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Transcript of Dr. Chris Kyriakakis

Date: March 28, 2024

Case: Meta Platforms, Inc. -v- Eight kHz, LLC (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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Transcript of Dr. Chris Kyriakakis
Conducted on March 28, 2024

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1 UNITED STATES PATENT AND TRADEMARK OFFICE	1 A P P E A R A N C E S:
2 -----	2
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17 March 28, 2024	17
18 11:03 a.m. CST	18 Also Present:
19	19 Jesse Castro - Remote Tech
20 Job No. 529947	20 Malcolm Cooke - videographer
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5 1 PROCEEDINGS 2 VIDEOGRAPHER: Here begins Media Number 1 3 in the videotaped deposition of Dr. Chris 4 Kyriakakis in the matter of Meta Platforms, Inc. 5 v. Eight KHz, LLC in the United States Patent and 6 Trademark Office before the Patent and Trial -- 7 the Patent Trial and Appeal Board, Case Number 8 IPR 2023-01003 and IPR 2023-01005. 9 Today's date is March 28th, 2024. The 10 time on the video monitor is 11:03 a.m. Central 11 time. The remote videographer today is Malcolm 12 Cooke representing Planet Depos. All parties of 13 this video deposition are attending remotely. 14 Would counsel please voice identify 15 themselves and state whom they represent? 16 MS. PARTRIDGE: Yes. Jayme Partridge and 17 I represent Eight KHz, LLC. I also have Patrick 18 Dunn with me, and he also represents Eight KHz, 19 LLC. 20 MS. WANG: Grace Wang with the firm Paul 21 Hastings, and I represent Meta Platforms, Inc. 22 VIDEOGRAPHER: The court reporter today is	7 1 A Yes. 2 Q And we'll talk about -- have you been 3 deposited before? 4 A Yes, I have. 5 Q Okay. The only reason I was asking -- 6 well, I'll ask you for a couple of reasons. You 7 kind of understand this process, right? Then it's 8 not a trick question. I mean, you understand I'm 9 going to ask you questions, and you're going to 10 answer. 11 But you're going to give Ms. Wang -- 12 MS. PARTRIDGE: If that's the right 13 pronunciation. 14 MS. WANG: Yes. 15 Q Excuse me -- the opportunity to object if 16 she needs to. 17 And we're going to try not to talk over 18 each other, except that I'm really bad about it 19 sometimes, and I'm going to apologize in advance. 20 I don't mean to do it disrespectfully. It's just 21 sometimes, you know, I'm thinking about something. 22 And also, you nodded a minute ago. We're
6 1 Susan Klinger representing Planet Depos. 2 The witness will now be sworn. 3 DR. CHRIS KYRIAKAKIS, 4 having been first duly sworn, testified as 5 follows: 6 EXAMINATION 7 BY MS. PARTRIDGE: 8 Q Good morning. Can you state your name for 9 the record, please? 10 A My name is Chris Kyriakakis. 11 Q And it's Dr. Chris Kyriakakis, correct? 12 A Yes. 13 Q And we've -- spoke earlier, and we decided 14 that I can call you Dr. K if I start saying all 15 kinds of different -- instead of Kyriakakis, I'll 16 say other things. So I'm going to call you Dr. K, 17 but I'm not trying to be disrespectful at all. 18 A No. I understand, not a problem at all. 19 Q Okay. And I think you heard my name is 20 Jayme Partridge, and I represent Eight KHz, and 21 I'm taking your deposition today. 22 Do you understand that?	8 1 going to have to try to get verbal answers from 2 you, because it's hard to pick that up on the 3 transcript that Ms. Klinger is -- is taking for 4 us. Okay? 5 A I understand, yes. 6 Q Okay. And I am not going to ask you any 7 questions regarding attorney-client privilege 8 unless I just don't understand that that's part of 9 it. So I just warn you in advance that I'm not 10 trying to get into any of your conversations with 11 your counsel or anything. And if you feel 12 uncomfortable with some of that, you just let me 13 know, and we'll -- Ms. Wang and I will figure out 14 how to deal with those questions. Okay? 15 A Okay. 16 Q Now, you know you can take a break any 17 time you feel like it. I may be taking more 18 breaks than you because this technology is 19 actually -- you know, kind of makes my brain 20 explode sometimes. So I'll have to take a break 21 to -- some for that. But you understand that you 22 can take a break at any time you need to, correct?

9 1 A Correct. 2 Q Okay. And is there any reason you cannot 3 give true and accurate testimony here today? 4 A No, there isn't. 5 Q Okay. So you said you have been deposed 6 before. Tell me how many times have you been 7 deposed before? 8 A I don't have my record in front of me. 9 It's probably six or seven times, something on 10 that order. 11 Q Is part of your typical work providing 12 expert witness testimony or in lawsuits? 13 A I don't know if I would call it typical 14 work. My work is being a professor at the 15 university, but I have been -- I have participated 16 as an expert witness in a few cases over the past 17 few years. 18 Q Six or seven, right? 19 A Six or seven depositions. There have been 20 cases where I was not deposed. 21 Q Thank you for that clarification. 22 What would you say, percentage-wise, of	11 1 non-infringement and the invalidity. 2 Q So tell me about the ITC case. Who were 3 you testifying for in that case? 4 A The co-defendants were Apple and Samsung, 5 which -- 6 Q And you -- 7 A -- made it very interesting to represent 8 both at the same time. So I was testifying, but I 9 guess the -- technically a few days before the 10 trial Samsung settled. So when I was on the 11 stand, it was just Apple. 12 Q Okay. But you were consulting and 13 testifying for Apple and Samsung during most of 14 that ITC case? 15 A That's correct. That's right. 16 Q What -- at a very broad, high level, what 17 was the technology that was involved in that case? 18 A It had to do with noise cancellation in 19 headphones. 20 Q And how long ago was that? 21 A So signal -- that was either 2017 or 20 -- 22 no, it was not that. - I'm sorry, I don't
10 1 your work is taken up by being, you know, 2 basically an expert witness or of providing 3 declarations or testimony in lawsuits? 4 A The percentage compared to -- for my 5 overall? 6 Q Yes, very general. 7 A Very small, 1 percent. 8 Q Okay. It's not like 50 percent or 100? 9 A No, no. 10 Q It's -- we're on the level of 1 or 2 11 percent? 12 A Yeah, or less. 13 Q So you said you've been deposed before six 14 or seven times. What can you remember -- I'm 15 going to ask you, you know, what are those six or 16 seven times? Were they lawsuits, or were they 17 primarily in IPRs? 18 A It was a combination. There were some 19 that were IPRs. There were some that were 20 invalidity in civil court cases. There was an ITC 21 case, and there was, I think, at least one -- no, 22 probably two non-infringement where I did both the	12 1 remember. 2018 maybe. 2 Q Okay. I'm not trying to -- I'm just -- 3 A Yeah, yeah. 4 Q -- figuring out your prior testimony. If 5 I want something more specific, I'll let you know, 6 so -- but I appreciate it. 7 What about -- you said that there were 8 court cases that you have provided testimony in as 9 well. What were those? 10 A By that, I meant not IPRs. So I -- it 11 wasn't testimony in front of a jury. Those 12 were -- there was another Apple case that involved 13 miniature loudspeakers like the kinds you find in 14 mobile devices. And then there were -- there were 15 at least two cases for Google that also involved 16 various technologies about their loudspeakers. 17 And what else? Oh, there was another two 18 or three that -- it was the same plaintiff, and I 19 was testifying on behalf of a few -- two or three 20 of the automotive makers such as Hyundai and 21 Mercedes-Benz. 22 Q Was that on loudspeakers as well?

13 1 A That was on Bluetooth audio. 2 Q Okay. 3 A And connectivity of Bluetooth audio in the 4 cars. 5 Q Okay. Any other lawsuits that you can 6 remember? 7 A No. I had testimony in court in -- also 8 for Google for the same case, but it was in a 9 Canadian court, which was also an interesting 10 experience. 11 Q I bet. 12 A But that was -- it was remote, but yes. 13 Q That's interesting. I would like to hear 14 about that sometimes. 15 A Okay. 16 Q So anything else you can remember 17 regarding the lawsuits? 18 A No. That's -- that's -- that's a pretty 19 good picture of my involvement. 20 Q Okay. Have you testified for Meta before? 21 A I have not. 22 Q Okay. So you did provide a declaration in	15 1 sorry, my assistant just brought in a big stack of 2 documents. I'm not going to use those today, so 3 don't worry, but I'm like, what? 4 So -- so we're going to refer shorthand to 5 the other IPR proceeding, which was regarding the 6 '196 patent, as the 1004 -- 7 A Yes. 8 Q -- proceeding. Okay? 9 A Okay. 10 Q And if you get confused, I mean, just -- 11 just let me know. I'm just trying to get some 12 stuff out of the way. 13 So I'll be asking you some questions about 14 the declaration that you provided for Meta in the 15 1004 IPR as well as the one in the 1003 IPR, which 16 was -- which is -- the deposition you're giving 17 today is for the 1003 IPR. 18 A Okay. Just for clarification, I -- there 19 was also a third patent, the '628, and so the '628 20 and the '090 were the ones that were instituted. 21 The '196 that you mentioned was not. 22 Q Okay.
14 1 a different IPR for Meta, correct? 2 A In a different -- I'm sorry, IPR? 3 Q Proceeding for Meta, correct? 4 A In a different IPR proceeding? I guess -- 5 Q Right. Okay. Let me be -- I probably 6 should be a lot more clear. 7 The deposition today is about the U.S. 8 Patent 9,226,090, correct? 9 A Correct. 10 Q And you're familiar with that patent, and 11 you've provided an expert declaration in the IPR 12 which I call 1003 -- let me see if I can get you a 13 full number for that. IPR 2023-01003, that's the 14 IPR that you're testifying in today, correct? 15 A I will take your word for it. I don't 16 have that number in front of me, but yes -- 17 Q That's fair. 18 A -- it's regarding that patent. 19 Q Okay. For Meta you provided a declaration 20 in a different IPR proceeding as well, correct? 21 A Correct. 22 Q And just as shorthand, can we call that --	16 1 A So just -- okay. 2 Q Right. And I don't have anything on the 3 '628, but I just wanted to kind of set -- set the 4 stage for what I will be talking to you about 5 today. 6 A That is fine. I just -- I haven't 7 really -- I haven't read the '196 in several 8 months, so I might need some time to catch up. 9 Q Absolutely, and I'll give you whatever 10 time you need to answer any questions on that. 11 Let me -- are you -- do you have anything 12 with you today on your desk or that you are 13 referring to? I saw you look down. 14 A No. On my left I have a second monitor, 15 and on there, I have open my '090 declaration, a 16 clean copy of it. 17 Q A clean copy, and it is your -- 18 A Yes. 19 Q -- declaration for the -- I call it the 20 1003 proceeding here today? 21 A Yes, for the -- for the '090. I also had 22 open the '628, but I guess I can close that.

17 1 Q Is it clean as well? 2 A It is clean, yes. No, everything I have 3 is clean, yeah. 4 Q I don't think you need the '628. 5 Typically, you know, we'll just look at the -- the 6 stuff on the screen here, but as long as that is a 7 clean copy, and you are testifying under oath, 8 then I'm happy for you to be able to do this in a 9 way that is the easiest for you as possible 10 because that is a long declaration, so... 11 A Yeah. It just makes it easier to search 12 for things. 13 Q Okay. And I'll just take your word that 14 you're not receiving any other kind of messages 15 from any attorneys or other people during -- at 16 least while I'm asking you questions. 17 A Yes. Absolutely not. 18 Q Okay. It is just remote, so it's like 19 kind of weird -- either way. I don't expect it, 20 but I just want to set that out in advance, okay? 21 A No problem. 22 Q Okay. Great.	19 1 those describes it very well. It has to do with 2 conferencing and spatial audio. I don't know what 3 else to say about it at a high level. It has to 4 do with communication of people using spatial 5 audio methods. 6 Q When you say "spatial audio," what do you 7 mean by that? 8 A That is a term that covers multiple things 9 depending on the context, but in this context, it 10 is sound sources that are placed so that they are 11 perceived spatially in different directions by -- 12 by a listener. 13 There are various ways to do that, but 14 that is -- that is the term of art that describes 15 this. 16 Q Okay. Is spatialized -- or spatial audio 17 or spatialized audio, is that the same thing? 18 A Yeah. Spatial audio is more of a term of 19 art, but I've heard the other one as well. 20 Q Okay. I just have seen it in a number of 21 different ways. I'm definitely not a person in 22 this art, so I'm just fumbling around sometimes.
18 1 So you have provided a declaration at 2 least for Meta in three IPR proceedings, correct? 3 A Correct. 4 Q Okay. And nothing else for Meta other 5 than your work in these three IPR proceedings? 6 A Correct. 7 Q Okay. Now, just to set it up, we talked 8 about the 1004 proceeding, which is regarding the 9 '196 patent, and as you mentioned, the -- the IPR 10 proceeding, the institution was denied in that 11 proceeding, correct? 12 A Yes. That is what I was told. 13 Q And that was -- would you consider the 14 '196 patent and the patent we're talking about in 15 this proceeding, the '090 patent, to be in the 16 same area of technology? 17 A Very broadly speaking, yes. 18 Q And how would you describe, very broadly 19 speaking, the technology that we're going to be 20 talking about today? I want to get a shorthand or 21 something that you feel comfortable with. 22 A I think the patent titles or paraphrasing	20 1 Tell me what 3D audio is and how that -- 2 well, first, just -- just define for me 3D audio 3 or sound. 4 A That is also another way of saying the 5 same thing. I consider 3D audio a bit of a -- 6 what I would call a marketing term. It is just 7 easier, I guess, for lay people to understand. I 8 guess they have a notion of what 3-D means, but it 9 is basically the same thing. 10 Q The same thing when you say -- 11 A As -- as spatial audio. 12 Q Okay. So it is your testimony that 13 spatial audio and 3D audio are the same thing? 14 A They are used by different people to 15 describe the same thing, yes. 16 Q As a -- as -- you're an expert in this 17 field, correct? 18 A Yes. 19 Q As an expert in this field, you are 20 testifying that spatial audio and 3D audio are the 21 same thing? 22 MS. WANG: Objection, mischaracterizes

21 1 testimony. 2 Q You can answer. 3 A I'm just saying that depending on who you 4 talk to, several people use the word "3D audio" to 5 describe some of these phenomena. I don't know in 6 their mind what they're thinking when they say 3D 7 audio or when they say spatial audio, but in my 8 mind, they are in the same field at the high level 9 that we talked about in the beginning. 10 Q Okay. I'm going to drill down a little 11 bit because I don't -- I want to understand what 12 you believe, okay, as in -- first as an expert, 13 and then we can talk about a person of ordinary 14 skill in the art, but you are an expert in this 15 field, correct? 16 A Yes. 17 Q Okay. What is spatialized audio? 18 MS. WANG: Objection, asked and answered. 19 A Yeah, I believe I answered that already. 20 It is -- I could paraphrase it or we could look at 21 the record, but it -- spatialized audio, 3D audio, 22 and spatial audio, if you go to a technical	23 1 describe the spatialization of audio sources 2 around a listener. 3 Q So in your expert opinion, 3D audio and 4 spatial audio are the same thing? 5 MS. WANG: Objection, mischaracterizes 6 testimony. 7 A A set of algorithms that does what I just 8 said will be described by some people as 3D audio 9 and some people as spatial audio. 10 "The same thing" is a difficult thing to 11 answer. What does "the same thing" mean exactly? 12 They're not the same words, and so some people 13 decide to use one and some people decide to use 14 the other. It is hard to say out of context what 15 "the same" means. 16 Q I'm not asking about some people. I'm 17 asking about you and your opinion. And this is 18 not a hard question. I really need to know if 19 spatial audio and 3D audio are, in your expert 20 opinion, the same thing. 21 MS. WANG: Objection, asked and answered. 22 A Based on my experience, I have seen people
22 1 conference that has papers regarding these topics 2 or titles will have one or -- one of these 3 describing what they're doing, but they're all 4 describing various techniques, single processing 5 techniques to place. 6 Q Okay. So you're -- I just want to make 7 sure. As an expert in this field, your testimony 8 is that 3D audio and spatial audio are the same 9 thing? 10 MS. WANG: Objection, mischaracterizes 11 testimony. 12 A I am saying that they are describing 13 phenomena that are in the same category. 14 Q Okay. And that they are -- you can't give 15 me a different definition for 3D audio than 16 spatial audio? 17 MS. WANG: Objection to form. 18 A A different definition than what I already 19 gave? 20 Q What is 3D audio? 21 MS. WANG: Objection, asked and answered. 22 A 3D audio is a term that some people use to	24 1 use both terms in this field. I can't say 2 anything more about the same thing, because that 3 would require more context, like, are we talking 4 about a specific algorithm to do one -- to do 5 something or -- all I'm saying is that in this 6 field, people use both terms. 7 Q And do you use those terms 8 interchangeably? 9 A I do not. I use spatial audio. 10 Q Okay. How was 3D audio different than 11 spatial audio? 12 MS. WANG: Objection, asked and answered. 13 A It is just a different set of words that 14 some people have used for specific problems or 15 papers that they have written. Mostly I see it as 16 a marketing term, so publicity pieces use the 17 words "3D audio," but more recently it has been 18 "spatial audio," so I couldn't tell you what -- 19 what the difference is and why -- in my mind, 3D 20 audio came about around the time of 3D glasses 21 back in -- 25 years ago or more is when I started 22 seeing that term.

