNESS: More or less.
BY MR. HENRY:
Q And I'll -- do I understand correctly that in your view, a person of skill would have known how to implement a system or method performing each of the functions recited in the last limitation of claim 15 of the '196 Patent before 2014 because a person of skill would have been able to resort to known audio DSP structures within the art and common industry programming techniques or software libraries for audio processing?
MR. ELLIOTT: Objection; form.
THE WITNESS: I believe you paraphrased my declaration correctly.
BY MR. HENRY:
Q And do you agree then, that people in your view, people of skill would have been able to use known audio DSP structures and common industry programming techniques or software libraries to perform the functions recited in the last limitation of claim 15 before 2014?
MR. ELLIOTT: Objection to form.

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THE WITNESS: Yes, I think that would have been possible.
BY MR. HENRY:
Q What software libraries or audio DSP structures were available before 2014 to persons of skill in the art to achieve or perform the functions recited in the last limitation of claim 15 of the '196 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: Looking only at the limitation of a processor that executes instructions; is that correct?
BY MR. HENRY:
Q Yeah. The last limitation of claim 15 is the one we're discussing.
A Right. Right. Right. So let me take a quick look here.
So -- let's see here. So I gave an answer previously, regarding available software and hardware systems that could be configured to accomplish very similar tasks earlier in my deposition here. And so I would just restate those things.
Q In your view, those would be able to accomplish or perform the functions recited in claim 15 of the '196 Patent as well?
A Yes.
MR. ELLIOTT: Objection to form.

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THE WITNESS: Sorry -- right, yes.
BY MR. HENRY:
Q Can you think of a computing device that would perform the functions of the last limitation of claim 15 of the '196 Patent but not be a processor as recited in this claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: No, I can't think of something that wouldn't be a processor necessarily.
BY MR. HENRY:
Q Let's look at claim 19 of the '196 Patent.
A Yes.
Q Okay. You offer an opinion about this claim as well in your declaration, right?
A Let me confirm that.
Yes.
Q Is it fair to say that in your view, before 2014, a person of skill in the art would have known how to implement a system or method performing the functions recited in claim 19 by resorting to known audio DSP structures within the art and common industry programming techniques or software libraries for audio processing?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.

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BY MR. HENRY:
Q What audio DSP structures within the art and software libraries were available before 2015 that a person of skill could have used to perform the functions recited in claim 19 of the '196 Patent?
A What comes to mind immediately are programs that perform something called auralization, which is the simulation of room acoustic cues. And those room acoustic cues are based on basically spatializing audio reflections. And so an example, I believe, was CATT-Acoustic, C-a-t-t, Acoustic had those capabilities.
Q Does any other example come to mind?
A That's the first one that comes to mind. But I think there were other examples as well.
Q Can you identify any others today?
A I believe that some of the examples I gave you earlier, such as Slab or maybe even the Convolvotron. I'm not sure in later implementations as 3D audio, you know, was maturing, these capabilities became featured more and more.
Q You address auralization in your 1994 textbook, right?
A I did, yes.
Q And I said 1994 because you said that earlier, but I have a version of your textbook with a copyright

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date of 2000. Was it a republication?
A Yes. After the original publisher gave up the copyright, I decided to republish it as a NASA Technical Memorandum, give away the text. It's more or less the same. I think I corrected a few typos, and a lot of the pictures and things like that came out much worse. So... I recommend the book. Go to the book. It's -- I think you could still get a copy for a dollar on Amazon. And then I think you can get one for $100 too.
Q All right. I'll buy the former.
A Yes, you should.
Q Dr. Begault, was that -- was your textbook publicly available before 2014?
A Yes.
Q Okay. All right. Let's...
A Technically speaking, it wasn't a textbook. It was a reference book, because a textbook, I expect to have exercises or be designed around a curriculum. So just for that little academic clarification.
Q I'm happy to call it a reference book. Your reference book was publicly available before 2014?
A Yes, it was.
THE STENOGRAPHIC REPORTER: Counsel, if this is a good breaking point, can we take a ten-minute break?
MR. HENRY: Happy to go off the record. That's fine.

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THE VIDEOGRAPHER: The time is 2:57. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 1510. We are back on the record.
THE WITNESS: Test, 2, 3, can you hear me?
BY MR. HENRY:
Q Oh, sorry, test, 2, 3. I didn't know what you said. Yes, I can hear you.
A Oh, sorry.
Q All right. We're going to circulate another document now. It's going to be Exhibit 5. The file name of Begault Exhibit 5, the file name for this one is _US9674628.
(Whereupon Deposition Exhibit 5 was marked for identification.)
BY MR. HENRY:
Q Dr. Begault, let me know when you have it open and available to you.
THE TECHNICIAN: Should be in the chat right now.
THE WITNESS: I have the document open. I assume I can close the other document?
BY MR. HENRY:
Q You can leave them all open. In case we go back, it's just quicker. I don't have a preference, though,

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but...
A Okay. All right. I am on Exhibit 5.
Q And what do you recognize Exhibit 5 to be?
A United States Patent 9,674,628 B1.
Q Do you know which claims of the '628 Patent are asserted in this case?
A I don't know exactly which claims are asserted, no.
Q Let's look at claim 9, the '628 Patent, please. Let me know when you're there.
A Okay. Almost. All right. I am at claim 9.
Q And this is a claim that you offered an opinion on in your May 3rd, 2023, declaration, right?
A Yes.
Q Now, let's look at the first limitation after the preamble, do you see the limitation that begins, Processing during the telephone call?
A I see it.
Q Now, that's one of the processor terms that you address in your declaration, right?
A That is true.
Q Okay. Now, look at claim 16 as well, from the '628 Patent.
A I'm sorry. Claim what?
Q 16.

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It starts at the bottom of column 45 --
A Oh, I see it, a nontransitory. Yes, I see it now.
Q And do you see the second limitation of that claim, Similarly cites processing during the telephone call, and then it continues?
A Yes.
Q That's another processor term that you addressed in your declaration, right?
A That is true, yes.
Q Okay. Now, do I understand correctly from your declaration that in your view, before 2014, persons of skill in the art would have known how to implement systems performing the functions recited in the limitations of claim 9 and claim 16 that we just reviewed because a person of skill would have been able to resort to known audio DSP audio structures within the art and common industry programming techniques or software libraries for audio processing?
MR. ELLIOTT: Objection to form.
THE WITNESS: I believe you have essentially paraphrased my declaration.
BY MR. HENRY:
Q Do you believe that persons of skill in the art would have known how to implement a system performing the

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functions recited in the limitations of claim 9 and 16 of the '628 Patent before 2014 based on known audio DSP structures within the art and common industry programming techniques and software libraries?

MR. ELLIOTT: Objection to form.

THE WITNESS: I believe that they would, particularly with the limitations that we're discussing that begin with the word processing.

BY MR. HENRY:

Q What software libraries or audio DSP structures were available before 2014 to allow persons of skill in the art to implement systems that were able to perform those functions?

MR. ELLIOTT: Objection to form.

THE WITNESS: I would give you the same answer I gave you regarding the other processor terms that we discussed with relationship to the two other patents we discussed earlier. Which I do not have the numbers handy. I think it was '090, and I don't remember the other one.

BY MR. HENRY:

Q '196, right?

A Yes, that's right.

Q Okay. Looking at claim 9, in the first limitation again.

A Yes.

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Q Can you think of a computing device that would perform the function of processing a voice of a calling party with HRTFs so the voice of the calling party localizes to the called party as binaural sound and SLP that is 1 meter to 2 meters away from the called party and yet still not be a processor as recited by claim 9?

MR. ELLIOTT: Objection to form.

THE WITNESS: I'm sorry. I think that a processor would be involved to cause this effect that's called out here in this to occur. And I can't think of a -- well, wait. What was your question? Sorry.

BY MR. HENRY:

Q Can you think of a computing device that would perform the recited function but not be a processor as claim 9 recites?

MR. ELLIOTT: Objection to form.

THE WITNESS: I can't think of one off the top of my head, no.

BY MR. HENRY:

Q Looking at the second limitation of claim 16, my question is similar. With respect to that limitation, can you think of a computing device that would perform the function recited in that limitation but not be a processor?

MR. ELLIOTT: Objection to form.

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THE WITNESS: No. I would state that computing devices are processors or could be implemented as processors.

BY MR. HENRY:

Q All right. We're going to circulate another document, Dr. Begault. This one's going to be Begault Exhibit 6.

(Whereupon Deposition Exhibit 6 was marked for identification.)

BY MR. HENRY:

Q And it is _US10917737.

THE TECHNICIAN: Stand by, please. (Indicating.) Uploading now.

THE WITNESS: Okay. Okay. I have it.

BY MR. HENRY:

Q Dr. Begault, what do you recognize Begault Exhibit 6 to be?

A United States Patent 10,917,737 B2.

Q Do you know which claims of the '737 Patent are asserted in this case?

A I don't know exactly.

Q Let's look at claim 1, please. Let me know when you're there.

A I will do that. I am at claim 1.

Q Great. Do you see the first limitation recites,

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Tracking with a wearable electronic device, WED, worn on a head of a user, movement of a handheld portable electronic device, HPED, held in the hand of the user, and continues from there?

A I see that.

Q What's your understanding of what a wearable electronic device, WED, is?

MR. ELLIOTT: Objection to form. Beyond the scope.

THE WITNESS: Well, I suppose I would give you the obvious statement here, it's a device worn on the head of a user. That's my understanding. I just -- I would have to paraphrase that. I wouldn't know.

BY MR. HENRY:

Q Totally fine.

What's the -- would a head-mounted display be a wearable electronic device worn on the head of a user in your view?

A Yes, it's an example of one.

Q Would handheld controllers be an example of handheld portable electronic devices?

A Yes.

Q Before 2014, were people using head-mounted displays to track handheld controllers?

MR. ELLIOTT: Objection to form.

THE WITNESS: Restate your question?

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BY MR. HENRY:
Q Sure.
Before 2014, were people using head-mounted displays to track handheld controllers?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't believe people use head-mounted displays to track the handheld controller. That's the first time I've heard of that.
BY MR. HENRY:
Q What did they use?
A For what?
Q Tracking handheld controllers.
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, it would be some sort of device with a transmitter and a receiver. Could have been optical. Could have been magnetic. Something to track the hand. And it probably would be interfaced to some sort of processor or computer.
BY MR. HENRY:
Q And were those types of units used in conjunction with and on head-mounted displays before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would agree with in conjunction with. I wouldn't agree with the other part of your phrase, on, I think was the word.