25 1 But again, it is just a set of words in 2 this field describing various phenomena or various 3 algorithms. 4 Q And you can't tell me the difference 5 between spatialized audio and 3D audio? 6 A Not without -- 7 MS. WANG: Objection, asked and answered. 8 A Not without having more context. Like if 9 this paper has a title that says 3D audio 10 something, I would have to see what it is about, 11 and this paper has a title spatial audio 12 something, I would have to see what it is about. 13 If they're the exact same algorithm, then 14 I could have one opinion, but if they're talking 15 about something else, then it might be a different 16 opinion. 17 Q Okay. So as an expert, sitting here 18 today, you can't give me a definition of 19 spatialized audio -- I'm sorry, of 3D audio that 20 is different than spatialized audio? 21 MS. WANG: Objection, mischaracterizes the 22 testimony.	27 1 Q Would you -- would you say spatialized -- 2 I'm sorry, spatial audio is a term of art? 3 A Yes. 4 Q And you gave me the definition for that. 5 Is 3D audio a term of art? 6 A I guess if we define term -- if we define 7 art as some people use it, yes, it is in this 8 field. 9 Q You're an expert in this field, correct? 10 A Right, but I don't use it. 11 Q Would a person of ordinary skill in the 12 art think there is a difference -- you are giving 13 testimony as a person of ordinary skill in the 14 art, correct? Would a person -- 15 A Correct. 16 Q -- of ordinary skill in the art have a 17 different definition for 3D audio than spatial 18 audio? 19 MS. WANG: Objection, asked and answered. 20 A I suspect that a person of ordinary skill 21 being asked the same question would give the same 22 answer. They would need more context.
26 1 A I think I gave you a definition earlier, 2 right. 3 Q Tell me how 3D audio is different than 4 spatialized audio. 5 MS. WANG: Objection, asked and answered. 6 A I don't know how else to say it. It is 7 different in words, and it might be different in 8 the context that it is being used, but without 9 that context, I couldn't tell you more precisely 10 how they're different. 11 Q Okay. So you can't tell me without more 12 context the difference between 3D audio and 13 spatialized audio? 14 MS. WANG: Objection, mischaracterizes 15 testimony. 16 A Yeah, I would need more context, yes. 17 Q So there is no typical industry term for 18 spatialized audio that is different than 3D audio? 19 A Spatialized audio is much more rarely 20 used. Spatial audio is -- I know it sounds like 21 almost the same thing, but that is the term -- 22 that is what I would consider a term of art.	28 1 Q Okay. Well, you're testifying here as a 2 person of ordinary skill in the art, correct? 3 A Right. 4 Q Okay. So you suspect or you know that? 5 A Well, it's -- based on my experience and 6 interactions with hundreds of people in the art, 7 I'm testifying that some of them would use the 8 word "3D" audio in conversation or in discussion 9 about something related to this field, and others 10 would use "spatial" audio. 11 Whether everybody in the art thinks that 12 they're the same or not, I can't testify to that. 13 I think they're just two different terms for a 14 general field that has to do with placing sounds 15 in space around one or more listeners. 16 Q So you just can't give me a definition or 17 a difference between 3D audio and spatial audio 18 without more context? 19 MS. WANG: Objection, asked and answered. 20 A Correct. 21 Q And your testimony is that there is no 22 definition that persons of ordinary skill in the

29 1 art would understand for 3D audio? 2 MS. WANG: Objection, mischaracterizes 3 testimony. 4 A There's no difference they would 5 understand -- I don't understand the question. 6 Understand it from that? 7 Q Give me the definition of what -- a person 8 of ordinary skill in the art, how they would 9 define 3D audio? 10 MS. WANG: Objection, asked and answered. 11 A I believe I answered that already. 12 It's -- it has to -- it is a set of technologies 13 that are used to place sounds around one or more 14 people. And there are many ways to do that, and 15 that's why I'm giving you these answers. Because 16 there are many ways to do that, the term is -- may 17 or may not be identical depending on how it's 18 being -- what's being implemented. 19 Q So a person of ordinary skill in the art 20 would -- would use spatial audio and 3D audio 21 interchangeably? 22 MS. WANG: Objection, mischaracterizes	31 1 Q Okay. So you can't give me a definition 2 that a person of ordinary skill in the art would 3 believe that 3D audio meant? 4 MS. WANG: Objection, mischaracterizes 5 testimony. 6 A I'm saying that based on my knowledge of 7 the art, a person of ordinary skill -- that people 8 of ordinary skill may choose one or the other 9 depending on the context that the discussion is 10 happening in. 11 Q What's the context that they -- that you 12 need to know to be able to answer this question? 13 A What methods are we talking about? 14 Q Okay. So you're just -- so your testimony 15 is that 3D audio and spatial audio are the same? 16 MS. WANG: Objection, mischaracterizes 17 testimony. 18 A No. I said I couldn't answer that without 19 more context. 20 Q So your testimony is that 3D audio -- your 21 testimony, as an expert here, is that 3D audio is 22 just putting sound around people?
30 1 testimony. 2 A No. I'm saying that a person of ordinary 3 skill in the art would have made a choice which 4 one of the two to use most of the time, but would 5 understand what is meant by the other when seeing 6 it referenced. 7 Q Okay. So you just gave me a definition 8 for spatial audio. How is 3D audio different to a 9 person of ordinary skill in the art? 10 MS. WANG: Objection, asked and answered. 11 A They're both trying to achieve the same 12 thing, but some people believe that 3D audio -- a 13 POSA might think that 3D audio applies to a 14 certain set of algorithms, while spatial audio 15 applies to a certain other set. Again, out of 16 context, I couldn't tell you. 17 Q So what set would a POSA believe that 3D 18 audio applies to? 19 A I don't know how to answer that. There's 20 literally thousands of ways to render sound 21 spatially around a person. I couldn't 22 characterize it as a subset.	32 1 MS. WANG: Objection, mischaracterizes 2 testimony. 3 A No. I said that people of ordinary skill 4 over the years, over the past few decades have 5 created methods for placing sounds around 6 listeners, and 3D audio is a set of words that 7 describes -- or that some people use to describe 8 those methods. 9 Q Can 3D audio be created with stereo audio? 10 A What -- what definition -- what are we -- 11 what are you defining as stereo audio? 12 Q You give me the definition of stereo 13 audio. 14 A I -- 15 MS. WANG: Objection. 16 A I have that -- I have that in my 17 deposition if you'd like me to point you to that. 18 Q Sure. But, I mean, you're an expert. Can 19 you tell me what stereo audio is basically? 20 A Yes, I will. So on page 36 of my 21 deposition, I have a diagram I think that's 22 helpful to describe it. And I refer to somebody

33 1 who did this that -- whose definition from 1958, 2 Olson, is used to today as well. 3 Q I'm sorry. Where are you? 4 A I'm on paragraph 47 of my '090 deposition. 5 Q You know, let me go ahead and put your -- 6 just -- I'm sorry, Dr. K. 7 MS. PARTRIDGE: Jesse, can you put up the 8 declaration of Dr. Chris Kyriakakis in support of 9 the petition for inter partes review for the '090 10 patent, please? And I want mark this as 1, 11 Exhibit -- 12 REMOTE TECHNICIAN: Stand by. What is the 13 name on that one to be sure? 14 MS. PARTRIDGE: Declaration of Dr. -- 15 let's call him Dr. K -- in Support of Petition for 16 Inter Partes Review of U.S. Patent 9,226,090. 17 REMOTE TECHNICIAN: One moment. Let me 18 make sure I have the right one. 19 Is it the one with file name 9,226,090? 20 MS. PARTRIDGE: Yes. Well, I hope so. 21 Let's look. 22 REMOTE TECHNICIAN: Okay. Stand by.	35 1 Q Okay. What paragraph? I forgot. 2 A It was paragraph 47, page 35. 36 is the 3 diagram, yes. So -- 4 Q 47 or 37? I'm sorry. 5 A 47, 47. That's the one that's on the 6 screen. It's a -- the concept that Olson calls 7 stereophonic, which is often abbreviated just to 8 stereo. And so it is -- and in the quotes, it is 9 a sound-reproducing system in which two or more 10 microphones are used to pick up original sound 11 from these sound sources, and the two resulting 12 channels -- I'm paraphrasing, but the two 13 resulting channels -- it makes more sense if we 14 scroll down to the diagram, slightly to -- 15 beginning of the next page, yeah. 16 So there are sound sources at the top, and 17 there are two microphones that are picking up 18 sound from those sound sources. And then for a 19 listener, shown there sitting in the middle 20 with -- the sound is being reproduced by two 21 loudspeakers, so that's stereophonic sound. It 22 requires loudspeakers to -- to reproduce.
34 1 MS. PARTRIDGE: Well, that's the patent. 2 This is his declaration. 3 Pat or Homa, can you help us locate that 4 file? 5 MR. DUNN: Jesse, this is Pat Dunn. It's 6 the list I sent you, it's -- the file name is 090 7 Patent_1003 IPR_Dec_kyriak.pdf. 8 REMOTE TECHNICIAN: Got it. Stand by. 9 Should be on screen now. 10 MS. PARTRIDGE: Yes, thank you. 11 (Exhibit 1 marked.) 12 Q And this is marked -- I'm going to show 13 you, Dr. K, what's been marked as Exhibit 1 in 14 your deposition. And it's the Declaration of 15 Dr. Chris Kyriakakis in Support of Petition for 16 Inter Partes Review of U.S. Patent Number 17 9,226,090. Do you see that on your screen? 18 A I do. 19 Q Okay. Is this the declaration that you 20 were just telling me about that you wanted to 21 refer to for your testimony? 22 A Yes, that is the one.	36 1 Q Okay. So stereophonic sound requires 2 loudspeakers to reproduce, correct? 3 A Yes. And it can be more than two. At the 4 time in 1958, two was a number. But it has -- you 5 know, by the time of the patents there are ways to 6 play two channels over more loudspeakers, but just 7 sending that signal to other loudspeakers as well. 8 Q Okay. But one of the requirements of 9 stereophonic sound is that there must be 10 loudspeakers, correct? 11 A Yes. 12 Q Okay. Is stereophonic sound different 13 than 3D audio? 14 A I would consider it a subset of 3D audio. 15 It's a -- it's a special case. When I talked 16 about -- earlier about 3D audio, it has the 17 ability to place sounds all around the listener. 18 Stereophonic sound has traditionally been 19 different positions of sound, but typically in 20 front of the listener. 21 Q Okay. So -- 22 A But that's still --

37 1 Q I'm sorry. Go ahead. 2 A I was going to say that's still different 3 positions, and so that's why I made it a subset -- 4 Q Okay. 5 A -- of 3D audio. 6 Q But stereophonic sound is different than 7 3D sound, correct? 8 MS. WANG: Asked and answered. 9 A Well, if 3D sound using loudspeakers is 10 used to just play sources in front, then I suppose 11 they could be called the same thing. I'm just 12 saying it's a subset. 3D sound is capable of 13 doing things beyond stereophonic. 14 Q So your testimony is that 3D sound and 15 stereophonic sound are the same? 16 MS. WANG: Objection, mischaracterizes 17 testimony. 18 A No. That's not at all my testimony, 19 completely different. 20 Q They're different, right? 21 MS. WANG: Objection, asked and answered. 22 A Yes.	39 1 So again, I'm paraphrasing paragraph 45 Olson, but 2 binaural sound requires -- it is a -- it is what 3 is called a closed circuit. And what that means 4 is that microphones are picking up signals and are 5 delivering them directly -- that is not the 6 diagram. Scroll up, please. Yeah, that is the 7 one. 8 So scroll a little bit more, please, so we 9 can see the sound sources as well. Yeah, there we 10 go. So binaural sound is called a closed circuit 11 type system and also calls it that, because as you 12 can see, there are wires representing channels of 13 information from the left microphone to the left 14 ear delivered over a headphone. At the time those 15 were called telephone receivers, and from the 16 right microphone delivered separately to the right 17 ear. 18 So information is picked up by microphones 19 that are spaced approximately the width of a human 20 head, and they pick up sound sources and deliver 21 them to headphones that independently talk to the 22 ears.
38 1 Q I'm sorry, I missed your answer. 2 THE WITNESS: Sorry, Grace. There's a 3 delay and I'm -- 4 A Yes, they are different. One is a subset 5 of the other. 6 Q They're different, correct? 7 MS. WANG: Asked and answered. 8 A They are different. One of them is a 9 subset of the other. 10 Q And tell me how they're a subset. How -- 11 which one is a subset of which one? 12 MS. WANG: Asked and answered. 13 A Stereophonic is a subset of 3D in the 14 sense that it limits the -- I don't know what you 15 call it -- the range of angles at which sounds can 16 be presented, whereas 3D is capable of doing that 17 plus more if required by the application. And 18 that's why I'm calling it a subset of 3D. 19 Q Okay. What is binaural sound? 20 A Binaural sound, if we scroll up a bit, is 21 a little different. So if we look at -- I guess 22 the diagram is probably easier to look at, yeah.	40 1 Q And this is -- Figure 2 represents 2 recording binaural sound and providing it to a 3 listener, correct? 4 A I'm not sure what you mean by "recording." 5 It can be live, and this doesn't show a recording 6 to tape, but it can also be recorded to tape or to 7 a hard disk or live, it doesn't matter. It just 8 shows that sound is coming into the microphones 9 and goes to the ears of the listener 10 independently. 11 Q So this shows capturing binaural sound and 12 providing it to the listener? 13 A Well, this diagram doesn't show us if this 14 is a live situation. It is just a schematic, but 15 this system can be used for capturing, yes. 16 Q Is binaural sound different than 17 stereophonic sound? 18 A Yes, absolutely. Generally the word 19 "aural" at the end means that it is delivered over 20 headphones, so that is one big difference, and the 21 word "phonic" at the end of the word means that it 22 is delivered over loud speakers. So that is one

41 1 big difference. 2 The technical difference is that with 3 stereophonic sound, which is delivered over 4 loudspeakers, each loudspeaker delivers sound to 5 both ears by sound traveling through the air. 6 With binaural, each headphone delivers 7 sound only to one ear and the other one to the 8 other ear. 9 Q Is binaural sound different than spatial 10 audio? 11 A Yes. 12 Q How is it different? 13 A It is the same answer as I gave for 3D 14 audio. Spatial audio can be -- is a term that is 15 used for rendering sounds around one or more 16 listeners, and it can use headphones or 17 loudspeakers. Binaural is a subset of that. 18 Q So in your view, spatial audio is -- 19 spatial -- it is spatial audio, right, not 20 spatialized? 21 A Yes. 22 Q I apologize. I keep using that	43 1 subsets earlier. You asked me if they're 2 different, and I said they are subsets of 3D 3 audio. They're also subsets of spatial audio. 4 Q Can you have 3D audio without headphones? 5 A Yes, you can. 6 Q And how do you do that? 7 A You use loudspeakers. 8 Q And how do you use loudspeakers to provide 9 3D audio? 10 A That is -- that is the topic of a two-hour 11 class lecture, so there are multiple ways to do 12 that. I guess -- I don't know how much detail we 13 want to go into. There are -- there are methods 14 for knowing what signals to send to either 15 loudspeakers or headphones to produce this 16 sensation of envelopment or surrounding the 17 listener with sound. There are multiple ways to 18 do it. 19 Q But one of the requirements of 20 stereophonic sound is that it's provided through 21 loudspeakers, correct? 22 A That is one of the requirements, yes.
42 1 incorrectly. 2 A No problem. 3 Q But spatial audio is kind of a broad 4 category that encompasses both binaural sound and 5 stereophonic sound? 6 A At least those two, but it also 7 encompasses something that we haven't talked 8 about, which is multichannel, which is -- I think 9 I mentioned it before, sound that comes from 10 multiple speakers, more than two. 11 Q Does it also cover 3D sound? 12 A Does what cover 3D sound? 13 Q Spatial audio. 14 A Oh. No, we talked about this. This -- I 15 think they both could be used here to describe 16 what we're talking about. And as I've said, some 17 people use one and some people use the other. 18 Q When you said they can both be used here 19 to describe what we are talking about, what do you 20 mean when you say "what we are talking about"? 21 A We were just talking about stereophonic 22 and binaural, and so -- and I said those are	44 1 Q And one of the requirements of binaural 2 sound is that it is provided through headphones, 3 correct? 4 A Correct. 5 Q So you cannot have binaural sound without 6 headphones? 7 MS. WANG: Asked and answered. 8 A No. 9 Q And you cannot have stereo without 10 loudspeakers? 11 MS. WANG: Asked and answered. 12 A Correct, you cannot. 13 Q So is 3D sound spatial sound? 14 MS. WANG: Asked and answered. 15 A 3D sound -- the words "3D sound" and 16 "spatial sound" are terms that are used to 17 describe methods and algorithms that place sound 18 around one or more listeners. They're both used. 19 Q Are they synonyms? 20 MS. WANG: Asked and answered. 21 A No. 22 Q Why not?

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45 1 A They're just different words for similar 2 phenomena. I don't know if that is the definition 3 of synonym. I don't think it is. 4 Q Well, you told me that they both are 5 regarding putting sound into space, correct? I 6 short-circuited that. So again, I'm just -- if 7 they're not synonyms, what is the difference? 8 MS. WANG: Mischaracterizes testimony, 9 asked and answered. 10 A The difference, I guess it comes down to 11 the preference of the POSITA in describing 12 phenomena that we talked about -- 13 Q Do you -- 14 A -- the binaural -- 15 Q Go ahead. I'm sorry, I interrupted you. 16 A No, that is it, describing these phenomena 17 that we've been talking about. So some people 18 will call that 3D audio, and others will call it 19 spatial sound. 20 Q So do you -- what do you call it? 21 MS. WANG: Asked and answered. 22 A I believe I answered that. I normally	47 1 3D audio? 2 MS. WANG: Asked and answered. 3 A There is not a list of methods. It is a 4 decision by the person discussing it what they 5 want to call it. 6 Q Okay. So these terms are just used 7 interchangeably by POSITAs? 8 MS. WANG: Asked and answered, 9 mischaracterizes testimony. 10 A I have seen POSITAs use one or the other. 11 Q Okay. So 3D audio and spatial audio are 12 used for the same thing by POSITAs? 13 MS. WANG: Asked and answered, 14 mischaracterizes testimony. 15 A I think if we jump back to your -- one of 16 your original questions, the general field that 17 we're talking about, I would say yes, they're both 18 used by POSITAs in the field of placing sounds 19 around listeners. 20 Q And they're used interchangeably in the 21 field; that is your testimony? 22 MS. WANG: Asked and answered,
46 1 call it spatial sound, unless I am reading a paper 2 that has a title that says 3D audio in it, in 3 which case I will refer to that as 3D audio. 4 Q Okay. So they're synonyms, right? 5 MS. WANG: Asked and answered. 6 A I don't think they're synonyms. 7 Q They mean the same thing, correct? 8 MS. WANG: Asked and answered, 9 mischaracterizes testimony. 10 A They are used in related discussions about 11 sound and envelopment and placement of sound in a 12 space. 13 Q So they both mean -- are describing sound 14 envelopment and placement in space? 15 MS. WANG: Mischaracterizes testimony. 16 A They are both -- well, each -- there are 17 methods for doing sound envelopment and 18 localization in space, and some people will refer 19 to some of those methods as 3D audio, and others 20 will refer to them as spatial audio. I couldn't 21 give you a grammatical definition or difference. 22 Q So which methods would be used to -- for	48 1 mischaracterizes testimony. 2 A They are used by -- some people use one 3 and some people use the other. 4 Q To describe the same thing, correct? 5 MS. WANG: Asked and answered, 6 mischaracterizes testimony. 7 A I don't know how to answer that without 8 knowing what that same thing is. They -- there 9 are, as I said, many, many different aspects of 10 how to achieve placement of sound around 11 listeners. Some of -- some of them might be 12 characterized by some POSITAs as 3D audio and some 13 others or the same might be characterized by other 14 POSITAs as spatial audio. It is a choice that -- 15 it is a personal choice, I think, of what is 16 preferred. 17 Q So POSITAs use 3D audio and spatial audio 18 interchangeably -- 19 MS. WANG: Asked and answered. 20 Q -- based on what is preferred? 21 MS. WANG: Mischaracterizes testimony. 22 A What I said was that POSITAs will use one

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49 1 or the other in the field of sound placement 2 around listeners. 3 Q But you can't give me any more specific 4 definition or way in which spatial audio and 3D 5 audio are different? 6 A Well, they're – 7 MS. WANG: Objection. 8 THE WITNESS: Sorry. 9 A They are – I would call them umbrella 10 terms that encompass multiple methods of sound 11 placement. So I don't know if there's a more 12 specific definition other than trying to convey – 13 they both try to convey the notion that there are 14 techniques being used and methods to place sounds 15 around one or more listeners. 16 Q Are there different methods that are 17 generally encompassed by 3D sound versus spatial 18 sound? 19 MS. WANG: Asked and answered. 20 A No, I don't think that – I'm not aware of 21 any list of methods under one or the other. 22 Q So that is all you can give me on the	51 1 would you use 3D audio and spatial audio 2 interchangeably? 3 MS. WANG: Asked and answered. 4 A No. I would pick one. 5 Q Which one would you pick? 6 A Spatial audio. 7 Q And why would you pick spatial audio? 8 A It's a – I like it better. 9 Q Okay. 10 A It's a personal preference. 11 Q And so you wouldn't use the term "3D 12 audio"? 13 MS. WANG: Asked and answered. 14 A If I'm writing a paper today? 15 Q Yes. 16 A No, unless I'm referring in that paper to 17 somebody else's work that used the word "3D 18 audio," in which case the words "3D audio" would 19 appear in my paper. 20 Q Because some people use those terms 21 interchangeably? 22 MS. WANG: Asked and answered,
50 1 difference between spatial audio and 3D audio, 2 correct? 3 MS. WANG: Mischaracterizes testimony. 4 A I thought that was a lot. Why do you say 5 that is all? 6 Q Do you use it interchangeably? 7 MS. WANG: Asked and answered. 8 A As I said, there are papers, technical 9 papers, that I've read that have that – one or 10 the other term in the title or in the – in the 11 paper itself. And so when referring to that 12 paper, I will use that. But there are others that 13 have it – the other one, so I'll use the other. 14 It depends on the context. 15 Q When you write a paper do you use the 16 terms "spatial audio" and "3D audio" 17 interchangeably? 18 MS. WANG: Asked and answered. 19 A I don't know if I – I have over 100 20 papers, so I'm not sure. I'm not sure what I did 21 in all of them. 22 Q When -- if you're writing a paper today,	52 1 mischaracterizes testimony. 2 A Some people use 3D audio, and some people 3 use spatial audio. 4 Q For the same thing, correct? 5 MS. WANG: Asked and answered, 6 mischaracterizes testimony. 7 A It is – if, by the same thing, we mean 8 the same algorithm, that would be very unlikely 9 that somebody – if, by same thing, we mean the 10 field of technologies, then some people use one, 11 and some people use the other. 12 Q For the same thing, correct? 13 MS. WANG: Asked and answered, 14 mischaracterizes testimony. 15 A What is your definition of "thing" here? 16 Q I'm just trying to figure out -- I don't 17 understand why this is such a hard question. I'm 18 trying to understand whether spatial audio and 3D 19 audio are the same thing or if there are some 20 differences between the two that you understand as 21 an expert. 22 A Because they don't refer to a single

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53 1 mathematical thing there are many ways to do 2 spatialization of sound around people and 3 listeners. It is hard to say that they're the 4 same thing or different. They are just an 5 umbrella term, a title for multiple things that 6 could be happening. And some people use one to 7 describe what they are doing, and other people use 8 the other. 9 Q So you can't tell me, as an expert in this 10 field, whether 3D audio and spatial sound are the 11 same thing or they're different? 12 MS. WANG: Asked and answered. 13 A I believe I said that they're different in 14 the way they are used by people, their personal 15 preference for algorithms in the field that we're 16 talking about. 17 Q How are they different? 18 MS. WANG: Asked and answered. 19 A They're different words. 20 Q I'll give you that. So when do persons in 21 the field use spatial audio? 22 MS. WANG: Asked and answered.	55 1 I'm not sure if it was 3D audio or 3D sound, but 2 close enough -- to describe methods, techniques, 3 and algorithms that are used to place sound around 4 one or more listeners. 5 Q And how is spatial audio defined? 6 MS. WANG: Asked and answered. 7 A Spatial audio is a term that some people 8 use to describe algorithms used to place sounds in 9 space around one or more listeners. 10 Q And how are 3D audio and spatial audio 11 different? 12 MS. WANG: Asked and answered. 13 A They are different only in the choice of 14 words that the person describing them has made. 15 Q But they both mean methods and algorithms 16 that are used to place sound around one or more 17 persons? 18 MS. WANG: Mischaracterizes the witness' 19 testimony. 20 A They are both used to describe those kinds 21 of algorithms, yes. 22 Q Would you say that one more time?
54 1 Q What method, what's different than when 2 they use 3D audio? 3 MS. WANG: Asked and answered, compound. 4 A I don't know if there's a method. I think 5 it's just a preference. 6 Q So it's just a preference. Some people 7 might use 3D audio, and some people might use 8 spatialized sound to mean the same thing in the 9 industry? 10 MS. WANG: Mischaracterizes the witness' 11 testimony. 12 A I agree with you until the "thing" part, 13 because to -- they -- some people would use one 14 and -- or the other to describe things algorithms 15 in the field of sound placement movement that 16 we're talking. 17 Q Okay. We can start over again because I 18 have a lot of time, okay, lot of time today. 19 What is 3D audio? 20 MS. WANG: Asked and answered. 21 A 3D audio is a term that some people use, 22 including Dr. Begault in the title of his book --	56 1 A Both terms are used to describe those 2 kinds of algorithms. 3 MS. PARTRIDGE: Okay. Let's go off the 4 record for 10 minutes. 5 VIDEOGRAPHER: We are going off the 6 record. The time is 12:06. 7 (Recess, 12:06 p.m. to 12:20 p.m.) 8 VIDEOGRAPHER: We are back on the record. 9 The time is 12:20. 10 Q Hello, Dr. K. Welcome back. 11 A Thank you. 12 Q Do you still have -- I think Exhibit 1 is 13 your declaration? 14 A Yes. 15 Q And I am moving to paragraph 50. 16 A Paragraph 50. 17 MS. PARTRIDGE: And, Jesse, can you put 18 the -- thank you. 19 Q Can you see that, Dr. Begault? I'm sorry. 20 Dr. K, do you see that? 21 A Yes, I see it. 22 Q Okay. Paragraph 50 of your declaration in

57 1 this matter, correct? 2 A Correct. 3 Q Okay. And it is entitled ITD, correct? 4 A Correct. 5 Q What does ITD stand for? 6 A It's an abbreviation for interaural time 7 difference. 8 Q Okay. And what is interaural time 9 differences? 10 A It is the -- 11 Q I'm sorry. I was going to say -- maybe I 12 should say, what are interaural time differences? 13 A I think actually singular is fine, because 14 it is the time difference -- it's the difference 15 in time of arrival of a sound in the two ears. 16 Q That's what you say in your -- paragraph 17 50 of your declaration, correct? 18 A Yeah. That's basically -- I'm quoting a 19 review paper that I wrote in 1998 talking about 20 these topics, but yes -- 21 Q Okay. 22 A -- that's what I'm saying.	59 1 A It would be zero. 2 Q Now, what would the ITD be if the sound is 3 directly behind the listener? 4 A If it's in the symmetric position from 5 what's shown here, 180 degrees behind, it would 6 also be zero. 7 Q Okay. Now, then you go on -- and this is 8 on the next page. It's paragraph -- I'm sorry. 9 Somehow I got a printout of your declaration, and 10 it doesn't have the page numbers on it. So I have 11 to use paragraphs. 12 A Okay. That's -- 13 Q But on the very next page -- 14 MS. PARTRIDGE: Go back just a little bit, 15 Jesse. Right here. Stop. 16 Q Do you see where -- the writing in the 17 middle that starts with "but," can you read that, 18 please? 19 A But sound from a source positioned to the 20 left of the listener will arrive at the left ear 21 slightly before it arrives at the right ear as 22 depicted in Figures 13C and D of the '628, meaning
58 1 Q And then can you read the next sentence, 2 please, of your declaration in paragraph 50 starts 3 with "for example"? 4 A For example, and as the patent recognizes, 5 when a sound source is positioned directly in 6 front of the human listener, the sound generally 7 arrives at each ear of the human listener at the 8 same time as depicted in Figures 13A and B of the 9 '628 patent. That -- 10 Q Okay. 11 A I'm sorry, if I could just -- I meant to 12 do this in the beginning, and I forgot. There's a 13 cut-and-paste typo. Of course, I was talking 14 about the '090 patent, but it's the same figure, 15 not the '628. 16 Q Okay. 17 A Yeah. 18 Q I got it. Thank you for that. 19 So what would be the ITD -- would the 20 IT -- what would -- what would the ITD be if the 21 sound arrives at each ear of the human listener at 22 the same time?	60 1 '090, patent. 2 Q Right. Okay. So there is -- when a 3 source is not directly in front or directly 4 behind, there's a delay between when the sound is 5 heard by your right ear or in your left ear, 6 correct? 7 A Correct. 8 Q Okay. And I think you told me that that 9 difference in arrival time between the two ears is 10 the ITD, correct? 11 A Interaural means between the two ears, 12 just a fancy word for that. 13 Q Doctor, I may have to put my hearing aides 14 in. I apologize. But I just missed your answer 15 to that one, and I apologize. 16 A No problem. So the I in ITD stands for 17 interaural, and that means between the two ears. 18 Q Okay. And so what would be the maximum 19 difference in arrival time in the delay for 20 something to be considered an ITD? 21 A Okay. So that question, the first part of 22 it makes sense to me, the second part doesn't.