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BY MR. HENRY:
Q You're not aware of any head-mounted display for virtual reality, for example, that could track with its components handheld controllers before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm not aware of the head track -- or sorry, the head-mounted display itself tracking the hand controller.
BY MR. HENRY:
Q What component of a virtual reality apparatus that a human can wear on their head do you believe is a head-mounted display?
MR. ELLIOTT: Objection to form.
THE WITNESS: A stereo visual display.
BY MR. HENRY:
Q Are you talking about just the lenses of an HMD or more than that?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's an example.
BY MR. HENRY:
Q You know that there were head-worn virtual reality devices that were capable of tracking handheld controllers before 2014, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: No, I disagreed with that. I wasn't

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ever aware of the head tracking device -- I'm sorry, the head-mounted device tracking the hand.
THE STENOGRAPHIC REPORTER: Doctor, I do have a question. A couple answers ago, did you say I would or I wouldn't agree with in conjunction with? I wouldn't or would agree with the other part of your phrase, on, I think is the word? It's a bit hard to hear and distinguish if you're saying would or wouldn't. So I just wanted to clarify that.
THE WITNESS: Well, let me give you what I think it was. I think it was would not, but then could you read back the paragraph before that for me, and then we could hear it in context.
THE STENOGRAPHIC REPORTER: Yes.
(Record read.)
THE WITNESS: Oh, no, what I said was I would agree with the term in conjunction with. I would not agree with the word on.
THE STENOGRAPHIC REPORTER: Perfect, thank you so much.
BY MR. HENRY:
Q Dr. Begault, you talked about the Polhemus device on the Convolvotron being on the headband of that device, right?
A That's correct.

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Q And that, headband presumably, would be worn on a user's head, right?
A Yes. Connected to the headphone strap.
Q And that device was used for tracking gestures of a data glove, right?
A No. The Polhemus transmitter on the head was used to track the position of the head. A separate Polhemus transmitter is used on the glove.
Q So --
A So the head tracker -- the head tracking -- I'm sorry. The head-mounted device is independent as a unit from the data glove in that system.
Q Are you aware that there were handheld controllers that could communicate via infrared or trackers in head-worn virtual reality apparatuses before 2014?
A I was aware of optical tracking systems in general.
Q And were you aware that optical tracking systems were used in virtual reality apparatuses to track handheld controllers before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q And were you aware that that tracking was

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facilitated by a head-worn virtual reality apparatus?
MR. ELLIOTT: Objection to form.
THE WITNESS: My understanding is that the optical systems for handheld controllers are separate streams of information from the tracking of the head. So there might be a central processing unit that takes in the information from the two devices, but where I'm having difficulty is that the head-mounted display is not in itself communicating with the hand or vice versa.
They're communicating with the computer.
BY MR. HENRY:
Q Fair. But you're aware of head-worn virtual reality apparatuses that had, for example, a camera on them to sense handheld controller movement before 2014, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'm not aware specifically of where the cameras were in optical systems to track hand position. My impression was that they were located -- what was the name of that system? I can't remember the name of the system that I'm thinking about. But typically the handheld controller was sensed at a distance from the person, not from their head, is my understanding.
BY MR. HENRY:
Q What do you mean by that, the sensor for the

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handheld controllers was positioned elsewhere or the sensor was positioned on the head? I'm not sure what you mean.
MR. ELLIOTT: Objection to form.
THE WITNESS: If we are understanding each other, which I'm not sure we are, my impression of the way that the optical controllers worked was that there is a central receiving point that would be receiving information from some sort of transmission or light or magnetic field from the head, that would be independent from the transmission from a handheld device, and that those would be assimilated at a central location away from a user, as opposed to on their head.
BY MR. HENRY:
Q You're not aware of any systems existing before 2014 that would assimilate that information in the head-mounted display?
MR. ELLIOTT: Objection to form.
THE WITNESS: Not in the head-mounted display itself. I would think of it being assimilated in an external processor.
BY MR. HENRY:
Q Are you aware of any head-mounted displays that had internal processors for that assimilation before 2014?
MR. ELLIOTT: Objection to form.

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THE WITNESS: I think that's the same question, and I will give you the same answer.
BY MR. HENRY:
Q Which is?
A No.
Q Look at... actually, what methods of tracking handheld controllers were known to people in the industry before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: I can think of optical and magnetic.
BY MR. HENRY:
Q What actions could people perform with handheld controllers in virtual reality environments before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: I believe that one could perform pointing, gestures, maybe gaming.
BY MR. HENRY:
Q Before 2014, was it known that people in virtual reality environments could point their handheld controllers at virtual objects to select them?
MR. ELLIOTT: Objection to form, speculation.
THE WITNESS: Yes.
BY MR. HENRY:
Q Before 2014, was it known that people in virtual reality environments could point their controllers at

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virtual objects to select them and move them?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Before 2014, was it known that people in virtual reality environments could point their controllers at virtual objects to select them to move them, and then a virtual object's sound would move with it?
MR. ELLIOTT: Objection to form.
THE WITNESS: I believe so, yes.
BY MR. HENRY:
Q Let's look at the fourth limitation of claim 1 of the '737 Patent, please. Which begins, Processing by a processor.
A So this is claim 1, and we are looking at the fourth limitation; is that correct?
Q That's right.
A 1, 2, 3, 4, yes. Okay.
Q Okay. This is one of the processor terms that you addressed in your declaration, right?
A That's correct.
Q Do you believe that before 2014 persons of skill in the art would have known how to implement a system performing the function recited in that limitation of claim 1 by resorting to known audio DSP structures within

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the art and common industry programming techniques or software libraries?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes. Oh, yes.
BY MR. HENRY:
Q And what software libraries or audio DSP structures were available before 2014 that a person of skill could have used to perform the function recited in the fourth limitation of claim 1 of the '737 Patent?
A It would be my same answers as I gave you for the prior patents that we've been discussing.
Q Looking at that fourth limitation of claim 1 of the '737 Patent, can you think of a computing device that would perform the function recited in that limitation and yet not be a processor as recited in claim 1?
MR. ELLIOTT: Objection to form.
THE WITNESS: No. I really can't, given my understanding of what the processor is doing.
BY MR. HENRY:
Q Can you look at claim 14, please, of the '737 Patent?
A Yes.
Q Okay. And the second limitation of claim 14 is a lengthy one. But I want to invite your attention to the clause that begins, Includes a processor that processes.

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Do you see that?
A I do.
Q And that is the beginning of another term that you addressed in your declaration as one of the processor terms, right?
A Yes. That's true.
Q Now, did you believe that before 2014, persons of skill in the art would have known how to implement the system performing that function by resorting to known audio DSP structures within the art and common industry programming techniques at software libraries?
A Yes, I do.
Q Now, what audio DSP structures and software libraries were available before 2014 that a person of skill could have relied on to perform the function recited in claim 14 of the '737 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, you were focusing on the part of the clause that begins, Process of sound with head-related transfer functions, which is what I addressed in my claim terms. And so with that proviso, it would be the same answer as I provided earlier.
BY MR. HENRY:
Q As you provided when I asked you that question for the other patents?

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A With similar wording, yes.
Q Can you think of a computing device that would perform the following function recited in the language, Includes a processor that processes sound with head-related transfer functions, HRTFs, so sound externally localizes as binaural sound that would do that but not qualify as a processor as recited in claim 14 of the '737 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: No, I can't think of anything.
BY MR. HENRY:
Q We're going to circulate another exhibit now, which will be Exhibit 7. And this one is going to be _ -- the file name for this is _US11290836.
(Whereupon Deposition Exhibit 7 was marked for identification.)
THE TECHNICIAN: Stand by, Counsel. (Indicating.) Should be in the chat now.
THE WITNESS: Okay. All right. I am open to the document, Exhibit 7.
BY MR. HENRY:
Q Dr. Begault, what do you recognize the document that's been marked Begault Exhibit 7 to be?
A Patent -- United States Patent 11,290,836 B2.
Q Dr. Begault, do you know which claims of the '836

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Patent are asserted in this case?
A I do not know off the top of my head.
Q Let's look at claim 8 of the '836 Patent, please, Dr. Begault. Let me know when you're there.
A I am there.
Q Okay. I'd like you to read the second limitation of claim 8. It's a relatively lengthy one. And then my question for you, which I'll give you now so you know, is does that limitation recite two of the processor terms that you addressed in your declaration?
A Okay. Stand by.
Yes.
Q The first is the term that begins, One or more processors that process sound for the image to generate binaural sound that has a sound localization point, SLP, with a coordinate location that occurs at a far field distance located behind the image and along a line of sight from the user, right?
A I see that.
Q Okay. And the second processor term in the second limitation of claim 8 that you addressed is wherein the one or more processors include a digital signal processor, DSP, that processes the sound for the image with far-field head-related transfer functions, HRTFs, right?

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A Yes, I see that.
Q Do you believe that before 2014, persons of skill in the art would have known how to implement systems performing the functions recited in those terms by resorting to known audio DSP structures within the art and common industry programming techniques and software libraries?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q And what known audio DSP structures and software libraries were available to persons of skill before 2014 that, in your view, could have been used to perform the functions recited in the claim terms in the second limitation of claim 8 that you called the processor terms of that claim?
MR. ELLIOTT: Objection to form.
THE WITNESS: I would state the same answer as I have for the prior patents.
BY MR. HENRY:
Q Can you think of any computing devices that would perform the functions recited in the processor terms in the second limitation of claim 8 of the '836 Patent but not be the processor or the digital signal processor recited in that limitation?

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MR. ELLIOTT: Objection to form.
THE WITNESS: I want to make sure I understand. So this refers to the use of a digital signal processor that -- and it also refers to one or more processors. And your question is, can I think of anything other than a digital signal processor and other processors that would accomplish these functions?
BY MR. HENRY:
Q No, my question for you is, can you think of any computing device that would accomplish those functions that would not constitute a digital signal processor as recited in claim 8?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't believe I can.
BY MR. HENRY:
Q We're going to put another exhibit in the chat now, Dr. Begault. It's going to be Exhibit 8. And this one is going to have the PDF file name _10368179.
(Whereupon Deposition Exhibit 8 was marked for identification.)
THE TECHNICIAN: Stand by, please. (Indicating.)
THE WITNESS: Okay. I have it.
BY MR. HENRY:
Q Dr. Begault, what do you recognize the document that's been marked Begault Exhibit 8 to be?

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A United States Patent 10,368,179 B1.
Q Dr. Begault, do you know what claims have been asserted from the '179 Patent in this case?
A No, I don't know off the top of my head.
Q Let's look at claim 14, please, of the '179 Patent.
A I am at claim 14.
Q Now, I'd like to look at the third limitation that begins with the word processing. Are you there?
A Yes.
Q Okay. And the third limitation of claim 14 reads, Processing by a digital signal processor, DSP, sound with the HRTFs to generate binaural sound that externally localizes in empty space in the virtual image in the environment. Do you see that?
A I do.
Q Do you believe that before 2014, persons of skill would have known how to implement systems performing the function recited in that limitation by resorting to known audio DSP structures within the art and common industry programming techniques and software libraries?
A I do.
Q What known audio DSP structures and software libraries could a person of skill have resorted to before 2014 to use to perform the function recited in the third

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limitation of claim 14 of the '179 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: Same answer as given for the other patents for similar material.
BY MR. HENRY:
Q Can you think of any computing device that would perform the function of processing sound with HRTFs to generate binaural sound that externally localizes an empty space from a virtual image in an environment that, in your opinion, would not be a digital signal processor, DSP, as recited by claim 14 of the '179 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: I believe your question was about a computing device. Did I hear that correctly? So I could think of how this might be implemented not with a physical digital signal processor but by a CPU or an ASIC or some other hardware solution.
BY MR. HENRY:
Q And would you consider a CPU or an ASIC implementing the function recited in the third limitation of claim 14 of the '179 Patent to not be a digital signal processor as recited in claim 14?
A It would depend if we're talking about a physical object or a software implementation. I mean, if we can -- sometimes digital signal processor, or DSP, can refer to

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software algorithm or a software process. And sometimes it can refer to a specific chip.