61 1 Any -- any difference including zero is considered 2 an ITD. So I will answer that and then we can go 3 back to it if needed. 4 The maximum time -- time difference is 5 shown in -- shown, but the situation in which that 6 would arise is shown in Figure 13. And to give 7 you a number, I would have to know the size of the 8 person's head. And as we know, some people have 9 bigger heads than others. So it is approximately 10 600 microseconds is the maximum time difference 11 for an average sized head. 12 Q And that would be .6 milliseconds I think 13 that is, I could be wrong. 14 A No, that is correct. 15 Q Okay. So let me make sure I'm saying this 16 correctly. So for an average sized head, the 17 maximum amount of delay for an interaural time 18 difference is around .6 milliseconds? 19 A Yes. And it arises in the situation shown 20 here, but that's -- that's the biggest you can 21 make the difference. Anything on the other angles 22 would be a smaller difference.	63 1 denote that there is some delay in the sound 2 reaching the listener's ear? 3 A Yes, in a different context though. 4 Echo -- we can think of echo as a copy of a sound 5 that arrives after, later than the original sound. 6 And so depending on the direction that it is 7 arriving from, it will be different -- two 8 different concepts of delay. 9 One is -- if we think of echo as arriving 10 from this direction, 1350 in Figure 13C, it will 11 still be a delay between the two ears, but also 12 there will be a delay as compared to the original 13 sound, between the original sound and the echo. 14 Q Is there a typical amount of time that is 15 considered an echo for a typical head? I don't 16 know if you need "typical head" in that, but is 17 there a -- go ahead, answer, and then I'll try to 18 do better. 19 A Okay. 20 MS. WANG: Objection, vague. 21 MS. PARTRIDGE: Good objection. 22 A I guess it depends on the kind of echo
62 1 Q And when you say "as shown here," what are 2 you talking about? 3 A I'm talking about Figure 13C where the 4 sound source is directly in the direction of the 5 left ear of the listener. 6 Q And that would be when you would see this 7 maximum ITD, is when it's either directly left or 8 directly right of the ear? 9 A That's right, because for the sound to get 10 to the other ear, it has to, in lay terms, travel 11 around the head, and that's where the size of the 12 head comes in. 13 Q I'm just working through your declaration 14 a little bit here. I'm on paragraph 52. I would 15 give you the page number, but I don't have it. 16 A I have it. It is okay. 17 MS. PARTRIDGE: Jesse, did you go to 18 paragraph 52? 19 Q Just so you will have that for reference, 20 and so -- I'm sorry, let me go back to just a 21 couple of questions about ITD. 22 What other -- does, for instance, echo	64 1 that we're talking about. If you stand at the 2 Grand Canyon, you will hear an echo that is 3 probably 1 or 2 seconds late. It doesn't really 4 depend on the size of the head, as you said. 5 So maybe you could -- I'm not sure what 6 you're -- you really want to ask here. 7 Q So as far as delay is concerned with echo, 8 is it larger than the delay that we're talking 9 about with an ITD? 10 A Oh, I see. It can be, depending on how 11 far the echo is coming from. It will be a larger 12 number, but it would be a number that would be 13 seen by both ears. 14 Q Okay. So it is different than an ITD, 15 correct? 16 A Well, those are not comparable. The 17 arrival of echo -- an echo is an acoustic 18 difference and echo is a time difference, so 19 they're not -- but the delay of an arrival of an 20 echo can be very large or it can be very small. 21 It depends on how far it is coming from. 22 Q Okay. Is it typically larger than the

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65 1 delay that we're talking about with an ITD? 2 MS. WANG: Asked and answered. 3 A If the echo is a reflection from a wall 4 near the listener, that wall can be very close and 5 it could be -- it could be the same or smaller. 6 If the echo is from a big open space, a 7 building across the courtyard, then it would be 8 bigger. So it can take on many different values 9 of delay. 10 Q So I think your testimony is that an echo 11 could be smaller -- the delay with an echo could 12 be smaller than the delay with an ITD? 13 MS. WANG: Mischaracterizes testimony. 14 A Right. I said that the delay of an 15 echo -- the delay of an echo is not the delay 16 between the two ears. The delay of an echo is the 17 delay relative to the sound that created the echo. 18 And so that delay between when the 19 original sound cannon was created and when the 20 echo arrived can be larger or smaller than what 21 would be seen for an ITD. 22 Q So an echo could be smaller than .6	67 1 it is very common to sit next to a wall. Most 2 home settings have a couch right up against the 3 back wall, so you are -- your head could be just a 4 few centimeters from the back wall in many, many 5 situations. 6 To answer that requires more information 7 about the room, because if we're talking about a 8 room, echos are sometimes called reflections 9 develop -- depending on what materials are in the 10 room. And so the acoustics -- the acoustic 11 materials in the room could influence the arrival 12 of echos. 13 Q Okay. And in general, an echo can be .6 14 milliseconds or less, the delay? 15 MS. WANG: Asked and answered. 16 A As I say, there is a range that it can 17 cover, and yes, it can be less than .6. 18 Q What is the range, the typical range for 19 an echo? 20 A That is hard to answer without knowing 21 more about the room. It depends on where the 22 sound source was and where the echo -- how the
66 1 milliseconds? 2 A You mean the time of arrival of an echo? 3 Q Yeah, I didn't say that right, and I 4 apologize. Yes. 5 A I understood, yes. So, right, if there is 6 a -- if there is a wall, let's say, a few 7 centimeters from the left ear of the listener, 8 the -- and the sound source is played somewhere 9 else in the room, the echo would arrive perhaps at 10 a smaller -- it depends on the distance of the 11 wall, but it could be, yes. 12 Q What if it is in a typical room? I mean, 13 most people don't stand -- I mean, maybe you do, 14 but hopefully it is not being tortured or 15 something, you stand that close to a wall. 16 What about in a typical situation, is the 17 echo typically -- the delay of the echo generally 18 longer than the delay of an interval time 19 difference? 20 MS. WANG: Objection, vague, calls for 21 speculation. 22 A Well, you would be surprised or not, but	68 1 echo is created, like, so -- 2 Q Okay. 3 A -- it is hard to say without knowing more 4 specifics. 5 Q Okay. What about, what is reverberation? 6 A Reverberation is a phenomenon that happens 7 when there's a sound source in a room, let's say, 8 and it is playing something. And when it stops, 9 we can still hear that sound source. 10 You might be experiencing that in a church 11 or other big space where that will take much 12 longer to subside or in a small room where it will 13 be much faster. So reverberation time is the time 14 that it takes for sound to decay after the sound 15 has stopped. 16 It is caused by reverberation, which is 17 thousands or hundreds of thousands of reflections 18 that are happening from the sound source in the 19 room. That is why they linger in the room. 20 Q Is reverberation the same as echo? 21 A Well, echo -- it is not the same. I guess 22 we could say reverberation consists of many, many

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69 1 echos, reflections, yeah. 2 Q Is there a typical -- we're still talking 3 about a delay in -- with reverberation, correct? 4 There's a delay in the sound waves reaching the 5 ears? 6 A Yes. 7 Q And is that -- is a -- I don't know, I'm 8 just trying to find out, is a reverberation delay, 9 like, comparable to an echo delay, or is it 10 different than an echo delay? 11 MS. WANG: Objection to form. 12 A It depends on -- on the room. So if your 13 room is all padded curtains, they could be very 14 close to each other because it doesn't have time 15 to develop very long delays, but if it's a marble 16 space, it will take longer. So it can be a range. 17 Q Okay. So reverberation would take longer 18 than an echo? 19 A Those are not really comparable points. 20 Typically an echo is one discrete copy of a sound 21 that arrives at a certain time later, as we said, 22 depending on where it is coming from, what caused.	71 1 milliseconds be perceived by the human brain as 2 separate? 3 MS. WANG: Objection, vague. 4 Q Let me restate the question. Strike that. 5 Can a delay of less than 20 to 30 6 milliseconds be perceived by the human brain? 7 MS. WANG: Objection, vague, calls for 8 speculation. 9 A So which delay are we discussing here? 10 Which delay -- what kind of delay are we talking 11 about? Between what and what? 12 Q As in interaural -- I'm sorry, a delay in 13 echo. 14 A Okay. So we have a sound, and then an 15 echo of that sound arrives 20 to 30 milliseconds 16 later? 17 Q Right. 18 A Yes, it can be perceived. 19 Q What about -- I'm sorry, it can be 20 perceived as separate by the listener? 21 A Oh, no, it can be perceived that it is 22 present, but that there is a -- that there is a
70 1 -- reverberation is once -- multiple copies that 2 are happening at different times because the room 3 has different surfaces. 4 Q Okay. 5 A So I can't really compare them directly. 6 Q Can you compare it to an ITD? 7 A The reverberation? 8 Q Correct. 9 A No, not really. The ITD has to do with 10 the delay of sound, so I guess reverberation comes 11 from everywhere, so no, it is hard to say what the 12 ITD of reverberation would be. 13 An echo usually comes from one direction, 14 so it would have two aspects of delay. One is the 15 total time it took to get there to your head, and 16 the second is, did it reach one ear before the 17 other, in which case, that would be the ITD. 18 Q Okay. So they both deal with the delay, 19 but they're -- they're dealing with different 20 delays? 21 A That's right. 22 Q Can a delay of less than 20 to 30	72 1 reflection or an echo. 2 Whether we hear it as a distinct, separate 3 sound depends on the training of the listener, so 4 we can be trained to hear very short differences. 5 The average person may or may not perceive 6 it. I can't say without knowing -- without 7 testing them. 8 Q Okay. So there is nothing like standard 9 in the industry or typical that a human brain can 10 perceive? 11 MS. WANG: Calls for speculation. 12 Q You're an expert. 13 A Yeah. No, I understand. 14 It is a range. It depends on the 15 experiment and how it is conducted. So I don't 16 know of a single value to give you that would be 17 the threshold. 18 Q Okay. So let me just make sure. Your 19 testimony is that 20 to 30 milliseconds delay 20 could potentially be perceived by the human brain 21 as separately? 22 MS. WANG: Mischaracterizes the witness'

73 1 testimony. 2 A That is not quite what I said. I said 3 that if we have a sound, and then we create a 4 delay, an echo of that sound that is 20 to 30 5 milliseconds later, and we play them both, a 6 listener would know that that is -- would perceive 7 the difference between that and not having the 8 echo. 9 Q Even if it -- I'm sorry, even if the delay 10 was only 20 to 30 milliseconds? 11 A Yes, they would perceive a difference 12 between that and no echo. Whether they would 13 perceive it as an echo copy is a -- is dependent 14 on the listener. 15 Q And there is nothing typical -- that a 16 typical listener that you are aware of as an 17 expert that a -- that a typical listener can 18 perceive? 19 MS. WANG: Asked and answered. 20 A I'm not aware of a single number. I have 21 seen -- and I've done these experiments myself. 22 I've seen quite a range.	75 1 Q From where? 2 A I'm sorry, I still have the '628 patent 3 open. Sorry. I was reading -- 4 Q Wait. So wait. So you're opening other 5 things because we need to be careful when you're 6 doing that, because then I don't know what the 7 record is. Okay? 8 A I apologize. I will close that file. 9 Q Yeah. You -- but -- 10 A Yeah. I apologize. It -- 11 Q I'm not trying to -- 12 A -- file. 13 Q -- scold you, but then I don't know what 14 you're doing, so -- 15 A Sorry. 16 Q -- if you need to look at something, let 17 me know, and we should have it as an exhibit, 18 although I don't have the '628. 19 A Okay. 20 Q But do you have anywhere in your 21 declaration first -- let's just start with that -- 22 in Exhibit 1 the definition of head-related
74 1 Q Okay. Okay. Let's move to paragraph 52. 2 If you want to read through that, and just let me 3 know when you're finished. I'm just going to ask 4 you some general questions. 5 A Okay. 6 Q Are you ready? 7 A Yeah. I'm ready, yes. 8 Q You probably said that, and I missed it. 9 A That's okay. 10 Q Sorry. So just what is HRTF? 11 A It's an acronym for the quantity that's 12 call the head-related transfer function. 13 Q Okay. And what is a head-related transfer 14 function? 15 A So in the context of these patents, I was 16 given a definition that Eight KHz uses, and so I 17 used that, which is functions that describe 18 transformation of sound that modify the spectrum 19 and time of arrival at a listener's ears. 20 Q Are you reading that from something? I'm 21 sorry. 22 A I'm reading it from the -- further up.	76 1 transfer function? 2 A The exact -- not as a definition. I'm -- 3 are you talking about here in paragraph 52? 4 Q Right. 5 A So -- 6 Q Or -- 7 A -- 53 -- 8 Q -- in your declaration anywhere. 9 A I -- the reason -- the reason I had my 10 previous statement that I got scolded about is 11 because I was using that definition to make my 12 assessment of any -- you know, things that have to 13 do with HRTF in these patents. 14 But the answer to your question is I don't 15 believe I have a definition. I just have 16 descriptions in paragraph 52 and 53. 17 Q Okay. Well, first tell me, as an expert, 18 how you would define head-related transfer 19 function, and then we can go, if you want to, to 20 the '090 patent. 21 A So I didn't opine on a definition. I 22 described here kind of what it involves. And

77 1 because I was doing this kind of holistically 2 across multiple patents, in my assessment of prior 3 art, I used the Eight KHz definition. 4 Q And what is that definition? 5 A I have to open the other file again. I 6 don't want -- 7 Q Let's go -- you want to look at the '090 8 patent to tell me what that definition is? 9 A It's the -- we're in the '090 patent now, 10 right? 11 Q I'm sorry, Dr. -- 12 A It was in the '628 patent. 13 Q So there's no definition of head-related 14 transfer function in the '090 patent? 15 A No. That was -- the definition I read 16 from before was in the -- in the -- in the claim 17 construction section of the '628, but I don't 18 believe there is one of that in the '090. 19 Q Do you have a definition, as an expert in 20 this field, of what a head-related transfer 21 function is? 22 A As I said, I used -- to give you that	79 1 matter? 2 A No. I have a statement saying that I was 3 asked to use the definition that Eight KHz 4 provided. 5 Q And where is that definition? 6 A If you allow me to open it again, I 7 will -- 8 Q Tell me what you're opening, I'm sorry. 9 A The '628 -- '628 declaration. 10 Q Okay. I have that as an exhibit, so -- 11 A Okay. 12 Q -- we can pull it up, and tell me what 13 paragraph you're talking about. 14 A I need to open it again to see. It's in 15 the introduction section, or, no, sorry, not the 16 introduction section. It's in the -- 17 MS. PARTRIDGE: Jesse, there should a 18 declaration of Dr. K in the '196 -- in the IPR 19 petition for the '196 patent. 20 REMOTE TECHNICIAN: Stand by. 21 A Okay. Just for the record, I was talking 22 about the '628, but --
78 1 answer, I need to -- there's more context that's 2 needed to give a definition as with everything 3 that we talk about. I was asked to use the 4 definition provided in the claim construction 5 by -- by Eight KHz, and that's what I used. So as 6 far as -- as far as my declaration is concerned, 7 that is the definition that I'm using. 8 Q Okay. Where is that in your dep -- your 9 declaration? 10 A Where is what? 11 Q Where do you say -- 12 A That I use -- 13 Q -- that that's the definition of HRTF that 14 you're using? 15 A I believe it's in the -- I know it's in 16 the '628, '628, yeah. 17 Q I'm sorry. Are you saying something 18 because it's breaking up? 19 A I don't believe I have that wording in the 20 '090 declaration. I have it in the '628. 21 Q You have your definition of HRTF in your 22 declaration for the '628 patent, in the '628	80 1 Q The '628, I'm sorry. 2 A And it's paragraph 83. 3 Q So that's your definition -- well, so read 4 that into the record so I will be able to 5 understand, because -- what you're talking about 6 for HRTF. 7 A Okay. But put it in context, let me just 8 read -- it's a short paragraph. Paragraph 83: I 9 understand that patent owner contends certain 10 claim elements in the '628 patent should have 11 their plain and ordinary meaning, specifically I 12 understand that Eight KHz's position is that if 13 construed, the below terms in the '628 patent 14 should have the following meanings. 15 And there are three terms there, telephone 16 call, HRTF, and wearable electronic device. We 17 are talking about HRTFs. And it says: It should 18 mean functions that describe transformation of 19 sound that modify the spectrum and time of arrival 20 of a listener's ears. 21 And then I conclude by saying: I have 22 applied the plain meaning of the terms and phrases