So that clarification applies to all of the patents that we've discussed so far.

Q Can you think of any computing device -- strike that.

Under what circumstances would a CPU or ASIC that performs the recited function of claim 14 of the '179 Patent not be a digital signal processor in your view?

MR. ELLIOTT: Objection to form.

THE WITNESS: I can't think of one off the top of my head if I understand your question correctly.

BY MR. HENRY:

Q Can you think of any circumstances under which any other computing device that performs the function recited in that third limitation of claim 14 of the '179 Patent would not be a digital signal processor as recited in claim 14?

MR. ELLIOTT: Objection to form.

THE WITNESS: So let me paraphrase. Is your question, can I think of a computing device that could not accomplish digital signal processing?

BY MR. HENRY:

Q No, that's not my question.

We talked about CPUs and ASICs already. Now

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putting those aside, my question is can you think of any other computing device that would perform the function of the third limitation of claim 14 of the '179 Patent, but that in your view, would not constitute a digital signal processor as recited in claim 14?

A No, I can't think of one.

Q Do you see in -- still in claim 14, but the first limitation after the preamble recites, Storing head-related transfer functions, HRTFs, in memory?

A I see that.

Q Before 2014, were people of skill in the art storing HRTFs in memory?

A Yes, they were.

Q Before 2014, were people of skill in the art storing HRTFs in cache memory?

A I believe so.

Q Do you know if before 2014, head-mounted displays had memory in them?

A I don't know.

Q I'd like to look at the last limitation of claim 14 now that begins with, Alerting. Are you there?

A I see it.

Q Okay. Your work in the industry before 2014, involved work on alerts, in some circumstances, right?

MR. ELLIOTT: Objection to form.

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THE WITNESS: I -- I've worked in, not properly in industry, but worked for government in the area of alerts.

BY MR. HENRY:

Q And you've published papers on using spatialized 3D audio as alerts, right?

A This is correct.

Q Before 2014, right?

MR. ELLIOTT: Objection to form.

THE WITNESS: Yes.

BY MR. HENRY:

Q What types of alerts were known to people in the industry that were spatialized audio alerts before 2014?

MR. ELLIOTT: Objection to form.

THE WITNESS: What type of alerts? I think it was fairly wide variety of different alerts. There were auditory icons that were symbolic sounds that were sometimes used. Plane tones. I experimented with caution and warning alerts on aircraft.

BY MR. HENRY:

Q Were verbal instructions used as alerts before 2014?

A Yes.

Q Now, what about -- what about a situation where you're walking into a virtual wall, were crashing sounds used in that situation as a type of alert?

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MR. ELLIOTT: Objection to form.

THE WITNESS: I don't know if it would be technically an alert. Maybe it was an alert. Maybe it could be some sort of environment simulation not intended to alert. When you say alert, I'm thinking specifically of alarms or things meant to improve one's interaction with a computing device.

BY MR. HENRY:

Q Fair enough.

But the crashing sound when people walked into virtual walls as a form of feedback was known before 2014, right?

MR. ELLIOTT: Objection to form.

THE WITNESS: That sounds very familiar.

BY MR. HENRY:

Q You actually discuss that in your reference book, right?

A I don't recall that example, but I'm sure I did. Because I recall the example.

Q Was it known before 2014, that you could switch the nature of sound being heard by a user as a form of alert, for example, switching from monaural sound to binaural sound or stereo sound?

MR. ELLIOTT: Objection to form, irrelevant.

THE WITNESS: There are systems prior to 2014, that

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could switch sounds from -- well, using different types of spatial display, yes.
BY MR. HENRY:
Q And could those systems switch sounds from binaural audio to stereo audio or monaural audio as a form of alert?
MR. ELLIOTT: Objection to form.
THE WITNESS: Yes.
BY MR. HENRY:
Q Are you familiar with chaperon systems or redirected walking?
A No, not specifically.
Q Do you have any sense of what I mean when I ask about chaperon systems?
MR. ELLIOTT: Objection to form.
THE WITNESS: I could speculate.
BY MR. HENRY:
Q I mean systems that helped users stay within a certain area in a virtual environment. Does that help?
A I was thinking about guidance systems for the blind. There have been virtual audio systems used to help blind folks or visually challenged folks navigate through cityscapes for instance.
Q Interesting.
In general environments?

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MR. ELLIOTT: Objection to form.
THE WITNESS: If the person was completely unsighted, then it would just be audio.
BY MR. HENRY:
Q All right. I didn't understand what you meant by helping people navigate through a cityscape.
Was it actually an audio system to help you walk through a city?
A Yes. There would be beacons.
Q In a real city, not in a virtual setting. Is that what you're referring to?
MR. ELLIOTT: Objection to form, irrelevant.
THE WITNESS: Yeah, there have been systems like that that have been tested.
BY MR. HENRY:
Q Have there been system that in which spatial audio was used as a navigation aid in a virtual environment before 2014?
A I'm pretty sure there was.
Q Even though your focus wasn't on digital elements of virtual environments, were you familiar with any systems that existed before 2014 where virtual boundaries, images were presented to people to keep them within a set virtual environment space?
MR. ELLIOTT: Objection to form. Calling for further

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speculation.
THE WITNESS: I'm sorry. What were these boundaries? How were they --
BY MR. HENRY:
Q The image of a fence, for example --
A Oh, yes, I've heard of that.
Q And you heard of that before 2014?
A Yes. Yes. I've also heard about beacon systems in virtual reality.
Q Those were known to you and others before 2014?
MR. ELLIOTT: Objection to form.
THE WITNESS: That's correct.
BY MR. HENRY:
Q Do you know what -- have you heard about -- have you heard the term redirected walking before I asked you that question?
A No.
Q We are going to put in the chat now, Begault Exhibit 9, which is going to be _US 10448184 for the PDF file name.
(Whereupon Deposition Exhibit 9 was marked for identification.)
THE TECHNICIAN: Stand by. (Indicating.)
THE WITNESS: Okay. It arrived. Give me a moment to open it.

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BY MR. HENRY:
Q Of course.
A Okay. It is open, Begault Exhibit 9.
Q And, Dr. Begault, what do you recognize Begault Exhibit 9 to be?
A United States Patent 10,448,184 B1.
Q Dr. Begault, do you know which claims of the '184 Patent are asserted in this case?
A Not off the top of my head.
Q Let's look at claim 14, please, Dr. Begault.
A Okay.
Okay. I am there.
Q And I'd like to look at the third limitation of that claim, which reads, Processing by a digital signal processor, DSP, sound with the HRTFs to generate binaural sound that externally localizes to the user at the virtual image in the environment. Do you see that?
A I do.
MR. ELLIOTT: Pardon me, claim 7?
MR. HENRY: No. Claim 14.
MR. ELLIOTT: 14, thank you.
MR. HENRY: Sure.
BY MR. HENRY:
Q Dr. Begault, this third limitation of claim 14 of the '184 Patent is one that you addressed in your

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declaration, right?
A That is correct.
Q It's one of the processor terms that you addressed?
A It is.
Q And do you believe that before 2014, persons of skill in the industry would have known how to implement a system performing the function recited in the third limitation of claim 14 of the '184 Patent by resorting to known audio DSP structures and common industry programming techniques and software libraries?
MR. ELLIOTT: Objection to form.
THE WITNESS: I -- I do.
BY MR. HENRY:
Q What known audio DSP structures and software libraries were available before 2014, that a person of skill could use to perform the function recited in claim 14 of the '184 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'll refer to my same answer that I gave for similar phrasing of these processor terms, with relationship to the other patents that we discussed earlier.
BY MR. HENRY:
Q Can you think of a computing device that would

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perform the function recited in the third limitation of claim 14, but that in your opinion, would not be a digital signal processor as recited in claim 14?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, the limitation says processing by a digital signal processor. So by definition, this is processing by a DSP.
BY MR. HENRY:
Q And can you think of any computing device, be it CPU, ASIC or any other computing device, that would perform the function recited in the third limitation of claim 14 of the '184 Patent, but that in your view, would not constitute a digital signal processor as recited by that claim?
A No. That seems contradictory. I can't think of something that isn't a digital signal processor that functions as a digital signal processor.
Q So you can't identify for me any -- sitting here today, any computing device that in your view, could process sound with HRTFs to generate binaural sound that externally localizes to a user at a virtual image in an environment that, in your opinion, would not be a digital signal processor?
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, if digital signal processing is

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involved, then per this limitation, the processing has to involve digital signal processing.
BY MR. HENRY:
Q So if you are able, identify for me any computing device that could perform the recited function in the third limitation of claim 14 of the '184 Patent, but that in your view, is not a digital signal processor.
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, it depends on our definition of digital signal processor, if we want to talk about a CPU doing an implementation of digital signal processing as distinct from a digital signal processor, then there's an example. But otherwise, if we're talking generically about the idea of digital signal processing being done by an ASIC, being done by software, being done by a specialized chip, et cetera, et cetera, et cetera, these different ways of accomplishing the processing could all be used to accomplish the limitation as stated.
BY MR. HENRY:
Q Is there a way that a CPU can do an implementation of digital signal processing that is distinct from a digital signal processor in your view?
A They would be distinct in the way that they would handle memory and probably in other ways too, maybe the way that things are addressed as well.

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Q CPUs are different than digital signal processors in your view?
A Well, they can perform exactly the same function.
Q Are CPUs digital signal processors?
A The CPU can mimic a digital signal processor's function.
Q Is a CPU a digital signal processor?
A That depends if you define a digital signal processor as an external chip or if you consider a digital signal processor an algorithm that sits in the CPU.
Q Well, I'm asking you, Dr. Begault, because you remember, you opined on what a digital signal processor is in this case, right?
A At what point?
Q In your declaration.
A Would you like to point me to what you're referring to?
Q Sure.
You have a section on digital signal processor in paragraph 14 of your declaration.
A Okay. Yes, I see it.
Q So we can agree that you've offered opinions on what the term digital signal processor means in this case, right?
A Yes. And paralleling what I gave you as an

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answer a couple minutes ago.
Q Okay. So based on -- applying your understanding of what a digital signal processor is, do you draw any distinction between CPUs and digital signal processors?
MR. ELLIOTT: Objection to form.
THE WITNESS: I draw distinction in the means of -- or the way that the processing might be implemented, a POSITA -- I'm sorry, a person of skill in the art would know that different approach might be required to program a digital signal processor that was a dedicated digital signal processor as an external chip, for instance, than they would to program a convolution process, let's say, on a CPU.
There might be different approaches with the same end result.
BY MR. HENRY:
Q Can we agree that CPUs are different than digital signal processors?
A Well, not necessarily, because again, CPUs, central processing unit, can have several threads designed in the way that the architecture is designed, and various threads can be assigned to work specifically to mimic what a hardware DSP chip would do.
Q If we're looking at the third limitation of claim 14, Dr. Begault, are you with me?