81 1 in the claims in my analysis as a POSA would have 2 understood those terms and phrases at the relevant 3 time around 2014 and, where applicable, have also 4 applied Eight KHz's position as I understand them. 5 However, it is my opinion that the prior art 6 relied on in the grounds set forth below discloses 7 the subject matter of the challenged claims under 8 any reasonable construction, including their plain 9 meaning. 10 Q Okay. So do you agree that -- that 11 HRTF -- do you agree with that definition of HRTF 12 as a -- as a person of ordinary skill in the art? 13 A I did not opine on it. To give a -- to 14 give my own definition, I would have to spend some 15 time to give a concise definition for claim 16 construction purposes. I agreed to use it as is. 17 Q Understood. I'm not asking you for claim 18 construction purposes. I am asking you, as an 19 expert in the field, do you agree with that 20 definition of HRTF? 21 MS. WANG: Asked and answered. 22 A I don't know if I can answer that on the	83 1 answering -- 2 Q So give me the different contexts. 3 A -- the definition. 4 Q You're an expert in this field, right? 5 A Right. 6 Q And this is an important term in the 7 field, right, HRTF? It's pretty important, right? 8 A It's a commonly used term, yes. 9 Q So what does it mean to you as an expert? 10 MS. WANG: Asked and answered. 11 A It means to me what I said in those two 12 paragraphs. 13 Q Okay. So that's the definition of HRTF 14 that you're using? 15 MS. WANG: Asked and answered, 16 mischaracterizes the witness' testimony. 17 A No, that's not the definition. The 18 definition I'm using is the one we just read 19 before from the claim construction. Paragraphs 52 20 and 53 are representing some of the concepts that 21 relate to HRTF that a POSITA would know. I didn't 22 write it in the form of a definition or a claim
82 1 spot. I need to -- need to read it some more and 2 look at some context in which it's used in order 3 to give a good answer to that. 4 Q Okay. How would you -- not looking at 5 that answer, how would you, as an expert, define 6 HRTF? 7 MS. WANG: Asked and answered. 8 A I think my discussion -- going back to the 9 '090, my discussion of HRTF in paragraphs 52 and 10 53 represents my opinion of what is involved. 11 Q So paragraphs 52 and 53 of Exhibit 1 you 12 believe is your definition of HRTF? 13 A I don't know if I would call it 14 definition. It is my description of what is 15 involved in HRTFs. As I said, I wasn't asked to 16 provide a definition. 17 Q Yeah. I'm asking you to provide a 18 definition as an expert in this field. Do you 19 know what HRTFs are generally as an expert? 20 A That's the problem. Generally and in the 21 context of certain applications, the answer could 22 be different, and that's why I'm not comfortable	84 1 construction sentence because I was not asked to 2 do that. 3 Q Okay. 4 A So I'm not comfortable doing it now 5 either. 6 Q So you can't, sitting here today as an 7 expert, give me your definition of HRTF? 8 MS. WANG: Mischaracterizes the witness' 9 testimony. 10 A Beyond what I just said, I am not 11 comfortable giving a definition. I think what we 12 just discussed has my opinions about what HRTFs 13 are. I just don't know if it's in the form of a 14 definition that you're looking for. 15 Q So what's the definition of HRTF? 16 MS. WANG: Asked and answered. 17 A The definition that I used is the one that 18 we read from the claim construction. The things 19 associated with HRTFs in the field that a POSITA 20 would know are in paragraph 52 and 53. 21 Q Do you agree with the definition of HRTF 22 that you're applying?

85 1 MS. WANG: Asked and answered. 2 A I did not form an opinion on that. 3 Q Well, I'm asking you to form an opinion on 4 that. 5 A Well, what I'm saying is I don't know if I 6 can do that without going back and reading many, 7 many things and documents that -- in which the 8 term is used because it can't be just defined 9 without context. 10 Q Okay. So you can't give me a definition, 11 sitting here today? 12 MS. WANG: Asked and answered. 13 A Not in the next 30 seconds, no. 14 Q I will ask you again later. Can you give 15 me a definition in an hour? 16 A I don't know. I don't know how long it 17 would take me to read all the related documents 18 again. 19 Q So as an expert, you need to read 20 documents to be able to tell me what a commonly 21 used term in the industry is? 22 A Yes, because every term that we talk about	87 1 A The description of the factors that are 2 involved in HRTF, yes, are in paragraphs 52 and 3 53. 4 Q So what does HRTF mean to a person of 5 ordinary skill in the art? 6 MS. WANG: Asked and answered. 7 A My definition for it in this writing of 8 the -- of my declaration was what Eight KHz said 9 it means. 10 Q And is that the definition that a person 11 of ordinary skill in the art would apply to HRTF? 12 A If they were asked -- 13 MS. WANG: Asked and answered. 14 A If they were asked by their -- by the 15 attorneys to use the definition that is provided, 16 then yes, that is the definition that a person of 17 ordinary skill would use. 18 Q Okay. So the definition in the 19 declaration of the '628 -- your declaration, the 20 definition of HRTF in the '628 declaration is one 21 that a person of ordinary skill in the art would 22 apply for HRTF?
86 1 is in the context of the totality of the documents 2 involved in this -- in this IPR. 3 Q I'm asking you not about this IPR. I'm 4 asking you as an expert in this field what HRTF 5 means. 6 MS. WANG: Asked and answered. 7 A My opinions about what -- what is involved 8 in HRTFs are in paragraphs 52 and 53. 9 Q What is your definition of HRTF as an 10 expert in this field? 11 MS. WANG: Asked and answered. 12 A If definition means a sound bite, then I 13 don't have one at the moment. 14 Q I'm not trying to get a sound bite. I'm 15 trying to get a definition because you're an 16 expert in this field. 17 A Right. So that is why I wrote paragraphs 18 52 and 53 to explain all of the relevant concepts 19 that go into an HRTF, the concept of an HRTF. 20 Q So the definition of HRTF is in your 21 paragraphs 52 and 53 of your -- of Exhibit 1? 22 MS. WANG: Mischaracterizes testimony.	88 1 MS. WANG: Mischaracterizes the witness' 2 testimony. 3 A If they were asked to use that by the 4 attorneys. 5 Q So are you telling me that is the 6 definition that a person of ordinary skill in the 7 art would use? 8 MS. WANG: Asked and answered. 9 A I'm saying that is what they would use if 10 in the instructions given to them when they were 11 writing the report, they were told, use this 12 definition. 13 Q Those are ridiculous answers. 14 A Thank you. 15 Q I want to know whether you can tell me as 16 an expert the definition of HRTF. This is a 17 common term, right? 18 A It is a commonly used term, and that is 19 why it took me let's say a paragraph and a half to 20 describe it, because it involves many aspects that 21 need to be taken in the context of what we're 22 talking about.

89 1 Q If I wanted to know a definition that is 2 accepted in the industry of HRTF, where would I 3 look? 4 A Are you asking me for a reference? 5 Q Sure. 6 A I don't have one off the top of my head. 7 Q Is there a general reference dictionary 8 that persons refer to in your industry? 9 A A dictionary for these technical terms 10 that they refer to? No, I don't believe there is. 11 Q What is a dictionary definition of HRTF? 12 A I don't know. I have never looked it up 13 in the dictionary. 14 Q So you just don't know, or you can't give 15 me, or you won't give me, sitting here today, a 16 definition of HRTF that you, as an expert, would 17 use? 18 MS. WANG: Mischaracterizes testimony, 19 asked and answered. 20 A I am using it here as written, and that is 21 the definition that I -- 22 Q That is the definition your attorneys told	91 1 meaning is head-related transfer function? 2 A That -- 3 MS. WANG: Vague, mischaracterizes 4 testimony. 5 A That is the plain and ordinary meaning, 6 yes. 7 Q So the plain and ordinary meaning to you 8 that you have applied for HRTF is head-related 9 transfer function? 10 MS. WANG: Mischaracterizes testimony. 11 A I don't know if I can break it up as to 12 just one or the other. I use the combination of 13 plain and ordinary meaning and the definition of 14 the claim construction proposed by Eight KHz, and 15 then I checked that box and said, this is what I'm 16 going to use as I look through the prior art and 17 everything else in the patents to form my opinion. 18 Q Okay. Are you making -- is that how a 19 person of ordinary skill in the art would define 20 HRTF? 21 MS. WANG: Asked and answered. 22 A I don't know if a POSITA would have an
90 1 you to use, correct? 2 A Correct. So I did not opine on anything 3 beyond that. There was no point. 4 Q So you're not using, in your testimony, 5 what a person of ordinary skill in the art -- how 6 a person of ordinary skill in the art would define 7 HRTF, correct? 8 MS. WANG: Mischaracterizes testimony. 9 A As I read at the end of that paragraph 83 10 from the '628, in addition to the -- I'm 11 paraphrasing -- in addition to the position by 12 Eight KHz, I also applied plain and ordinary 13 meaning. So it is the combination of those things 14 that informed my opinion as to how to look for 15 HRTF in the -- in the prior art. 16 Q So what is the plain and ordinary meaning 17 of HRTF? 18 MS. WANG: Asked and answered. 19 A It is what the words say. It is a 20 transfer function related to the head. 21 Q Okay. So your definition of HRTF as a 22 person of ordinary skill -- of plain and ordinary	92 1 answer to that without context. Where is it being 2 applied, how -- there is many different ways that 3 this can happen and be implemented, and so that is 4 why context is needed. 5 Q Okay. What context do you need to be able 6 to define HRTF? 7 A The context is what -- the context that I 8 used it in is here. It has to do with everything 9 that we're talking about in these patents. 10 Now, in the hypothetical, what other 11 context I would need for another definition that's 12 slightly different, I don't know. I don't know if 13 I can answer that. 14 Q You are making opinions today based on a 15 person of ordinary skill in the art, correct? 16 A Yes. 17 Q The whole context of what opinions you're 18 in, correct? 19 A Yes. 20 Q And you're making opinions regarding HRTF, 21 correct? 22 A Yes.

93 1 Q Okay. And all I'm trying to find out, 2 because I think this is a really major basis of 3 your opinions here today, is what your definition 4 of HRTF is as a person of ordinary skill in the 5 art. 6 MS. WANG: Asked and answered, form. 7 A I didn't form my own opinion about a 8 definition and use it in anything that I opined 9 on. I used the definition that was provided and 10 then formed my opinions using that. 11 Q So you applied the claim construction 12 opinion that you told me about, right? 13 A Yes. 14 Q And then you made your opinions as a 15 person of ordinary skill in the art, right? 16 A I made opinions about where HR -- yes, 17 about -- anywhere HRTFs are involved in what we're 18 talking about, I used that -- my opinions are 19 formed based on that definition, yes. 20 Q Okay. And that definition is a definition 21 that a person of ordinary skill in the art would 22 use for HRTF, correct?	95 1 trying to give a ridiculous answer. 2 I'm just saying, in the task that I was 3 tasked with, that I would write opinions about 4 this and use this definition, I provided some 5 additional knowledge that I have about -- that 6 relates to HRTFs, and the totality of those things 7 is what informed my opinion. 8 Q But you don't believe the definition that 9 you were asked to use is the definition of a 10 person of ordinary skill in the art would apply to 11 HRTF? 12 MS. WANG: Asked and answered. 13 A I didn't opine on that. I didn't -- that 14 wasn't the question that I looked at. 15 Q So you have no opinion of what a person of 16 ordinary skill in the art would define HRTF? 17 MS. WANG: Mischaracterizes the witness' 18 testimony, asked and answered. 19 A My opinion in this is that a POSITA would 20 define HRTF's not in a vacuum, but in the context 21 of the problem they are looking at or the field 22 they're examining.
94 1 MS. WANG: Asked and answered. 2 A That definition is what Eight KHz 3 proposed. It doesn't mean what you just said. It 4 is a proposed definition, and I was just asked to 5 use it. 6 Q So what are your opinions based on? 7 Because your opinions are from the perspective of 8 a person of ordinary skill in the art, correct? 9 A Correct. 10 Q So are your opinions based on the 11 definition of HRTF that a person of ordinary skill 12 in the art would apply? 13 MS. WANG: Asked and answered. 14 A My opinions are based on the definition in 15 paragraph 83 of the '628 plus the ancillary 16 material that I talked about in paragraphs 52 and 17 53 of my '090. 18 Q And is that how a person of ordinary skill 19 in the art would define HRTF? 20 A We can't look at that in a vacuum. It 21 depends on what task they were tasked with. That 22 is what I was trying to say before. I wasn't	96 1 Q Okay. What is that definition? 2 A There isn't a single definition. It 3 varies, depending on the problem, or it can be. 4 Q So a person of ordinary skill in the art's 5 definition of HRTF would vary based on the 6 circumstance? 7 MS. WANG: Vague. 8 A The circumstance -- it can vary, depending 9 on what the person of ordinary skill is examining, 10 what problem they're looking at. 11 Q Well, what about looking at the prior art 12 in this case, did you apply a definition of HRTF? 13 A Yes. 14 Q And it's the definition that you just told 15 me? 16 A It's the definition in paragraph 83 of the 17 '628. 18 Q And in paragraph 83 of the '628, is that 19 the definition a person of ordinary skill in the 20 art would apply to HRTF? 21 MS. WANG: Asked and answered. 22 A For this task, which was to look at prior

97 1 art and examine invalidity of these patents and 2 write a report, that would be what a POSITA would 3 use, along with concepts related to that that I 4 wrote about in 52 and 53 paragraphs of my '090. 5 Q So a POSITA in -- for this task that 6 you're applying would use the definition in 7 paragraph 83 of the '628 declaration plus what you 8 provided in paragraphs 52 and 53 in your 9 declaration? 10 MS. WANG: Asked and answered, 11 mischaracterizes testimony. 12 A Yeah. If we're talking about the task 13 that was assigned to me and -- a POSITA would do 14 the same thing, yes, that I did. 15 Q So the definition of a -- that a POSITA 16 would use in the task that you were assigned would 17 be the definition that's contained in paragraph 68 18 of the '628 -- in the -- in the '628 patent IPR 19 plus the information that you provide in 20 paragraphs 52 and 53 of this -- in this suit? 21 MS. WANG: Form, mischaracterizes the 22 testimony.	99 1 pull this next exhibit up. 2 I just want to make sure. You did not 3 provide a definition of HRTF in your declaration 4 in this matter in the 1003 IPR, correct? 5 A No, I did not. I used the claim 6 construction definition. 7 Q You used -- you put your definition for 8 HRTF in your declaration for the '628 IPR matter, 9 correct? 10 A It -- I merely indicated that I used the 11 Eight KHz definition, and I wrote down what that 12 was that I was given. 13 Q Right. And you put that in your 14 declaration for the '628 case, correct? 15 A Correct. 16 Q But you did not put that in your 17 declaration for the '090 case we are talking about 18 here today, correct? 19 A I did not -- you mean -- the Eight KHz 20 definition is not in my '090. 21 Q Okay. And, again, we're going to try to 22 keep the reference materials to what I'm showing
98 1 A First, it's not paragraph 68. It is 2 paragraph 83, but -- 3 Q Sorry. I wrote it down wrong. 4 A I believe I said basically that, yes, a 5 POSITA's -- a POSITA, for this task, would use the 6 definition that is proposed for claim construction 7 plus some knowledge of related factors that inform 8 that, that would inform their opinion. And those 9 related factors I write in paragraphs 52 and 53 of 10 the '090. 11 MS. PARTRIDGE: Let's take a break a few 12 minutes, maybe 10 minutes. 13 THE WITNESS: Okay. 14 MS. PARTRIDGE: Thank you. 15 VIDEOGRAPHER: We're going off the record. 16 The time is 1:14. 17 (Recess, 1:14 p.m. to 1:31 p.m.) 18 VIDEOGRAPHER: We are back on the record. 19 The time is 1:31. 20 MS. PARTRIDGE: Jesse, can you pull up -- 21 Q And first, Dr. K, let me ask you just a 22 few follow-up questions, and then we'll -- I'll	100 1 you, instead of what you're using. 2 A Okay. 3 Q I really need you not to open other things 4 unless you ask first if it's something that should 5 be done. Okay? 6 A Okay. 7 Q We are talking about the record for the 8 IPR in the '090 patent. Okay? 9 A Yes. 10 Q Okay. 11 MS. PARTRIDGE: Can you pull up, Jesse -- 12 there's an article by Dr. K, Fundamental and 13 Technological Limitations of Immersive Audio 14 Systems. 15 REMOTE TECHNICIAN: Stand by. Do you 16 happen to know the file name? 17 MS. PARTRIDGE: I don't know. Article. 18 REMOTE TECHNICIAN: Aalborg University? 19 MS. PARTRIDGE: No. There should be 20 another one, article. 21 Pat, Homay. 22 REMOTE TECHNICIAN: I believe I found it.

101 1 Fundamental -- Fundamental and Technological 2 Limitations? 3 MS. PARTRIDGE: Right. 4 REMOTE TECHNICIAN: Okay. Stand by. 5 MR. DUNN: You got it. 6 MS. PARTRIDGE: And is this Exhibit 2? 7 REMOTE TECHNICIAN: Yes. 8 (Exhibit 2 marked.) 9 Q So, Dr. K, I'm marking as Exhibit 2 an 10 article entitled Fundamental and Technological 11 Limitations of Immersive Audio Systems, and you 12 are the author, correct? 13 A Correct. 14 Q Okay. Do you want some time to 15 familiarize yourself with this article? Are you 16 familiar with this article? 17 A I am. 18 Q Okay. I am going to direct your 19 attention -- and if you need to look at more 20 things, let me know, but I'm going to direct your 21 attention to the right-hand paragraph -- the 22 right-hand side of the article on page 1, and it	103 1 HRTF you applied in this matter? 2 A I don't know if this is a definition. 3 This is -- this is not so dissimilar from the 4 paragraphs 52 and 53 that we talked about, which 5 are also -- well, one of them is from that paper. 6 This is just me listing the things that matter in 7 an HRTF. I don't know what -- it's not a 8 definition. It's just, here's a list of items 9 that affect HRTFs. 10 Q So these are things -- these are a list of 11 identities that affect HRTF in what context? 12 A In the context of the paper that I was 13 writing, which it's been a little bit, but this 14 was just a -- kind of a review of various, I would 15 say, state of the art technologies in spatial 16 sound at the time that I wrote this. So there are 17 other aspects in this paper, not just HRTFs. 18 Q Would this -- would these items that you 19 list in here be applicable to your opinions in 20 this case? 21 A They would. As I said in my '090 22 paragraphs, those are basically expanding on this
102 1 starts about a third of the way through the first 2 full paragraph, and it starts with "sound 3 perception." It's right after 7. Yeah, right 4 here. 5 So can you -- can you read that sentence 6 into the record, please? 7 A Sound perception is based on a 8 multiplicity of cues that include level and time 9 differences and direction-dependent frequency 10 response effects caused by sound reflection in the 11 outer ear, head, and torso, cumulatively referred 12 to as the head-related transfer function. 13 Q Would you consider this a definition of 14 HRTF? 15 A In the context of the paper that I was 16 writing, which is a general review of the state of 17 the art in 1998, I believe, I was just describing 18 what HRTF involves. These are all the parameters 19 that are involved in HRTF in this -- in this 20 paper. 21 Q How is that definition of HRTF that you 22 used in the paper different than the definition of	104 1 sentence. 2 Q Okay. So you said cumulative -- I'm 3 sorry. I just missed your testimony. You're 4 saying this is cumulative referred to as HR -- as 5 head-related transfer function. That's what you 6 say in your article, correct? 7 A The list of things -- 8 MS. WANG: Mischaracterizes the document. 9 A I listed a number of things, and then I 10 said, the umbrella term "cumulatively," these 11 things together are referred to as the 12 head-related transfer function. 13 Q Okay. So this is the definition of 14 head-related transfer function, correct? 15 A This is the -- well, this paper, this is 16 the list of things that I put under that umbrella. 17 Q Okay. And, again, you said this -- these 18 items are applicable to your opinions in this case 19 for HRTF, correct? 20 A The -- I think what I said is that -- and 21 we can look at '090, paragraph 52 and 53. I think 22 I've expanded on those items by adding some

105 1 context around them in my '090. 2 Q Okay. But these items that you use in 3 your paper are applicable to your opinions in the 4 '090 matter? 5 MS. WANG: Asked and answered. 6 A These items, as expanded in the '090, plus 7 my use of the Eight KHz definition, is what I used 8 to form my opinion on things that related to HRTF 9 in this matter. 10 Q Okay. Well, you don't have your 11 definition from the Eight KHz matter in the -- in 12 your expert declaration, correct, in this matter? 13 A That's correct. These were done 14 concurrently, so I used the one from the '628. 15 Q Okay. You didn't have -- you don't have 16 any definition of HRTF in your declaration for 17 this matter, for the '090 matter, correct? 18 A Would you give me a minute so I can just 19 make sure? 20 Q Sure. 21 A Can I look through my declaration? 22 No. Other than those paragraphs that we	107 1 A I'm struggling with the word "definition." 2 That, to me, implies, like, a one-liner. They are 3 describing all of the concepts that I know are 4 related to HRTFs. 5 Q Okay. And you testified earlier that 6 these paragraphs are not the dictionary definition 7 of HRTF, right? 8 A I have never looked in the dictionary for 9 this term. 10 Q Okay. So, again, for this matter, the -- 11 in the '090 patent, there is no definition of HRTF 12 in your declaration? 13 MS. WANG: Asked and answered. 14 A If you can help me understand what you are 15 looking for in the word "definition." To me, 52 16 and 53 is -- represents what a POSA would think of 17 as an HRTF. 18 Q And, again, in your paper, Exhibit 2, we 19 looked at the description of HRTF as well, right? 20 A We looked at the terms that I listed that 21 go under the umbrella of the term "HRTF." 22 Q And are these also what a POSA would think
106 1 talked about, that's the -- and the background 2 section, that's the only place I -- 3 Q Okay. Other than -- 4 A -- talk about the process. 5 Q Other than paragraphs 52 and 53, correct? 6 A Correct. 7 Q Okay. And you told me that paragraph 52 8 and 53 are not a definition of HRTF? 9 A I don't know what a definition is -- in 10 the dictionary definition, no, they're not. 11 Q And they're not your definition, correct? 12 A They are a description of the knowledge I 13 have of HRTFs. 14 Q Okay. So, again, is there a dictionary 15 definition of HRTF? 16 MS. WANG: Asked and answered. 17 A I have never looked in the dictionary for 18 that term. 19 Q Okay. And so just -- I'm just trying to 20 get it straight. Are 52 and 53 a definition of 21 HRTF or not? 22 MS. WANG: Asked and answered.	108 1 of as an HRTF? 2 A A POSA would certainly agree that those 3 terms are -- fall under that umbrella, yes. 4 Q Are there any other terms we need to add 5 under the umbrella of HRTF? 6 A Can I look at that again, please, just to 7 make sure? 8 Q Can you look at what? 9 A The paper. 10 Q Okay. 11 A I think these terms are a good description 12 of all the concepts of an HRTF. There might be 13 some nuances that have to do with how these are 14 measured that a POSITA would need to know. 15 So I wouldn't say this is a list of the 16 important ones, and then there are some ones that 17 would change depending on the context. 18 Q But these are the list of the important 19 ones a POSITA would need to know regarding HRTF? 20 A Not would need -- a POSITA would know that 21 these are the important ones. 22 Q Okay. And these are important -- the

109 1 important -- these are the important aspects that 2 a POSITA would need to know about -- that a POSITA 3 would know about an HRTF? 4 A Yes. 5 Q And when I say "these," it is the 6 definite -- or it is what you refer to as HRTF in 7 Exhibit 2, your article, Fundamental and 8 Technological Limitations of Immersive Audio 9 Systems, correct? 10 A I refer to a list of items, and I say that 11 includes, which means there can be others, as I 12 said, and then I put them under the umbrella term 13 of "and related transfer function." 14 Q These are important items that a POSITA 15 would know and understand regarding HRTF, correct? 16 A Yes. 17 MS. WANG: Asked and answered. 18 Q Let's change. 19 Do you know Dr. Durand R. Begault? 20 A I do. 21 Q How do you know him? 22 A I have met him in-person a number of years	111 1 book in your expert declaration in this matter, 2 correct? 3 A I do, yes. He covered many of the 4 concepts back in 2000. 5 Q And we'll talk about it, but that is the 6 book, 3D Sound for VR and Multimedia, that you 7 reference in your paragraphs 57 through 59 of your 8 declaration here? 9 A Is it okay to look? 10 Q Let's pull up Exhibit 1. And can you go 11 to paragraph 57 to start with, please. 12 And so in paragraph 57, you are referring 13 to Dr. Begault's book called 3D Sound for Virtual 14 Reality and Multimedia, correct? 15 A Yes. 16 Q And you're relying on that as part of your 17 expert opinion in this matter, correct? 18 A I am relying on it as prior art, yes. 19 Q And have you -- are you familiar with 20 Dr. Kyla McMullen? 21 A I am not. 22 Q Do you know that she was an expert for
110 1 ago that I can't recall at least one conference, 2 probably more. I read his book in the past, the 3 one that he wrote I think in the early 2000s 4 maybe, or even before. So that is -- that is the 5 context of how I know him. 6 Q Okay. When did you read his book? 7 A I first read it when it came out. I just 8 don't remember the year. 2000, maybe. 9 Q Okay. And why did you read it? 10 A I read it because it was an interesting 11 book in the field that I was studying and 12 researching. 13 Q Would you consider Dr. Begault an expert 14 in this field? 15 A Yes, I would. 16 Q What is his -- what is Dr. Begault's 17 reputation in the field as an expert? 18 A His reputation involves me asking other 19 people as well. I don't know what his reputation 20 is. My own opinion of his work is that it is very 21 high quality. 22 Q Would you agree -- I mean, you rely on his	112 1 Meta in the lawsuit? 2 A I don't believe I saw any of that 3 information. 4 Q Would you agree -- 5 A I didn't -- 6 Q Would you agree with Dr. McMullen that 7 Dr. Begault's book is one of the seminal 8 references in the industry? 9 A I don't know what she said, and I haven't 10 met her, so as I said, I think very highly of 11 Dr. Begault's work. 12 Q Would you agree that this reference book, 13 the 3D Sound for VR and Multimedia is a seminal 14 book in the industry? 15 A I do. It was one of the first to cover 16 almost everything that we're talking about in 17 these patents. 18 Q Have you ever tried to work with 19 Dr. Begault? 20 A I'm sorry, you broke up. Have I ever 21 tried to? 22 Q Have you ever tried to collaborate or work

113 1 with Dr. Begault on any matter? 2 A No. 3 Q Let's turn to your declaration at 4 paragraph 54. Let's go back to paragraph 54. 5 And can you -- you don't have to read it 6 into the record, but go ahead and familiarize 7 yourself with paragraph 54, and I'm going to ask 8 you a few questions. 9 A Okay, I'm ready. 10 Q So I'm going to try to paraphrase some of 11 this, but if not, correct me, please. 12 So you talk about -- the heading here is 13 creating binaural sound, correct? 14 A Yes. 15 Q And you say here: Binaural sound can be 16 created in two ways, correct? 17 A Yes. 18 Q And you agree with that statement? 19 A Yes. 20 Q And then can you just read the next 21 sentence out loud? 22 A The first is to record binaural sound	115 1 MS. PARTRIDGE: Jesse, can you please pull 2 up -- and we're going to mark this as Exhibit 3. 3 And this is Dr. Begault's -- let me just see, 4 Dr. Begault's declaration. It should be -- it may 5 be the last thing that Patrick sent you, Jesse. 6 REMOTE TECHNICIAN: Dr. Begault's 7 declaration is C? 8 MS. PARTRIDGE: Let me see. Yeah, do you 9 have that? 10 REMOTE TECHNICIAN: Yes. 11 MS. PARTRIDGE: And this is the 1004 12 matter. 13 (Exhibit 3 marked.) 14 Q Have you ever seen this declaration, Dr. 15 K? 16 A I have seen a declaration by Dr. Begault. 17 I just don't know if he had more than one, so 18 I'm -- 19 Q Well, if you need to spend a few minutes 20 familiarizing yourself with it, but this is -- I 21 will represent to you that this is Exhibit 3, and 22 it is the declaration of Dr. Begault in the Meta
114 1 using two microphones that are spaced at the same 2 distance as the width of a human head, i.e., a 3 binaural recording. 4 Q So the first way to create binaural sound 5 is to create a binaural recording? 6 A Well, record here can mean a recording 7 that is listened to later or just to have the 8 microphones open and be listening live, but yes, 9 that is what this means. 10 Q Okay. So one way to create binaural sound 11 is to record it as binaural sound, correct? 12 A Right. Another word for that is to 13 capture. The microphones are on, and they're 14 listening to sound, and what comes out 15 delivered -- we talked about this earlier this 16 morning. For me it was delivered to the ears with 17 headphones. That totality of that system is a 18 binaural sound. 19 Q Okay. And this is one way to create 20 binaural sound, correct? 21 A Correct. 22 Q Okay. Let me show you also --	116 1 Platforms versus Eight KHz IPR2023-01004 and it is 2 regarding Patent 9,282,196. 3 Do you see that? 4 A I do see it. I'm just trying to 5 remember -- I guess, can I ask you a clarifying 6 question? Has he -- has Dr. Begault been deposed 7 more than once or it is the only one? 8 Q So this is a declaration, not a 9 deposition. 10 A Oh, I'm sorry, I'm sorry. I apologize. I 11 thought it was -- 12 Q If I said deposition, then I'm wrong, but 13 it is a declaration. 14 A Okay. I have -- so I looked at a lot of 15 documents, and I'm fairly certain that I saw this, 16 but I'm not 100 percent sure. 17 Q Okay. Well, let me -- but again, 18 Dr. Begault is someone that you -- that has a good 19 reputation in the industry and you think highly of 20 his work, correct? 21 A I do, although the spelling of 22 "declaration" is wrong. He probably didn't write