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A I'm with you.
Q Okay. Claim 14 of the '184 Patent, just to be clear. Right?
A I'm looking at it at the top of column 48, yes.
Q If you had a CPU that processed sound with HRTFs to generate binaural sound that externally localizes to the user at the virtual image in the environment, in your opinion, would that CPU be a digital signal processor, DSP, as required by claim 14 of the '184 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: It could be. It's possible to mimic within a CPU the function of a hardware DSP.
BY MR. HENRY:
Q Well, I'm asking you if you had a CPU there that performed that function in claim 14 of the '184 Patent specifically, would you consider that to be a digital signal processor, DSP?
MR. ELLIOTT: Objection to form, asked and answered, argumentative, badgering the witness.
THE WITNESS: The CPU would have, as part of its structure or the way that the CPU is comprised with its various threads, a portion of it that would be a digital signal processor.
BY MR. HENRY:
Q Can you identify any computing device that would

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perform the recited function of claim 14 of the '184 Patent, but that you would consider to not need a digital signal processor?
MR. ELLIOTT: Objection to form.
THE WITNESS: All I can imagine is a computing device that lack -- if I'm understanding your question correctly, I could imagine hypothetically a computing device that lacked the computational power to execute the signal processing required by the limitation.
BY MR. HENRY:
Q But that device then would not be able to perform that function, right?
MR. ELLIOTT: Objection to form.
THE WITNESS: I gave you an answer there that I could imagine hypothetically, a computing device that would be incapable of performing the digital signal processing due to, I suppose memory limitations or speed limitations of that CPU, like an older -- very old computer.
BY MR. HENRY:
Q So can you identify for me any computing device that is capable of performing the recited function in claim 14 of the '184 Patent that you would believe is not a digital signal processor as claim 14 recites?
MR. ELLIOTT: Objection to form.
THE WITNESS: Well, I answered you earlier. I can

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imagine a computing device that does not have the capability to implement digital signal processing due to lack of memory or speed.
BY MR. HENRY:
Q And I just asked you if there's any computing device that has the capacity of performing this recited function that you --
A Oh, that was your -- oh, sorry.
Q Yeah, that was my question.
-- that you would consider to not be a digital signal processor.
MR. ELLIOTT: Objection to form.
THE WITNESS: So read that question again?
BY MR. HENRY:
Q Sure.
Can you identify for me any computing device that has the capacity to perform the recited function in claim 14 of the '184 Patent that you would consider to not be a digital signal processor?
MR. ELLIOTT: Objection to form.
THE WITNESS: If it -- if there was a computing device that had the capability but did not have the digital signal processing implemented in it, that would be an example.

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BY MR. HENRY:
Q Can you give me any other example of a computing device that you believe wouldn't qualify as a digital signal processor as recited in claim 14 of the '184 Patent?
MR. ELLIOTT: Objection to form.
THE WITNESS: No. I've given you some examples.
MR. HENRY: Let's take a break. Let's go off the record.
MR. ELLIOTT: That's fine.
THE WITNESS: How long?
THE VIDEOGRAPHER: The time is 1614. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 1621. We are back on the record.
BY MR. HENRY:
Q All right. Dr. Begault, we are going to circulate another exhibit now. It will be Begault Exhibit 10.
(Whereupon Deposition Exhibit 10 was marked for identification.)
BY MR. HENRY:
Q And the file name for this one is 2023 04 12, parentheses, 83-14 Exhibit 3.

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THE TECHNICIAN: Stand by, Counsel. (Indicating.) It's uploading right now.
MR. HENRY: Thank you.
THE TECHNICIAN: And it should be ready now.
THE WITNESS: Okay. I have it. Give me a moment to open it.
MR. ELLIOTT: It's not wanting to open for me. There we go.
THE WITNESS: It's rather large. All right. Exhibit 3, 243 pages. And this appears to be Exhibit 10 and a copy of my reference book in the NASA version from April 2000.
BY MR. HENRY:
Q Now, so just for, because there's that -- there's a cover page that says Exhibit 3 on this, right, which is what you were referring to, Dr. Begault.
A Yes. It says Exhibit -- I'm sorry.
Q That's fine.
A It says Exhibit 3 on page 1. But on the bottom right-hand corner, it says, Exhibit Begault-10.
Q That's right. This is Begault Exhibit 10.
And you see that this is a copy of your reference book that we discussed earlier, right?
A That's correct.
Q Okay. And the title of that book is, 3-D sound

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for Virtual Reality and Multimedia, right?
A That's correct.
Q And this version of your book is dated April 2000. Do you see that?
A Yes.
Q Okay.
A Where do you see April? Oh, down there at the bottom. Yes, I see it. Yes.
Q And this was -- this book was publicly available before 2014?
A It was available in 1994.
Q Well, not this 2000 version, right, but this version was available before 2014, right?
A Oh, yes. The year 2000 was before the year 2014.
Q And your reference book was publicly available in 2000?
A And also available in 1994.
Q Thank you.
I'd like to scroll down to page 4, but it's PDF 17, if you want to navigate that way.
A Okay. Page -- with the subtitle, Source-medium-receiver Model.
Q That's right. We're on the same page.
Now, Dr. Begault, in that section, do you see the third sentence that reads, Note that spatial auditory

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images are not confined to two-ear or binaural hearing. One-ear hearing can provide spatial cues as proven by experience with telephone conversations?
A I do.
Q Is it possible for a person using a telephone to perceive sound as though it originates from a location external to the person on the phone?
MR. ELLIOTT: Objection to form.
THE WITNESS: Restate your question, please, so I can answer it accurately.
BY MR. HENRY:
Q Sure.
Is it possible for a person using a telephone to perceive sound as though it originates from a location external to a person on the phone?
MR. ELLIOTT: Objection to form.
THE WITNESS: So when you say a person on the phone, you mean, as an example, I'm holding up a Western Electric telephone handset to my ear, and I'm listening to somebody talk to me. Okay. And then your question is, is it possible to hear that person spatially that's communicating to me over that phone handset?
BY MR. HENRY:
Q Sure. We can start there.
Is it possible?

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A Yeah.
Q Okay.
A The example I was thinking about here -- I'm sorry. I'll just give you an example here. When I wrote this, I was thinking about, for instance, you could hear somebody in the background on a single-ear telephone, old-fashioned telephone, and you could hear somebody talking close to you. And so you would have a distance cue that you could hear with one ear.
Q Got it. Thank you for that explanation.
Okay. You see in the same page on the last paragraph, the paragraph that begins, While the source, are you there?
A Yes.
Q Okay. And do you see the sentence that reads, Natural spatial hearing seldom involves the single source, whereas virtual spatial hearing with a 3-D sound system involves the positioning of each of a number of sources individually?
A Yes, I see that sentence.
Q What does it mean -- what did you mean when you wrote, Virtual spatial hearing with a 3-D sound system involves the positioning of each of a number of sources individually?
A Well, I'll try to paraphrase that for you.

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That -- are you concerned with the second part of the sentence, or how does it differ from the first part of the sentence.
Q You can tell me what you meant by the sentence. That's fine. I just want to know what you meant by that sentence.
A Oh, well, I meant that if you use a 3-D sound system, oftentimes a number of sound sources are positioned to different locations. They don't have to be, but virtual spatial hearing with a 3-D sound system typically did involve or does involve in positioning a number of sources. We might even just position a single source, actually.
Q And whether you're positioning one source or positioning multiple sources, who does that positioning?
A Well, that could be an algorithm. That could be a person interacting with an algorithm.
Q Oh, I meant if this is -- maybe I was misunderstanding, but this is sort of in virtual reality, right?
A Well, I was speaking here about virtual spatial hearing with a 3-D sound system.
Q Oh, so virtual environment. All right. So if you're in a virtual environment and you're positioning sound sources at one or more locations, is it the listener

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who's doing that, the designer of the environment? Who's doing the positioning?
A Well --
MR. ELLIOTT: Objection.
THE WITNESS: In the context of this sentence, it was the -- it's the prescriptive aspect. What a sound designer might do with a 3D audio system. You're doing the positioning. It's a different matter about how I would hear those positions.
BY MR. HENRY:
Q Understood.
So this was prescriptive and directed towards the designer of the environment for the user's subsequent listening. Is that fair?
A Yes. I was saying -- when I said it involves the positioning, I was talking about the prescriptive portion of the 3D audio system. When I talk about virtual spatial hearing with the 3D audio system, that's talking about the result. So I can prescribe, for instance, that I want you to hear a sound in front of you. You may hear the sound behind you because sound sources, as we hear them, can be in different locations than the sound position we prescribed. Which was one of my problems with defense's claim construction for HRTF.
Q I understand.

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So if there's a -- you can't guarantee that I will not experience a reversal error, for example, right?
A Absolutely true --
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: I probably can't guarantee anything for you.
BY MR. HENRY:
Q Sure. Sure.
I didn't think that was a problematic question. But -- strike that.
But what you're referring to in the sentence that we're talking about is actually a, you know, prescription of locations for sound sources, and then subsequently whether a listener perceives them to be in those locations is a different matter; is that fair?
A I think that's fair.
MR. ELLIOTT: Objection to form.
THE WITNESS: Sorry.
I believe that's fair.
BY MR. HENRY:
Q Thank you.
If you go to page 8 of your reference book, let me know when you're there.
A I am there.
Q And I'd like to look at the paragraph that starts

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with, Virtual reality and multimedia systems and then has the enumerated 1, 2, 3, just to orient you. Okay?

A Yes.

Q Okay. And you see where you wrote, A hardware component definition of a virtual reality system usually involves the following elements, and then you listed the three subparagraphs?

A Yes.

Q Okay. Some of the elements that you identified as being usually involved in a virtual reality system in your reference book included head-mounted displays, headphones, and force feedback devices, right?

A That is --

MR. ELLIOTT: Objection -- objection to form, scope, irrelevant.

THE WITNESS: That is what I wrote.

BY MR. HENRY:

Q And at the time you wrote that, did virtual reality systems usually involve those elements?

MR. ELLIOTT: Objection to form, scope, irrelevant.

THE WITNESS: They were typically defined that way. Some were more successful than others at actually implementing all these things.

BY MR. HENRY:

Q Okay. And you also wrote in your reference book

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that virtual reality system usually involves sensors, hardware such as magnetic or mechanical position trackers six-degrees-of-freedom trackball, speech analyzers, and data gloves. Do you see that?

A Yes, I do.

Q At the time you wrote this reference book, did virtual reality systems usually involve those components?

MR. ELLIOTT: Objection; form, scope, and irrelevant.

THE WITNESS: They involved them either by intention or by actual implementation.