117 1 that. 2 Q That is a good point. 3 Okay, let's go to paragraph 20. 4 A I'm sorry, could we zoom in a little bit? 5 It is hard to read. 6 Q Can you read that to yourself, just 7 paragraph 20 to start with, and that is the full 8 paragraph 20. 9 A (Reviewing document.) Okay. I would need 10 a lot more context to understand what is being 11 referred to, and also I should say I don't know if 12 this looks familiar to me. 13 Q Okay. 14 A I'm happy to answer questions, but I 15 just -- 16 Q Yeah. Well, all I'm going to ask you is, 17 do you agree with this paragraph 20 written by 18 Dr. Begault? 19 A I don't know what Figure 6 is. I don't 20 know what he's talking about above. I need a lot 21 more information. 22 Q Okay. Well, let's start here. Do you	119 1 Q Yeah. 2 A Okay. I just haven't looked at the '196 3 in probably nine months, so... 4 Q Okay. So this is 19. Keep going. 5 A Okay. 6 Q Because you said you wanted some context. 7 And then -- 8 A Yeah, yeah. 9 Q -- are you finished with this page? 10 A I am, yes. 11 Q Okay. And then this is 20. 12 A Okay. 13 Q You said you needed some context. So do 14 you agree that -- so, again, you said initially, I 15 think, you don't agree. Binaural recording does 16 not allow a user to arbitrarily manipulate the 17 spatial characteristics of the recorded sound. 18 And you say that you do not agree with that? 19 A I don't. 20 Q Okay. And, again, tell me why you don't 21 agree with it. 22 A A binaural recording, using the definition
118 1 agree that binaural recording does not allow a 2 user to arbitrarily manipulate the spatial 3 characteristics of the recorded sound? 4 A No, I don't agree with that. 5 Q You do not agree with that. Why? 6 A Because a user can definitely manipulate 7 the spatial characteristics of the recorded sound, 8 and I have done it myself many, many times. 9 So that is why I don't know what the con 10 -- what context he is using this in. But on its 11 own, I don't agree with that sentence. 12 Q Well, go above. Let me look up a couple 13 of paragraphs. Just a minute. Okay. Let's 14 start. I would like you to read paragraphs 18 and 15 19 of the declaration -- I'm sorry, 19. Sorry 16 about that. 17 A It looks like he's just quoting what you 18 just read from my declaration; is that correct? 19 Q Okay. And then keep going. 20 A So this is his response to my declaration 21 for the '196, is that what you said before? I 22 think you said that, right?	120 1 that I had in -- that he quoted, is a left and a 2 right channel of audio that is delivered to the 3 headphones. And the user can certainly manipulate 4 those channels and, therefore, the spatial 5 characteristics of the recorded signal. 6 Q Okay. So you just think Dr. Begault is 7 wrong here? 8 A Either wrong or misinterpreted what I was 9 trying to say. I just -- I don't -- I don't agree 10 with that sentence. 11 Q What about the second sentence? The sound 12 localization points of the sound sources in the 13 resultant recording are fixed. Do you agree with 14 that sentence? 15 A Well, that's a follow-up of his assumption 16 that it can't be manipulated, so, no, I don't 17 agree with that either. 18 Q Okay. And let me be real clear. We're 19 talking about the first way of creating binaural 20 sound, binaural -- binaural recording here, right? 21 A Right. 22 Q And so you -- I just want to make sure

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121 1 that -- so you disagree with Dr. Begault's 2 statement that binaural recording does not allow a 3 user to arbitrarily manipulate the spatial 4 characteristics of the recorded sound. You 5 disagree with that, correct? 6 A Correct. 7 Q And you disagree with the sound 8 localization points -- of sound services -- 9 sources in the resultant recording are fixed. You 10 also disagree with that? 11 A Yes, for the same reason I mentioned -- 12 those related concepts that he's talking about, 13 so, yes, I disagree. 14 Q Okay. So we haven't discussed it yet, but 15 do you agree that there is a difference between 16 binaural recording and binaural synthesis? 17 A I believe I explain the difference in my 18 declaration. 19 Q Do you agree that there's a difference 20 between binaural recording and binaural synthesis? 21 A Yes. 22 Q And we'll talk about that in your	123 1 statements in paragraph 21? 2 A In its entirety, let's see here. 3 Q Let's start with sentence -- the first 4 sentence. 5 A Okay. 6 Q By contrast, the second example to 7 synthesize binaural sound by processing 8 non-binaural content with the left and right HRTFs 9 means that a user can play sound sources at 10 arbitrary locations based on the design and 11 application of a human interface. 12 Do you agree with that? 13 A I do. 14 Q Okay. And let me see just a second. And 15 do you also agree with the excerpts from the book 16 that you relied on in your declaration, 3D Sound 17 for Virtual Reality and Multimedia? Do you agree 18 that 3D sound refers to techniques where the outer 19 ears -- I don't know how to say that word -- the 20 pinnae are either -- 21 A Pinnae. 22 Q -- directly implemented or modeled as
122 1 declaration. Let me see. So it's your 2 declaration at -- sorry, I've got to get back to 3 it. Your declaration at paragraph 55, so can we 4 go back to Exhibit 1, yeah, you're right. So 5 paragraph 55. Okay, do you want to review that 6 real quickly or as quickly as you need to? 7 A Yes. Okay. 8 Q Okay. So there -- the second way of 9 creating binaural sound is to synthesize binaural 10 sound by processing non-binaural content from the 11 left and right HRTFs of the desired placement 12 angle and position. You agree with that? I mean, 13 you write it in your declaration. You agree with 14 that, correct? 15 A I'm sorry. I already -- I said yes. 16 Maybe you didn't -- I do. 17 Q Well, I'm sorry. So let's go to -- let's 18 go back to Dr. Begault's declaration, Exhibit 3, 19 and I want to go to paragraph 21, and if you'll 20 read that. 21 A Okay. 22 Q And do you agree with Dr. Begault's	124 1 digital filters. 2 Do you agree with that? 3 A I do. That sentence doesn't seem 4 complete. It's not just the pinnae. There are 5 other -- and I'm sure he talks about it in his 6 book. There are other parts of the body, upper 7 body, that contribute. 8 Q Okay. And then by the next sentence says: 9 By filtering a digitized sound source with these 10 filters, one can potentially play sounds anywhere 11 in the virtual space about a headphone listener. 12 Do you agree with that? 13 A Yes. 14 Q And this talks about the second way of 15 creating binaural sound, which is synthesizing 16 binaural sound, correct? 17 A Yes. 18 Q Okay. And let's go back to Exhibit 1, to 19 your declaration. You're fast. And I want to 20 find out where in your declaration you discuss the 21 differences between recorded binaural sound and 22 synthesized binaural sound.

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125 1 A I'm sorry. Other than here, you mean? 2 Q Yeah. You said that -- you explained it 3 in your -- the differences between recorded -- I 4 think you told me this, but if not, you can 5 correct me -- that you explain in your -- your 6 declaration the differences between the two ways 7 of creating binaural sound. I'm just trying to 8 make sure I understand where -- where that is in 9 your declaration. 10 A I believe we're at that point now. If you 11 scroll up, I think it's paragraphs 54 and 55, 12 yeah, right there. 13 Q Anywhere else besides 54 and 55 in your 14 declaration? 15 A I would have to look. 16 Q Just let me know. 17 A I need to scan through it to see. This is 18 where I -- in the introductory section where I 19 made the difference. But I may refer to these in 20 other places. I don't remember exactly. It 21 wouldn't be any different than this. This is my 22 opinion on how to create binaural sound.	127 1 A Correct. 2 Q Okay. So I hear that they're different, 3 but tell me more about how creating binaural sound 4 using a recording is different than creating 5 binaural sound by synthesizing it. 6 A Creating binaural sound with microphones 7 as in a recording or live, as we said, does not 8 involve any processing. The signal from the left 9 microphone goes directly to the left ear, and the 10 one from the right microphone goes directly to the 11 right ear. So it's like -- that's why Olson, as I 12 said in my declaration, calls it a closed circuit 13 system. 14 In the second type, which is the 15 synthesizing, we start with sound that is not 16 binaural. So it can be a single channel of audio, 17 and that single channel of audio then is processed 18 through HRTF filters. So that -- think of it as a 19 single channel of audio goes in, and the HRTF 20 filters one for the left ear and one for the right 21 ear, produce two channels that are fed to 22 headphones. And so it's made to be binaural at
126 1 Q Okay. 2 A So I'm happy to take a minute and look 3 through my declaration if you want me to. 4 MS. PARTRIDGE: Okay. Why don't we go off 5 the record for just five minutes or however you 6 need to do that. Okay? I need to actually take a 7 quick break. 8 THE WITNESS: Okay. 9 VIDEOGRAPHER: Okay. We are going off the 10 record, the time is 2:12. 11 (Recess, 2:12 p.m. to 2:21 p.m.) 12 VIDEOGRAPHER: We are back on the record, 13 the time is 2:21. 14 Q Welcome back. Okay. You, I think -- I 15 believe you testified just right before the break 16 that there are two different ways to create 17 binaural sound. The first is to record the 18 binaural sound, and the second is to synthesize 19 the binaural sound by processing non-binaural 20 context -- content with the left and right HRTFs 21 at the desired placement angle and position, 22 correct?	128 1 whatever angle HRTF we selected. 2 If I could add some context to -- related 3 to this as to the reason I disagreed with 4 Dr. Begault's sentence, it's this second part. 5 The -- a binaural recording is. 6 Two channels of audio, one from the left 7 mic and one from the right mic. It is only 8 binaural if it is played back over headphones 9 corresponding to each ear. On their own, each of 10 those channels are monaural recordings. They 11 don't know of the other. It's just a -- one 12 microphone just recorded one signal. 13 And so what I was referring to -- and it's 14 essentially something that we did in my class last 15 Friday. If you take the left recording from the 16 microphone and pass it through an HRTF filter, now 17 you have made a binaural version of that. And if 18 you do the same thing for the right, you have also 19 created a binaural version of that. And your 20 choice of HRTF filters determines what -- where to 21 place them, somewhere different in space. So 22 that's why I was disagreeing.

129 1 Q Okay. You said a lot, so I just need -- 2 A I understand. I know. 3 Q Give me a sec. 4 A I had to get it off my chest. 5 Q Thank you. I appreciate that. 6 So to synthesize binaural sound, though, 7 you're processing non-binaural content, right? 8 A Right. 9 Q And when you say -- what is examples of 10 non-binaural content -- content? 11 A The one example is -- that I mentioned 12 here is monaural, meaning a single channel. 13 Q Okay. Can it also be stereo? 14 A Well, let's be careful. Stereo -- stereo 15 requires loudspeakers, and now we're talking about 16 headphones. It can be a two-channel sound that 17 was recorded with two microphones. And this is 18 what I was augmenting before. Each one of those 19 channels is monaural. Together they are 20 two-channel audio. 21 Q Okay. So you cannot process sound that's 22 recorded as stereo sound and synthesize it into	131 1 is called filtering. So you think of it as a box 2 that has a process -- a way to run software inside 3 that -- so it takes in the monaural sound, and it 4 processes it through either multiplication or 5 convolution -- these are fancy words for 6 processing -- with an HRTF pair. So HRTFs always 7 come in pairs, really, one for the left ear and 8 one for the right ear. 9 And so what the box spits out are two 10 signals now intended for playing in your left ear 11 and in your right ear. So now it has become 12 binaural by being processed through an HRTF box, 13 let's call it. 14 Q Okay. HRTF box? 15 A I'm using that term to describe something 16 that runs digital filters. It can be a 17 stand-alone processor or it can be computer 18 software. It can be all kinds of different 19 things. 20 Q And it is required to use HRTFs or an HRTF 21 box to process non-binaural sound to become 22 binaural sound?
130 1 monaural sound. Is that what you're saying? I'm 2 just trying to figure out what you're saying 3 there. 4 A I'm saying that you can. Sound that was 5 recorded, let's say, with two microphones intended 6 to be played back over loudspeakers, that's what 7 stereo is, as we talked about earlier. 8 Q Okay. 9 A Can be processed so that it -- it becomes 10 binaural to be played back over headphones. 11 Q Okay. And how do you -- let me go back 12 just a second. 13 How do you -- I'm sorry. Strike whatever 14 I just rambled on about. 15 How do you process -- you said that it's 16 processed that the two channels are the single 17 channel sound. The non-binaural sound is 18 processed to become binaural sound, correct? 19 A Correct. 20 Q And how -- if there are a lot of ways, but 21 at a high level, how was that processed? 22 A The process is something in the art that	132 1 A Right. Somehow you have to alter the 2 signal by filtering it through an HRTF pair, left 3 ear and right ear. 4 Q And we're talking about the second 5 category of sound here, the synthesis of binaural 6 sound? 7 A Yes. 8 Q Okay. So how does the synthesis of 9 binaural sound creating it by synthesis differ 10 from creating it by recording? 11 A Okay. I thought -- I thought I answered 12 that. That was your first question. The 13 difference is that one of them requires this 14 processing box, so that some manipulation of the 15 signal happens through these processes that we 16 call convolution, multiplication, whereas the 17 other method requires nothing but two microphones 18 at a spacing of approximately the human head and 19 sometimes with an object in between to simulate 20 the presence of a head, of a human head. 21 So it is direct. There is no processing 22 needed. You just record it and you have your left

133 1 ear and your right ear channels ready to go, and 2 they can be live, by the way. 3 Q Okay. So when you are recording it, is 4 that the same as capturing it? 5 A Yes. 6 Q Okay. And do you use HRTFs when you are 7 recording -- when you are creating sound, binaural 8 sound by recording it? 9 A You don't. They -- the signals are 10 naturally, so let's call it altered. The signal 11 from the sound source is naturally ordered -- 12 altered, excuse me, by the spacing of the two 13 microphones and the reflections from the ears and 14 the mannequin head. So there is no convolution or 15 multiplication or filters or software or anything 16 like that. 17 Q It is basically captured just by the way 18 you do the recording? 19 A Yes. 20 Q Okay. And the other one you could record 21 it as I think -- when I say the other one, let's 22 be a little clearer since we're in a deposition --	135 1 understand, because I know you clarified it some, 2 because in the binaural recording, you have two 3 monaural channels, and you can basically process 4 each monaural channel independently to make 5 binaural sound from each separately, right? 6 A That's right. So to add to that, let's 7 say you take the left binaural -- the left 8 microphone signal. It is not binaural -- if it's 9 just by yourself, right, it is not going to play 10 anything in your other ear. It is just the left 11 signal. We pass it through an HRTF pair, and it 12 becomes binaural for a certain angle, and then we 13 send the left to the left ear and the right to the 14 right ear. 15 Then we take the other side of that 16 original recording, the other channel, and do the 17 same thing, and send the left to the left and the 18 right to the right. 19 So now, your left ear is receiving two 20 signals, one from the first monaural HRTF process 21 and one from the second, and so is the right. 22 Q Okay. So do you agree that you cannot
134 1 regarding synthesizing binaural sound, you're 2 using an input of a single channel or a 3 multichannel that is non-binaural sound, and you 4 are running it through -- that sounds weird -- 5 HRTFs to make binaural sound? 6 A That is basically right. The signals -- 7 the audio recordings are -- came from somewhere 8 that doesn't have to be a binaural recording. 9 They're usually a single channel. They could be 10 multichannel as well. 11 Each one of them is processed according to 12 the desires of the user as to where to place it. 13 So you pick the HRTF. 14 Let's say I want to place it at 30 degrees 15 to my left. I pick that HRTF pair, meaning HRTF 16 to the left ear at 30 degrees, HRTF to right ear. 17 And I process this non-binaural signal with those 18 two HRTFs, and out come two signals that are fed 19 to my headphones. 20 Q Okay. So let me go back. You remember we 21 talked earlier about -- you said you disagreed 22 with Dr. Begault. I just want to make sure I	136 1 process a binaural recording both of the -- I 2 mean, I'm sorry, you cannot process both of the 3 monaural -- the monaural channels at the same 4 time? 5 A No, you can. I talked about it 6 sequentially, but this imaginary HRTF box that we 7 talked about would be a computing device of some 8 sort that has multiple audio inputs. So you can 9 plug in your left channel and your right channel 10 and out will come four channels, two for the left 11 ear and two for the right ear, which are now 12 binaural. 13 Q Okay. Sorry, I'm just a lot slower than 14 you are. And so this is hard stuff. But thank 15 you very much for that clarification. 16 So if you process a monaural channel, you 17 are not processing a binaural sound, right? 18 A A monaural channel is monaural. It is not 19 binaural, right. I'm creating -- I can create a 20 binaural sound out of a monaural sound. I'm not 21 sure if that is what you're asking, but by itself, 22 the incoming sound is monaural, not binaural.