BY MR. HENRY:

Q What is a -- actually, you mentioned earlier on six-degree-of-freedom capability, and I see that -- I see language here six-degrees-of-freedom trackballs. What is six degrees of freedom referring to?

MR. ELLIOTT: Objection to form and irrelevant.

THE WITNESS: Well, three degrees of freedom might be, for instance, tracking the head in terms of the pitch, yaw, and roll, and then we can add another three degrees of freedom in terms of the XY position of the human themselves.

THE STENOGRAPHIC REPORTER: I'm sorry, Doctor. It sounded like you said John roll. What did you say?

THE WITNESS: Pitch, yaw, y-a-w, and roll, r-o-l-l.

THE STENOGRAPHIC REPORTER: Thank you.

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MR. HENRY: It's actually pitch, if that didn't come through with a P.

THE STENOGRAPHIC REPORTER: Thank you.

THE WITNESS: And those kind of rolls taste terrible.

BY MR. HENRY:

Q All right. What is a sixth-degree-of-freedom trackball?

MR. ELLIOTT: Objection to form, irrelevant.

THE WITNESS: It's been a long time since I've thought about this six-degree-of-freedom trackball. I know that I saw one that was claimed to be that. I believe it was a mouse-like device that you could rotate the trackball to indicate pitch, yaw, and roll, and then the stand that that trackball was mounted on could also be moved.

BY MR. HENRY:

Q And the XYZ coordinates to be six?

A Yeah. And I'm trying to picture it. It's been so many years since I've seen a sixth-degree-of-freedom trackball. They didn't exactly take off.

Q I was going to say, if it -- holding it, moving it in the Z direction seems a little bit odd.

A Yes.

Q Okay. All right. Let's see.

Was the Polhemus tracking system we've discussed previously a six-degree-of-freedom system?

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MR. ELLIOTT: Objection to form and irrelevant.

THE WITNESS: Yes. I think it could be configured to work that way, but I think you needed an extra sensor or something like that. So it could be configured that way. A lot of times it was just used as a three-degree-of-freedom device.

BY MR. HENRY:

Q If you had pitch, yaw, and roll, usually what additional sensor would you need to give you the ability to move in the X, Y, and Z directions for six degree of freedom with the Polhemus?

MR. ELLIOTT: Objection to form, irrelevant.

THE WITNESS: You're really testing my memory here, but I believe that at least an extra receiver was needed. I don't know if a separate transmitter was needed. And that was the earliest generation of Polhemus, or as we call them, Polhemi. That's P-o-l-h-e-m-i. I don't know -- and I can't recall the capabilities of later systems.

They might have made it so that multiple trackers and, you know, transmitters and receivers could be operated from the same external hardware device.

BY MR. HENRY:

Q Thank you.

And can you look at page 13, please.

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A Page 13.
Q Yeah. And you see the header, So what is 3-D sound good for?
A Yes.
Q And the last paragraph -- strike that.
The first sentence of the paragraph at the bottom of page 13 of your reference book reads, 3-D sound can contribute to the sense of immersivity in a 3-D environment. Do you see that?
A I do.
Q Do you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: My opinion has not changed about that.
BY MR. HENRY:
Q And the next sentence reads in part, One might be able to work more effectively within a VR environment if actions were accompanied by appropriate sounds that seemingly emit from their proper locations. Do you see that?
A (Indecipherable utterance.)
MR. ELLIOTT: Objection to form and irrelevant.
BY MR. HENRY:
Q Did you answer, Dr. Begault? If it did, it didn't come through.
A Oh, I'm sorry, I -- what was your question? Do I

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agree with that statement?
Q Do you see that statement?
A I see that statement, yes.
Q Do you agree with that?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: I'll agree -- yes, I agree with that statement. I'd like to emphasize the words might, as in might be able. There could be situations where one might be able to work more effectively if sounds did not emit from their, quote/unquote, proper locations.
I think this was a reference to people using monaural sound, let's say, but with digital graphics. It didn't conceive of the advantage of having maybe separation locations for sound and virtual images, in this sentence at least.
BY MR. HENRY:
Q Do you agree that it might be helpful for users in a VR environment if actions are accompanied by appropriate sounds seemingly emitting from their proper locations?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: It may and it may not. It depends on the particular context, what one is trying to accomplish.
BY MR. HENRY:
Q And before 2014, people in the industry would

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know that in some context, it might help, and in some context it might not; is that fair?
MR. ELLIOTT: Objection irrelevant and form.
THE WITNESS: I don't know the answer to that question.
BY MR. HENRY:
Q And you believed before 2014 and wrote in your reference book that in certain circumstances, it could help if sounds seemingly emit from their proper locations in VR environments, right?
MR. ELLIOTT: Objection to form, also irrelevant.
THE WITNESS: Well, if you go to the topic, What is 3-D sound good for, that was being contrasted with non-3-D sound, which typically was monaural sound, et cetera. So the context for this sentence was what -- why go to the trouble, at that time in particular, to implement 3-D sound, what would be the advantages of doing so.
And so one possibility would be that you might be able to work more effectively within the environment if sounds came from their proper locations. However, even during the time this was written, for instance, the Ames Spatial Auditory Display, I had implemented systems where sounds didn't come from a, quote/unquote, proper location. It came from locations meant to optimize performance, for instance, or to improve the user experience.

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BY MR. HENRY:
Q What would be an advantage of having a sound seemingly emit from its, as you said here, proper location?
A What would be the --
MR. ELLIOTT: Objection. Objection to form. Objection --
BY MR. HENRY:
Q What would be an advantage --
MR. ELLIOTT: Objection; irrelevant.
THE WITNESS: An advantage of sound being emitted from the same location from a, quote/unquote, proper location?
BY MR. HENRY:
Q Yes.
A What would be the advantage, in other words --
Q What would be the advantage?
A I believe one of the advantages could be for the -- how could I put this -- the synthesis of the auditory object with the visual object in one location. So if that were important, for instance, if you had a moving object and the sound came from the same direction as the moving object, then that sense of motion could be improved. As opposed to only seeing a truck pass by, let's say, but hearing it monaural.
Q And that was an advantage that you were aware of

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before 2014; is that fair?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Was I rare of the advantage I wrote about in 1994? Yes, I was.
BY MR. HENRY:
Q And actually, if you flip down to the next page, page 14 of your reference book, do you see where you wrote in the first sentence of the first full paragraph, Sound provides an important channel of feedback that either can be helpfully redundant to a visual cue or can provide feedback for actions in situations that are out of field of view of the listener?
A Correct.
Q In what -- you were just describing with the truck moving and sort of sound -- associated sound moving with it, is that what you're referring to here as a redundant visual cue?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Oh, I think I was referring to that in part, let me think here. I believe I was focusing in this paragraph, on the topic sentence of situational awareness. So here, I was thinking about high-stress human interfaces, like a pilot or something of that sort.
For instance, if you picture a cockpit display or something in a space shuttle at the time, different

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warning devices could be lit from different locations. And so helpfully redundant to a visual cue meant that you could direct your eyes to the location of the alert -- visual alert, which frequently was associated with a button for instance.
BY MR. HENRY:
Q And was -- were you discussing visual cues in reality or in a virtual environment setting here?
MR. ELLIOTT: Objection to form, irrelevant.
THE WITNESS: Both.
BY MR. HENRY:
Q And so then the audio cue would be redundant with the visual cue in its location?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Well, not always. So, for instance, in a traffic collision avoidant system, I actually used exaggerated audio cues relative to the actual position of the visual cue, which was an aircraft outside the window that you were going to crash into.
The reason we used exaggerated cues was because it was better for performance to get people to look in the general direction of where that potential hazard might be. So it turned out that visual acquisition of target information was actually better served by exaggerating or -- yeah, exaggerating the position of the audio cue.

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BY MR. HENRY:
Q And in what direction were you exaggerating the position of the audio cue, to the right of the visual cue, left to the visual cue, behind the visual cue, which direction?
MR. ELLIOTT: Objection to form, compound, scope, and irrelevant.
THE WITNESS: In the example I'm citing, if the aircraft were, say, 30 degrees to the left, relative to the frontal view of a pilot, we would actually move it to -- I can't remember, 45 degrees or 60 degrees. So there was some ratio, 1 and a half, 150 percent of the angular position, et cetera.
BY MR. HENRY:
Q What are individualized or personal HRTFs?
A Generally speaking, that would be either a measurement made on a human with the microphones located at some position in their ear canal. So that would be my personal HRTFs could be measured in that way, along with we haven't discussed the signal processing to eliminate the influence of the measurement system. But we'll leave that aside.
It could also be the selection that some people have done of HRTFs according to kind of a shoe size estimation. In other words, some HRTFs you might select

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from different sound examples, and so some systems create, quote/unquote, personalized HRTFs that aren't necessarily your own, but the best match to your own.
And then finally there are synthetic HRTFs that could be derived from, for instance, holding an iPhone or similar handheld device up to your ear and moving your head.
Q And what are non-individualized or generalized HRTFs?
A Well, that would include, for instance, your example of a KEMAR dummy head. It would include measurements made on anything that is not you. So of course, I was describing an overlap there because you could have personalized HRTFs that are derived from something that is not individualized. So if you want to make the strictest definition of a personalized HRTF, it's that the measurement was done on me.
But, again, there are sort of best-fit HRTF, and then there's other approaches that people have done too, for instance, compensating just for the ITD and not for the HRTF.
Q And in your reference book, you discussed both individualized and non-individualized HRTFs, right?
A I do.
Q And in spatialized audio systems predating 2014,

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people were using both individualized and non-individualized HRTFs, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Your question was people were using individualized and non-individualized HRTFs?
BY MR. HENRY:
Q I'll rephrase.
A No, no, that's fine if that's the question.
Q I'll strike the question. I'll rephrase it for you.
A Okay.
Q In spatialized audio systems predating 2014, did people of skill in the industry know that you could use non-individualized HRTFs?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q Okay. Before 2014, did people of skill in the industry know that you could use in spatialized audio systems individualized HRTFs?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q If you could go to page 69 of your reference book, which is PDF 80, if it's easier to navigate that

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way.
THE TECHNICIAN: Stand by.
THE WITNESS: 69, did you say?
BY MR. HENRY:
Q Page 69.
A Yes.
THE TECHNICIAN: Stand by.
THE WITNESS: Okay. Page 69. I'm on page 69.
BY MR. HENRY:
Q It's the top of -- just so we're looking at the same thing, do you see Chapter 3 at the top?
A I do.
Q Okay. And then you see the header, 3-D sound distance and reverberation?
A I do.
Q The first sentence under that reads, The inclusion of distance and environmental context within a 3D audio system is almost imperative for maintaining a sense of realism among virtual acoustic objects, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes, that was my statement there, yes.
BY MR. HENRY:
Q And you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes. If we're trying to make a

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realistic representation of the environmental context, and -- yeah, so this would be certainly an improvement for a simulation to include those things.
BY MR. HENRY:
Q You agree that -- can we agree that reverberation is key for the effective simulation of distance in the perception of environmental context?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Except for some exotic cases, I might be able to think of the environmental context as cued by reverberation.
BY MR. HENRY:
Q Do you see the sentence right after what we just covered, where you wrote, In fact, the same physical cue, reverberation, is key for the effective simulation of distance and the perception of an environmental context, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes. I see that.
BY MR. HENRY:
Q Do you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q I'd like you to --

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A You can simulate -- let me clarify, that you can simulate distance, but you can't simulate the environmental context and distance together without reverberation.
THE STENOGRAPHIC REPORTER: Hi, Counsel. I need to plug in my sound system. Can we take a really quick break? I just need to re-plug it in.
MR. HENRY: Sure, of course.
Let's go off the record.
THE VIDEOGRAPHER: The time is 1657. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 1658. We're back on the record.
BY MR. HENRY:
Q Dr. Begault, I'd like to look at page 95 of your book, PDF 106.
A Page 95. Chapter 4.
Q Great. Do you see the number paragraph Number 1?
A I do.
Q Do you see the first two sentences there, You pose questions?
A Yes.
Q Okay. And then the sentence after that, the third sentence reads, In virtual reality and multimedia

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applications, most sounds are somehow connected to visual events requiring decisions as to how representative they need to be. Do you see that?
A I do.
MR. ELLIOTT: Objection to form. Objection to form and irrelevant.
BY MR. HENRY:
Q Do you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yeah, I agree with that statement. I mean, in the context of the audio guru on a design team for an application in most cases.
BY MR. HENRY:
Q What is interpolation, Dr. Begault?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Mathematically, it's the -- an intermediate value between two other values, but in the context of 3-D sound, if one has measured positions and one was to simulate a position that is not at a measured position, then one would use the technique of interpolation to achieve an intermediate spectral modification of the sound.
BY MR. HENRY:
Q Are there different methods of interpolation?
MR. ELLIOTT: Objection to form and irrelevant.

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THE WITNESS: Yes there are.
BY MR. HENRY:
Q What are some of those, Dr. Begault?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: One form of interpolation is simply cross fading between prerecorded 3D-audio sounds, which was done early on. There are a couple of techniques that are bandied about in the literature for determining the best way to interpolate between measured HRTFs, and some of those depend on linear interpolation.
Some of those involve spherical coordinate interpolation. And then there are people these days more recently who record so many positions, that interpolation is almost unnecessary, or it can be done in the old-fashioned way with the cross fading.
BY MR. HENRY:
Q And you mentioned linear interpolation and spherical interpolation in that response. Were there any other methods of interpolating between measured HRTF positions?
MR. ELLIOTT: Objection to form, irrelevant.
THE WITNESS: Simple cross fading.
BY MR. HENRY:
Q Any other methods?
A Those are the three I'm most familiar with.

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Sometimes different methods are used to interpolate the interaural time delay separately from the magnitude transfer function.
Q When you say separate from the magnitude transfer function, what transfer function are you referring to when you say magnitude transfer function?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: The spectral component of the HRTF, absent in its time delay component (indecipherable utterance.)
BY MR. HENRY:
Q Thank you.
THE STENOGRAPHIC REPORTER: I'm sorry. Can you repeat that answer, please?
THE WITNESS: The spectral, s-p-e-c-t-r-a-l, component, separate from the time delay component.
THE STENOGRAPHIC REPORTER: Thank you.
THE WITNESS: Yeah.
BY MR. HENRY:
Q If you look at page 167, which is PDF 177, if you want to navigate it that way.
A 167?
Q That's right.
A Yes.
Q Do you see the heading, Head-tracked 3D audio for

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virtual environments?
A I do.
Q The first sentence under that heading on page 167 of your reference book reads, In virtual reality, the key to immersivity is directly tied to the success of the interface in providing realistic information at the effectors and the degree to which sensors are able to track human interaction. Do you see that?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: I see that.
BY MR. HENRY:
Q Do you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes. There's some other keys to immersivity. So I don't want to say that this is the exclusive list of things. I think in my writing style there, I was saying that one of the key elements.
BY MR. HENRY:
Q And the sentence after the one that we just read on page 167 reads, For this reason, head-tracked virtual acoustic systems represent the best approach to implementing sound so that sound sources can remain fixed in virtual space independent of head movement, as they are in natural spatial hearing.
Do you see that?

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MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: I do.
BY MR. HENRY:
Q Do you agree with that statement?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Well, 35 years plus experience -- or how many years has it been since I wrote this? I can't do the math. Close to 40; is that right? No. But anyway --
BY MR. HENRY:
Q This is 2023. So --
A Yeah, dang it. Okay.
Q A little bit more.
A Yeah, yeah, yeah, okay. All right. So point is that I can, with that based off my experience, head-tracking virtual acoustic systems were very idealized at that time. I think what we have found is that in some applications, it's better not to use head tracking. I think there's some recent Apple headphone, like the ones I'm wearing now, that can include head tracking.
And some people find it very disturbing to have the world moving in quasi-realistic fashion. Another thing that we found over the last almost 40 years is the effect of latency. And if the processors can't keep up with moving your head, then you can get something called virtual environment sickness.

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BY MR. HENRY:
Q When you wrote your reference book, it was known, though, that head-track virtual acoustic systems could keep a sound source fixed in a location in virtual space independent of head movement, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes. With the proviso of latency that I just gave you there, but yes, that was a very exciting discovery in the 80s.
BY MR. HENRY:
Q And actually, if you look down below it, under the heading, Crystal River Engineering, it seems you described the Convolvotron as one of the first head-track virtual audio systems. Do you see that?
MR. ELLIOTT: Objection to form, irrelevant.
THE WITNESS: Yes, that's a true statement.
BY MR. HENRY:
Q And Convolvotron, described in -- as described in your reference book, used spatialization functions run through software or other routines, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: I think it says that somewhere.
BY MR. HENRY:
Q Okay. Well, even without that, Convolvotron used spatialized audio, right?

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MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q And processed HRTFs?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: It used -- it implemented the head-related transfer function for sources.
BY MR. HENRY:
Q If you turn to page 168, do you see the paragraph under the image, not the caption, but the paragraph below the image?
A These impulse responses?
Q Yeah.
A Yeah.
Q And that goes on to say, These impulse responses are convolved, and then continues from therein, correct?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Correct.
BY MR. HENRY:
Q So the -- is it fair to say that Convolvotron was using convolution processes with HRTFs?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q If you go to the next page 169, and the bottom

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paragraph on that page that begins, The Convolvotron hardware, are you there?
A I'm there.
Q Okay. And then in that paragraph, it talks about the Convolvotron using DSPs, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Let's see. DSPs is mentioned specifically in the sentence beginning, The convolution engine.
BY MR. HENRY:
Q Yeah, and that sentence reads, The convolution engine is a custom-made board that contains four INMOS A-100 cascadable DSPs, and then continues from there, right?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q So do I understand from that then, that Convolvotron was using DSPs for its sound processing?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: It was using a DSP hardware chip that was mounted to this custom-made board.
BY MR. HENRY:
Q And using that DSP chip for sound processing, right?

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MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes. So it was using those DSPs for sound processing.
BY MR. HENRY:
Q On the bottom of page 170, your reference book discusses something called, Focal Point. Do you see that?
A I do.
Q And in the second paragraph, the first sentence reads, Gehring later entered the virtual reality market with a low-cost device known as the Focal Point system, a head-tracked virtual acoustic display for either the Macintosh or the PC. Do you see that?
MR. ELLIOTT: Objection to form and irrelevant.
THE WITNESS: Yes.
BY MR. HENRY:
Q Okay. And then -- actually, I'll just ask you, before 2014, did people of skill in the industry know that you could use DSPs with Macs for sound processing?
A Yes.
Q Did they know you could use DSPs with Macs for processing spatialized audio?
A (Indecipherable utterance.)
MR. ELLIOTT: Objection to form. Objection to form and irrelevant.
And, Mr. Henry, can we take a break? And also I

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just want to launch a general objection in the record that we have wasted hours of time turning this into a prior art deposition, wherein its purpose is claim construction.
MR. HENRY: We can take a break if you need a break. That's fine. I'm happy to go off the record, as I said before, but there is a pending question. So we're going to get an answer to my question before we break --
MR. ELLIOTT: Oh, I apologize.
MR. HENRY: That's fine.
And your objection was noted for the record. We don't have to quibble about it now. But I disagree including because you have been objecting to things that were specifically discussed in defendant's expert's claim construction declaration as irrelevant. Which -- and also, it's a deposition. So your relevance objections are, you know, likely improper. And you know that.
But, yeah, sure. Let's get an answer to the pending question.
MR. ELLIOTT: That's fine.
MR. HENRY: And then we can take a break if you'd like, and then we will reconvene.
BY MR. HENRY:
Q So let me just restate my question for you, Dr. Begault. Before 2014, did people of skill in the industry know you could use DSPs with Macs to process

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spatialized audio?
A Yes.
MR. HENRY: Okay. Let's go off the record.
THE WITNESS: How long?
MR. HENRY: We'll go off the record, and then we'll discuss.
THE VIDEOGRAPHER: The time is 1714. We're going off the record.
(Recess taken.)
THE VIDEOGRAPHER: The time is 1727. We're back on the record.
BY MR. HENRY:
Q Dr. Begault, I want to look at your report, which is Exhibit 1. You still have that, your declaration?
A Yes.
Q Now, your declaration, not counting your CV, is eight pages long, right?
A I haven't counted. Though, I will. Yes, I see eight pages, and that includes, I believe, a cover sheet -- no, does not include the cover sheet nor the table of contents.
Q 17 paragraphs, right?
A I haven't counted those paragraphs, but I will believe you that there's 17 paragraphs. Yes, it appears there are 17 paragraphs.

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Q And on page 8 of your declaration, that's your signature?
A Yes, it is.
Q Do you know what a means-plus-function term is?
A No, not exactly.
Q Do you have any understanding of what a means-plus-function term is?
A Not that I -- no, I'll say no. I don't really have a full understanding of it.
Q In your declaration, Dr. Begault, do you cite any patents, articles, publications, or documents other than the asserted patents?
MR. ELLIOTT: Objection to form.
THE WITNESS: I don't believe I included any citations to other documents other than the patents.
BY MR. HENRY:
Q Dr. Begault, I may have question for you following your counsel's questions, but if not, I don't have any further questions for you right now. So thank you for your time.
A Thank you.
EXAMINATION
BY MR. ELLIOTT:
Q All right. Dr. Begault, you remember the series of questioning by Mr. Henry where you were asked about

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computing devices that perform the processing steps and were asked if these were not processors, do you remember that line of questioning?
MR. HENRY: Object to form, ambiguous.
THE WITNESS: Yes. I remember that line of questioning, that was over the series of patents that we looked at.
BY MR. ELLIOTT:
Q Mm-hmm. Can a processor that performed those processing steps that claims also be a software processor?
A Yes.
MR. HENRY: Object to form.
THE WITNESS: Sorry, sorry. I'll stop --
BY MR. ELLIOTT:
Q Go ahead and pause like you did before so Mr. Henry can get his objections down as well.
A Yes.
Q So those steps can be performed by software; is that correct?
A Yes, they can.
Q And that's true of each one of those processing limitations that you went through with Mr. Henry?
A I believe so, yes.
Q If I can please direct you to the '090 Patent?
A Okay.

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Q And I apologize. I don't remember which exhibit that turned out to be.
Do you know, Mr. Henry?
MR. HENRY: Exhibit 3.
MR. ELLIOTT: Thank you.
THE WITNESS: All right. I'm at the '090 Patent, yes.
BY MR. ELLIOTT:
Q Okay. If you would, go to column 4, lines about 38 to 41.
A Column 4, lines 38 through 41. I am there.
Q Paragraph beginning, Further yet, why don't you go ahead and read that, and then once you've read it, tell me if that gives you a definition of proximate.
MR. HENRY: Objection to form, outside the scope. Not cited in his declaration to be clear.
THE WITNESS: Okay. I've read it.
BY MR. ELLIOTT:
Q And does that give you an indication of what the patent means by proximate?
MR. HENRY: Same objections.
THE WITNESS: Yes. That's consistent with my testimony earlier.
BY MR. ELLIOTT:
Q And what definition does it give here?
MR. HENRY: Same objections and mischaracterizes

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Dr. Begault's testimony.
THE WITNESS: It says, From the point of view of the listener can be proximate to the listener, such as in the same room -- which is consistent with my prior testimony -- Or far away from the listener, such as several kilometers away.
BY MR. ELLIOTT:
Q All right. Then if you would, turn to column 11 -- or excuse me, sorry. Column 9 first.
A Column 9.
Q And look at the paragraph, would be about Line 22, beginning with, The sound localization point.
A Yes.
Q And then the middle of the paragraph, probably around Line 25, you want to read the end of that paragraph, and let me know when you're finished?
A Okay.
Yes, I've finished.
Q Okay. Does this language give you a definition of proximate within the patent?
MR. HENRY: Objection to form, beyond the scope, not in Dr. Begault's declaration. It's a clear attempt to supplement his opinions on the improper redirect.
THE WITNESS: This statement here is wholly consistent with my earlier testimony about speech levels, and it has

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to do with a second individual being proximate, such as both individuals being in the same room together.
BY MR. ELLIOTT:
Q And then column 11, Line 46.
A Yes, I am there.
Q And go ahead and read from Line 46 down through the end of that paragraph, the paragraph beginning, Sound adjustments are made.
A Okay. From Line 44.
Yes, I've read it.
Q And does this also give you an instance in respect where there is a definition of proximate?
MR. HENRY: Objection to form, beyond the scope, not in Dr. Begault's declaration. Again, another clear attempt to supplement Dr. Begault's opinions with improper redirect.
THE WITNESS: Yes, again, this statement is wholly consistent with my earlier testimony. And one moment...
It's also wholly consistent with my declaration paragraph 10.
BY MR. ELLIOTT:
Q And does this -- what definition does this give for proximate?
MR. HENRY: Same objections.
THE WITNESS: Let's see. It gives us a definition of

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proximate, as... if the listener were standing or sitting next to the talker or otherwise physically located at or proximate to the virtual microphone point. And it's as if the listener and talker were talking to each other -- well, I think I already stated it.
BY MR. ELLIOTT:
Q Then column 15, Line 12, you have a sentence --
A Yes.
Q The sentence beginning, The HPED.
A Yes.
Q Go ahead and read that down through about Line 17.
A Yes, I see it.
Q Does this also give a definition of proximate in the specification of the patent?
MR. HENRY: Objection to form, beyond the scope. Not in Dr. Begault's declaration. Another clear attempt to supplement Dr. Begault's opinions with improper redirect.
THE WITNESS: Yes. This states a definition of proximate -- or an example of proximate, I should say, between 1 to 3 feet from the face or mouth of a person, again, wholly consistent with my declaration paragraph 10. And also, wholly consistent with my earlier testimony with regards to speech levels.

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BY MR. ELLIOTT:
Q Okay. If I can take you back to column 11.
A Yes.
Q And take a look at the paragraph towards the top of column 11, beginning with Figure 5. And read those two paragraphs there.
A Okay.
Okay. I read it.
Q Okay. And is -- are the terms electric call -- or excuse me, electronic call used in that particular paragraph there?
MR. HENRY: Objection to form, beyond the scope. Not in Dr. Begault's declaration. Yet another clear attempt to supplement Dr. Begault's opinions with improper redirect.
THE WITNESS: I see the term or phrase electronic call.
BY MR. ELLIOTT:
Q And then if you would, still in column 11, read the last partial paragraph. No need to carry over into column 12.
A Okay.
Yes.
Q And do you see the terms electronic telephone call and telephone call in that partial paragraph?

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MR. HENRY: Objection to form, beyond the scope. Not in Dr. Begault's declaration. Another clear attempt to supplement Dr. Begault's opinions with improper redirect.
THE WITNESS: I see electronic telephone call. And what was the other phrase?
BY MR. ELLIOTT:
Q Telephone call.
MR. HENRY: Same objections.
THE WITNESS: Yes, I see both phrases in this same paragraph, the same discussion of an example.
BY MR. ELLIOTT:
Q Okay. And so in reference to Figure 5, are the terms electronic call, electronic telephone call, and telephone call used interchangeably in this column 11?
MR. HENRY: Objection to form, beyond the scope. Not in Dr. Begault's declaration. Another clear attempt to supplement Dr. Begault's opinions with improper redirect, improper leading.
THE WITNESS: Yes. I see these terms used interchangeably with regards to Figure 5. Specifically, I see the words electronic call, electronic telephone call, and -- where's the third one -- telephone call.
And these are reflected in my declaration.
BY MR. ELLIOTT:
Q At one point in time, you were -- you had given

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some testimony on DB, decibels, and I believe your -- you said at some point in there -- correct me if I'm wrong, but I think you said you haven't reviewed the patents carefully?
A That's correct. I don't -- would not say I've had a careful review of the patents.
Q Okay. Do you mean you haven't reviewed them carefully to see if DB references are in the patents?
A That's correct. I don't -- I can't say that they're not.
Q Also, Mr. Henry took you through a series of things being distant. I think we went around the world and into outer space --
A We certainly did.
Q Are any of these being distant from you relevant to a distance, as that term is used in the patent?
MR. HENRY: Objection to form.
THE WITNESS: Based on my initial review of these patents, I saw no references to planetary distances or distances such as Paris, Tokyo, or some of the other examples that were cited.
BY MR. ELLIOTT:
Q We've used the word phone a lot today. Is the definition of phone a static item over time?
MR. HENRY: Objection to form, beyond the scope --

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THE WITNESS: No.
MR. HENRY: -- improper supplement of Dr. Begault's opinions.
THE WITNESS: No. Well, the root of the word phone is sound. And it's manifested itself in many different ways.
BY MR. ELLIOTT:
Q What do you think the definition of a phone would be in 1965?
MR. HENRY: Objection to form, beyond the scope. Improper attempt to supplement Dr. Begault's declaration.
THE WITNESS: It's -- in my earlier testimony, I gave an example of a Western Electric landline telephone which were widely used by the Bell System in the United States.
BY MR. ELLIOTT:
Q And what do you think the definition of phone would be in 1985?
MR. HENRY: Same objections.
THE WITNESS: Well, we have a whole variety of ways of communicating. Speech or even other types of signals, by 1985, I believe it was possible to do some primitive voice communication over computers. I don't know if that's our era of wireless telephones, if those were yet available at the time, but I think they were with the big, long antennas. And so that might have been considered a phone.

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BY MR. ELLIOTT:
Q What about the definition of a phone in 2014?
MR. HENRY: Same objections.
THE WITNESS: We could include systems such as Zoom, that we're using now or other Voice over Internet Protocol types of communication systems, where a communication signal is transmitted between two parties electronically. We have smart phones, any number of different hardware implementations, even emergency systems on cars and -- can talk to you. And sometimes there's a human, and sometimes there's not a human that is communicating.
BY MR. ELLIOTT:
Q Is a walkie-talkie just a specialized type of phone?
MR. HENRY: Same objections.
THE WITNESS: Yeah, there's a lot of similarity to a walkie-talkie and a cellular telephone, in that both are using radio signals to transmit speech signals from one location to another.
BY MR. ELLIOTT:
Q I'm sorry to shift topics back to kind of where I began, but the definitions that we found for proximate in the specification, the '090 Patent, there were four of them. Would that be considered a plethora as cited in your declaration?

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MR. HENRY: Same objections and mischaracterizes Dr. Begault's testimony.
THE WITNESS: I think that would constitute a plethora. I mean, I don't have a single number, and I think I testified earlier that I was using that term as equivalent to the idea of many, which I can also define as more than one.
MR. ELLIOTT: Okay. I've got no more questions for him, Mr. Henry.
FURTHER EXAMINATION
BY MR. HENRY:
Q Okay. Dr. Begault, can you please go to column 4, lines 38 to 41 of the '090 Patent, which is Begault Exhibit 3?
A Sure. Column 4. And which lines?
Q Lines 38 to 41.
A 38 through 41. Yes.
Q Do you remember Mr. Elliott asked you questions about those?
A I remember he asked me questions about this section of the patent.
Q Yeah, did I ask you a question about that section of the patent today?
A I don't recall.
Q Did you cite column 4, lines 38 to 41 in your

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declaration?
A Not specifically.
Q Go to column 9, lines 22 to 29, please.
A Column 9, lines 22 through 29, yes.
Q Do you remember Mr. Elliott asking you questions about that section of the '090 Patent?
A Yes.
Q Did I invite your attention to that section of the '090 Patent today?
A No, not directly.
Q Did you cite column 9, lines 22 to 29 in your May 3rd, 2023, declaration?
A Not specifically. But we discussed in this declaration, the concept of proximate.
Q Did you cite lines -- did you cite column 9, lines 22 to the 29 from the '090 Patent in your declaration?
A No, I did not.
Q Please go to column 11, lines 44 to 51, please.
A 44 through 51. Yes, I am there.
Q Do you remember Mr. Elliott asking you questions about that section of the '090 Patent today?
A Yes, I do.
Q Did I ask you any questions about that section of the '090 Patent today?

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A Only in the sense that you were asking me about the word proximate.
Q Did I invite your attention to column 11, lines 44 to 51 today?
A You've made no such invitation.
Q Did you cite column 11, lines 44 to 51 in your May 3rd, 2023 declaration?
A No, I did not.
Q Please go up to column 11, lines 9 to 17.
A Lines 9 through 17.
Q Do you remember Mr. Elliott asking you questions about that section of the '090 Patent?
A Let's see.
Yes. I do.
Q Did I invite your attention to column 11, lines 9 to 17 at any point in time today during my questioning?
A Not directly, no.
Q Did you cite column 9, lines -- strike that.
Did you cite column 11, lines 9 through 17 in your May 3rd, 2023, expert declaration?
A No, I did not cite it in this particular declaration.
Q Did you cite it in any other declaration served in this case?
A None that exist so far.

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Q Are you actively preparing another declaration?
MR. ELLIOTT: Objection; calls for work product.
You can answer that question, though.
THE WITNESS: I am not actively doing other -- anything on this case other than responding to your questions in this deposition.
BY MR. HENRY:
Q Are you preparing another declaration for this case?
MR. ELLIOTT: Objection; calls for work product.
You can answer that question.
THE WITNESS: I am currently not preparing any other declaration.
BY MR. HENRY:
Q Do you plan to prepare another declaration relating to issues about claim construction in this case?
MR. ELLIOTT: Objection; again, work product.
Yeah, you can go ahead and answer.
THE WITNESS: I would be prepared to do so if asked by counsel.
BY MR. HENRY:
Q Have you been asked to prepare another declaration in this case relating to claim construction?
MR. ELLIOTT: Objection; work product.
You can go ahead and answer.

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THE WITNESS: Wasn't that the exact question you just asked?
BY MR. HENRY:
Q No.
A Then I don't understand.
Q I'll repeat --
A I thought you repeated your question.
Q I did not.
Have you been asked to prepare another declaration in this case relating to claim construction?
A No, I have not been asked at this point.
Q Please go to column 11, lines 52 to 67, please, of the '090 Patent?
A I am there.
Q Do you remember Mr. Elliott asking you questions about that?
A Yes.
Q Did I invite your attention to column 11, lines 52 to 67 during my questioning today?
A No, you did not.
Q Did you cite in your May 3rd, 2023, declaration column 11, lines 52 to 67 of the '090 Patent?
A Not directly.
Q Please go to column 15 of the '090 Patent, lines 12 to 17.

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A Okay. I am there.
Q Do you remember Mr. Elliott asking you questions about that section of the '090 Patent?
A I do.
Q Did I invite your attention to column 15, lines 12 to 17 during my questioning today?
A No. You only directed my attention to the concept of proximate.
Q Did you cite column 15, lines 12 to 17 in your May 3rd, 2023, declaration?
A No, I did not.
Q In your May 3rd, 2023, declaration, did you offer an opinion about the definition of phone or telephone in the year 1965?
A No, I don't think I directly addressed that.
Q In your May 3rd, 2023 declaration, did you offer an opinion about the definition of phone or telephone in the year 1985?
A No, I don't believe I did.
Q In your May 3rd, 2023 declaration, did you offer an opinion about the definition of phone or telephone in the year 2014?
A Yes, I did. Essentially, I spoke about the terms being equivalent and their interchangeability in the specifications.

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Q What was the definition for phone or telephone that you offered in your May 3rd, 2023 declaration for the year 2014?

A It's -- I used the definition of describing the use of any type of medium to enable communication between two or more locations over some sort of electronic network.

Q And there, you're referring to your interpretation of the terms electronic call, electronic phone call, and telephone call in paragraph 8 of your declaration, right?

MR. ELLIOTT: Objection to form.

THE WITNESS: I'm referring to my analysis of the call terms in the patents at issue.

BY MR. HENRY:

Q And what are those call terms?

A Electronic call, electronic phone call, and telephone call.

Q Okay. Are those -- in that paragraph 8 of your May 3rd, 2023, declaration, do you state what a definition for the term telephone would be in the year 2014?

A I do not specifically call out the word telephone individually. I use the word telephone call. Phrase, not word, phrase. The phrase telephone call.

Q So is it fair to say in your declaration, you

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didn't actually define the term telephone?

A Well, no. That's not fair.

Q Okay. Show me the definition of telephone in your declaration.

A Well, when I refer to an electronic call, electronic phone call, and telephone call, that's the function of what a telephone does. Which is something that allows communication between two or more locations. So clearly, the function of the noun telephone is associated with the word call. And so therefore, it is defined.

Q Please point me to the language in paragraph 8 of your declaration that you contend defines the term telephone as it would be understood in the year 2014.

MR. ELLIOTT: Objection to form, argumentative, badgering the witness. Asked and answered.

THE WITNESS: Electronic call, electronic phone call, and telephone call are equivalent. The terms used -- are used interchangeably in the specification to describe the use of any type of medium. Any type of medium includes phone, because we are talking about an electronic phone call, or a telephone call with the understanding that the root of the word phone is sound, and the root of the words tele is distant.

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BY MR. HENRY:

Q So do you equate the word telephone to any type of medium?

MR. ELLIOTT: Objection; asked and answered, beyond the scope of the redirect.

THE WITNESS: No. You can read in my declaration that I constrain that type of medium that enables communication between two or more locations using some sort of electronic network.

BY MR. HENRY:

Q We talked about a train earlier. Do you believe a train is a telephone?

MR. ELLIOTT: Objection to form.

THE WITNESS: No.

BY MR. HENRY:

Q Do you believe a boat is a telephone?

A No.

Q Do you believe an airplane is a telephone?

MR. ELLIOTT: Objection to form.

THE WITNESS: No. These examples fall outside of my definition.

BY MR. HENRY:

Q You believe a computer is a telephone, though?

A It can be used --

Sorry. Go ahead.

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MR. ELLIOTT: Objection to form.

THE WITNESS: A computer can be used as a telephone.

BY MR. HENRY:

Q So is it your opinion that a computer is a telephone?

MR. ELLIOTT: Mr. Henry, we've been through this testimony previously today, and he's provided those answers. To me, this is just wasting further time on testimony he's already given.

So I'll enter my objection to form, but also, you know, further object to additional waste of time going down this duplicate line of questioning. That is also of the redirect.

MR. HENRY: It's a brazen objection to lodge after the improper redirect that you just conducted.

MR. ELLIOTT: No --

BY MR. HENRY:

Q Dr. Begault, would you answer my question?

MR. ELLIOTT: There's nothing improper about the redirect I just conducted. You asked him about citations, if they were there. You asked him what a plethora was, I walked him through the base for his opinion.

MR. HENRY: The record will speak for itself.

MR. ELLIOTT: It will. It will. I agree with that.

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BY MR. HENRY:
Q Dr. Begault, is a computer a telephone?
A A computer can function as a telephone.
Q Okay.
A It can also function as other things simultaneously. It can enable communication between two or more locations using an electronic network.
Q Can a train do that with its radios?
A The radios are a component of a train that could be -- I'm sorry. Let me start over.
The telephone communication system that might be present on a locomotive can be used to enable voice communication between two or more locations.
Q Dr. Begault, have you seen a Meta Quest headset?
MR. ELLIOTT: Objection; scope.
THE WITNESS: No.
MR. HENRY: No further questions.
MR. ELLIOTT: Just one other question.
FURTHER EXAMINATION
BY MR. ELLIOTT:
Q Did you give testimony under Mr. Henry's questioning earlier today discussing what the definition of phone might be?
A I'm sorry. Can you repeat your question? I'm sorry. I missed the first part.

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Q Did you give testimony earlier today when Mr. Henry was first questioning you, discussing what the definition of phone might be?
MR. HENRY: Objection to form.
THE WITNESS: Yes. I think we iterated several examples likes boats and trains and things of that sort.
MR. ELLIOTT: No further questions.
MR. HENRY: One more question.
FURTHER EXAMINATION
BY MR. HENRY:
Q Just so I can confirm your opinion.
In your view is it true, Dr. Begault, that any device, any device capable of electronic voice communication between two parties is a telephone?
MR. ELLIOTT: Objection to form.
THE WITNESS: I'll answer this way. I thought that my watch would never be able to function as a telephone and it was only something that Dick Tracy had, and now I can make phone calls on my watch.
BY MR. HENRY:
Q That's not responsive, Dr. Begault.
MR. ELLIOTT: Objection --
BY MR. HENRY:
Q Do I understand correctly that it's in your opinion, any device capable of electronic voice

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communication between two parties is a telephone?
MR. ELLIOTT: Objection; argumentative, form.
THE WITNESS: It can function like a telephone, if it is capable of adhering to the definition that I laid out in my declaration.
BY MR. HENRY:
Q Can you identify any device capable of voice communication -- electronic voice communication between two parties that is not a telephone --
MR. ELLIOTT: Objection --
Sorry, Mr. Henry.
Objection to form.
THE STENOGRAPHIC REPORTER: I didn't hear your full question, Mr. Henry.
MR. HENRY: Sure.
BY MR. HENRY:
Q Dr. Begault, if you are able, I'd like you to at this time identify any device that is capable of electronic voice communication between two parties that you would say is not a telephone.
MR. ELLIOTT: Objection to form.
THE WITNESS: Again, any device that could enable voice communication between two parties can function as a telephone.

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BY MR. HENRY:
Q I'll give you one more opportunity. If you are able to identify any device falling outside of the scope of what you have articulated a number of times, please do so now.
MR. ELLIOTT: Objection to form.
THE WITNESS: No. Because the definition I have given you states that any device capable of functioning as a telephone can be considered a telephone so long as it's done electronically.
MR. HENRY: I have no further questions.
MR. ELLIOTT: No further questions here.
THE STENOGRAPHIC REPORTER: Okay. Before we go off, Mr. Elliott, we did confirm off the record, you want the rough draft and regular final, correct?
MR. ELLIOTT: Yes, that's correct, please.
THE STENOGRAPHIC REPORTER: And, Mr. Henry, we have your standing order, thank you.
MR. HENRY: Thank you.
THE VIDEOGRAPHER: This marks the end of the deposition of Durand Begault, PhD. The time is 1803. We are off the record.
(WHEREUPON THE DEPOSITION WAS CONCLUDED AT 6:03 P.M. PACIFIC STANDARD TIME.)

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Please be advised I have read the foregoing deposition, pages 1 through 283, inclusive.
I hereby state there are:

(Check one)_____ no corrections

_____ corrections per attached

_____

DURAND BEGAULT, Ph.D.

--oOo--

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WITNESS'S CHANGES OR CORRECTIONS

NOTE: If you are adding to your testimony, print the exact words you want to add. If you are deleting from your testimony, print the exact words you want to delete. Specify with "Add" or "Delete" and sign this form.

Deposition of: DURAND BEGAULT, Ph.D.
Case Title: EIGHT KHZ V. META
Date of Deposition: MAY 22, 2023

I,_____have the following corrections to make to my deposition:
PageLine Change/Add/Delete

___ ___ _____
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REPORTER'S CERTIFICATE

I, Christa Yan, CSR No. 14316, do hereby declare:

That, prior to being examined, the witness named in the foregoing proceeding was by me duly sworn pursuant to Section 30(f)(1) of the Federal Rules of Civil Procedure, and the proceeding is a true record of the testimony given by the witness as accurately as possible. That said proceeding was taken down by me stenographically at the time therein named and thereafter reduced to text under my direction.

_X_ That said witness was requested to review the transcript and make any changes to the transcript as a result of that review pursuant to Section 30(e) of the Federal Rules of Civil Procedure.

___ No changes have been provided by the witness during the period allowed.

___ The changes made by the witness are appended to the transcript.

___ No request was made that the transcript be reviewed pursuant to Section 30(e) of the Federal Rules of Civil Procedure.

I further declare that I have no interest in the 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

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