137 1 Q Okay. And then you process it or 2 manipulate it or filter it to become binaural? 3 A Yes. And if I have two of them, I do them 4 at the same time, so now I have created two 5 binaural sources that maybe came from some 6 recording of two microphones. And when I put them 7 on and feed the left -- the left sides to my left 8 ear and the right sides to my right ear after they 9 have been binaurized through HRTF -- that is not 10 an actual word, so I just made it up. 11 Q I like it. 12 A Now you have a binaural version. And if 13 you pick HRTFs at an angle other than where those 14 came from, then you have manipulated that to a 15 different direction. 16 Q Is manipulated when you are using it 17 different than processing? 18 A Well, I'm using it as in the user -- I'm 19 sorry, I thought Dr. Begault used the word 20 "manipulated," so I was using it. I mean, the 21 user would decide on a direction through some 22 interface that he said.	139 1 just trying to figure it out. 2 A That is kind of a philosophical question. 3 It is binaural only if it is playing into your 4 ears at the same time. As far as before that, it 5 is just two microphone signals. 6 Q Okay. I think I heard what -- what you 7 said, though, is that you are not processing a 8 binaural signal to become binaural. If you start 9 with a binaural zone, you still have to divide it 10 up into by monaural -- two channels of monaural, 11 and then process it for binaural? 12 MS. WANG: Objection, mischaracterizes the 13 witness' testimony. 14 Q Okay. Can you explain it again? 15 A It is -- I'm not breaking it up. I'm just 16 taking a two-channel signal that may have been 17 recorded with a binaural head, putting it into my 18 magic HRTF box, and getting out a new binaural 19 signal. 20 Q And that is where you disagree with 21 Dr. Begault? 22 A Yes. I believe what he was saying -- and
138 1 Q Oh, a direction of the sound, where you 2 want the sound to come from? 3 A Yes. Where you want it from, and it might 4 be a different direction than where the binaural 5 recording was made from, and that is why I was 6 objecting to that. 7 Based on what we just talked about, I can 8 take a binaural recording, treat each channel as 9 monaural, and process it through HRTFs from a 10 different angle than where the binaural originally 11 came from. And, therefore, I manipulated it into 12 being a different angle. 13 Q Okay. So you're actually dividing the 14 binaural up and treating it as monaural. That is 15 where you are disagreeing with Dr. Begault that 16 you could -- 17 A Right. 18 Q But you still have to divide it up into -- 19 into each signal as monaural, right? 20 MS. WANG: Objection, mischaracterizes the 21 witness' testimony. 22 MS. PARTRIDGE: I'm not trying to. I'm	140 1 we can look at it again. He was saying that once 2 you have a recording of a binaural signal, you 3 can't change the -- let's say the direction from 4 which it was recorded. And I disagreed because I 5 just described a method by which you could. 6 Q And that -- that is by dividing the -- I 7 thought you said dividing the binaural sound up 8 into monaural and then processing it? 9 A I'm not -- it's a two-channel signal 10 coming in. I'm not really dividing it. I'm just 11 sending each one through a different -- slightly 12 different process. 13 Q Okay. You're processing each part of the 14 binaural signal differently? 15 A I'm processing it through a different set 16 of HRTFs that would correspond to a slight 17 difference in angle corresponding to the width of 18 your head. 19 Q Okay. And you're processing each monaural 20 channel independently, correct? 21 MS. WANG: Objection, mischaracterizes the 22 witness' testimony.

141 1 A I mean, I guess that is not how the 2 software would be written to do it. It would be a 3 two-channel input multiplied by a bunch of 4 numbers, which is what filtering is, and you would 5 get four channels out. Two of them would be sent 6 to the left ear and the other two to the right 7 ear. 8 So I don't think it is independent. I'm 9 just doing it all in one. 10 Q Okay. Well -- 11 A In other words, I'm not trying to mute one 12 side and process the -- and then go back to the -- 13 it is all happening at once. 14 Q Right. But you said -- I thought you said 15 that you were taking -- you were basically taking 16 a monaural signal -- the monaural piece and taking 17 one at a different angle than the other. 18 MS. WANG: Objection, mischaracterizes the 19 witness' testimony. 20 A That would be one way to do it. The other 21 way would be to say, I can -- well, no, that would 22 be the easiest way to do it. A binaural signal	143 1 slightly different. 2 Q Okay. 3 A I don't mean your head. I mean one's 4 head. 5 Q Mine's big. I know what when I try on 6 hats, so... 7 And you said that they're slightly 8 different, so they treat each channel slightly 9 differently, correct? 10 A The filters would be slightly different 11 for each channel, correct. 12 Q Okay. And, again, are the two channels 13 treated separately? 14 A So I guess this is what I -- in the second 15 part of my description of what is binaural sound, 16 when I talk about synthesizing, that paragraph 17 describes exactly what we're doing. It's just 18 that we're doing it twice. 19 So let's say I have a binaural recording 20 from a certain angle. If I wanted to make it 21 appear that it's from a different angle, I would 22 synthesize the left channel of that binaural
142 1 has two channels of audio. 2 Q Okay. 3 A Right. A two-channel processor takes in 4 two channels of audio and applies filtering to 5 them, something for the left channel and something 6 for the right channel, and produces a new binaural 7 signal, which is at a different direction or can 8 be at a different direction, if that's what the 9 user selected, than the one that was recorded. 10 Q Does the processing of one monaural 11 channel have an effect on the processing of the 12 other monaural channel? 13 A So you're asking -- I think I know what 14 you're saying. I guess what I'm saying is, and 15 see if that answers your question, is the HRTFs 16 that would apply to the left monaural channel 17 would be slightly different than the HRTFs -- and 18 I say for the right channel. I say slightly 19 because if we have started with a binaural signal, 20 the two channels come from a binaural recording, 21 the angle between them is small. It has to do 22 with the size of your head, so -- but they will be	144 1 recording, let's say, with a 30-degree HRTF and 2 the right channel with a 28-degree HRTF because of 3 the separation between them. And then generate 4 two binaural signals, again, one from each side, 5 and combine them together to make one binaural 6 signal at whatever that new direction is, 29 7 degrees or something, so -- or 35 or whatever 8 other angle. 9 Q So just one more, hopefully one more. So 10 the left -- 11 A Go ahead. 12 Q Since you said the left channel would 13 be -- would apply 30-degree HRTF, right? 14 A I'm saying if the -- if the recording came 15 from a -- I guess we have to go back to the first 16 principle. How do we make binaural recordings? 17 We put a source in front of a -- let's call it a 18 mannequin, and at a certain angle, sound arrives 19 at the left ear of the mannequin and the right ear 20 of the mannequin. And if we just listen to that, 21 that's binaural. We would -- it would appear to 22 the listener that the source is coming from the

145 1 direction that it was. 2 Q Okay. 3 A Now, I want to make it appear -- so I use 4 that direction to create -- to measure HRTFs. And 5 this is disclosed -- how to do that is a 6 well-known technique. It's disclosed by 7 Dr. Begault and many others. 8 So now I have HRTFs, and let's say I did 9 it for many different angles, not just that one. 10 So -- but I have a recording from 30 degrees. 11 Let's say that my nose is at 30 degrees so the 12 left ear and right ear would be 1 degree, let's 13 say, apart from that. And I want to make it -- I 14 want to manipulate so it appears somewhere else. 15 I would take the left side and the right 16 side recording and process it with a 59 and 61 17 degree HRTF and, therefore, produce a binaural 18 version of that signal that appears to be from 19 somewhere else. 20 Q Okay. So in that scenario, you would -- 21 you would filter the left side with the 59 degree 22 HRTF, and you would process the right signal with	147 1 slightly different filters. 2 Q But you could process it -- you could 3 process them independently of the other? 4 A Does "independently" mean different 5 filters? Yes. 6 Q Yes. 7 A Then yes. 8 Q Sorry. Different filters. 9 A Yeah. They're different filters. They're 10 slightly different filters. 11 Q Do you have the choice of just processing 12 one of the signals and not the other signal? 13 MS. WANG: Objection to form. 14 A You have that choice, but it would create 15 a rather bad result. 16 Q But you could do it? 17 A Well, you could process anything. You 18 can -- like, I don't see why a POSITA would ever 19 do that. It would be like trying to create a 20 stretched head or something odd. 21 Q Okay. Well, let me just reask the 22 question as a hypothetical.
146 1 a 61 degree HRTF? 2 A Yes. So probably flipped, but that's a 3 technicality. It depends on where you start 4 counting zero, but yes. 5 Q Okay. But you would apply two separate 6 HRTF filters, a 59 degree one and a 61 degree one, 7 correct? 8 A Right. And that's why I said it's a -- 9 it's my second paragraph 55 description. It's 10 applied twice, one to each. That one says that 11 monaural signals can be processed so we're 12 processing two monaural signals -- 13 Q Okay. 14 A -- using the method I described there. 15 Q So you can process one of the monaural 16 channels independently of the other? 17 MS. WANG: Objection, mischaracterizes 18 testimony. 19 A The problem with "independently" means to 20 me that I'm only -- I would have the choice of 21 doing just one and not the other. To me, I'm 22 processing them both at the same time with	148 1 You know, suppose you recorded a binaural 2 sound. Okay? You have a recorded binaural sound. 3 Can you just choose to manipulate one of the two 4 monaural channels and not process the other one? 5 A If your goal is to do what, though? 6 Q To provide binaural sound. Can you do 7 that? 8 A No. You can do it. What I'm trying to 9 say, you could do it technically, but it would not 10 produce very good binaural sound it would be a 11 very strange result. 12 Q Okay. But could -- you can manipulate it 13 separately? 14 MS. WANG: Asked and answered. 15 A I don't know how that was different from 16 what we were saying before. Separately means with 17 different filters, and so, yes, yes, you can. 18 Q And you could choose -- 19 A Each side. 20 Q -- to not process one of the signals? 21 MS. WANG: Asked and answered. 22 A You would not be a very good POSA if you

149 1 did that. 2 Q But you can? 3 A That would just give -- technically I 4 could tell the computer to do that. I just don't 5 see what purpose it would serve. 6 MS. PARTRIDGE: Okay. Great. I hate to 7 keep taking breaks, but can I just take about 8 10 -- do you need to eat? Does anyone need to -- 9 THE WITNESS: I'm okay, but -- 10 MS. PARTRIDGE: You don't eat? I eat a 11 little bit. You don't eat either, you skinny, 12 little, cute thing. But give me just -- give me 13 just 10 minutes. Okay? I'm just -- I eat 14 sometimes and so -- 15 THE WITNESS: Okay. 16 MS. PARTRIDGE: It's a little late. It's, 17 like almost 3:00 here. Okay? 18 THE WITNESS: Okay. 19 MS. WANG: Maybe we -- maybe we should 20 take a lunch break, Dr. K. I don't -- it's up to 21 you. 22 THE WITNESS: You want -- 15 minutes is	151 1 Do you remember this article, we talked about it? 2 A I do. 3 Q Okay. I'm just going to direct your 4 attention to page 5 of 11. Well, it's 945 at the 5 bottom, but it also says 5 of 11. It's the -- I 6 think it was production produced. 7 MS. PARTRIDGE: So can you go about five 8 pages down? You're right there. Okay. Stop. 9 Q Do you see the last full paragraph on the 10 left-hand side that starts with "head-related"? 11 A Yes. 12 Q Okay. And can you read that paragraph, 13 and then I just want to ask you a high level 14 question about it. 15 A Head-related binaural recording -- 16 Q I'm sorry. Why don't you read it to 17 yourself, just -- 18 A Okay. Okay. 19 Q Okay. And this paragraph, I went from -- 20 well, maybe I will read it. 21 Head-related binaural recording, or 22 dummy-head -- I should make you do it --
150 1 plenty for me, but I can do -- whatever works for 2 everybody else. 3 VIDEOGRAPHER: Counsel, do you want to go 4 off the record while we discuss this? 5 MS. PARTRIDGE: We can just take -- let's 6 take 20 minutes. We'll take a -- that way, if 7 y'all want to eat, you can eat. Okay? 8 THE WITNESS: Okay. 9 MS. PARTRIDGE: Thank you. 10 VIDEOGRAPHER: We are going off the 11 record. The time is 2:50. 12 (Recess, 2:50 p.m. to 3:15 p.m.) 13 VIDEOGRAPHER: We are back on the record. 14 The time is 3:15. 15 Q I guess it is afternoon for you as well. 16 Good afternoon, Dr. K. How are you doing? 17 A I'm good. 18 Q Good. 19 A Good afternoon. 20 MS. PARTRIDGE: Okay. Let me -- let me go 21 back. Jesse, can you pull up Exhibit 2? 22 Q This is your article, Dr. K, I believe.	152 1 stereophony methods -- 2 A Stereophony, yeah. 3 Q -- attempt to reproduce at each eardrum of 4 the user the -- of the listener the sound pressure 5 generated by a set of sources and their 6 interactions with the acoustic environment. Such 7 recordings can be made with specifically designed 8 probe microphones that are inserted in the 9 listener's ear canal or by using a dummy-head 10 microphone system that is based on average human 11 characteristics. Sound recording using binaural 12 methods is then reproduced through headphones that 13 deliver the desired sound to each ear. 14 Is that a fair description of binaural 15 recording? 16 A Well, I qualified it by saying 17 head-related, which means the microphones are -- 18 that there's a dummy head, as it says there. I 19 mean, technically you can have a binaural 20 recording that just uses two microphones as long 21 as they're spaced at ear spacing. 22 Q But this is talking about monaural

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153 1 recording, correct? 2 A It's talking about head-related binaural 3 recording, which means microphones in the ears of 4 the head. Real -- the second sentence is about a 5 real head where you put microphones in your ear 6 canal, and the first sentence is about a dummy 7 head. 8 Q It's not talking about synthesis of 9 binaural sound, correct? 10 A No, no. This is about head-related 11 recording. 12 Q Right. So the first way that we talked 13 about creating binaural sound by recording 14 binaural sound? 15 A Yes. 16 Q Okay. The only other thing about this 17 article -- just turn to page -- 18 A Sorry to interrupt -- Jayme, sorry to 19 interrupt. I can't see the -- I just want to make 20 sure -- I know you read it, but can I see the top 21 of the second column? 22 Q Sure, sorry.	155 1 MS. PARTRIDGE: Okay. Let's -- let me 2 mark as -- is Exhibit 3 the next exhibit? 3 REMOTE TECHNICIAN: It will be 4. 4 MS. PARTRIDGE: Oh, 4, okay. Let's mark 5 as Exhibit 4 -- I want to mark the '090 patent, if 6 I can find my copy of it. And this is 9,226,090, 7 Jesse, if that helps, patent. 8 (Exhibit 4 marked.) 9 Q Okay. Let me show you what has been 10 marked Exhibit 4 in your deposition. And this is 11 U.S. Patent Number 9,226,090. Do you see that, 12 Dr. K? 13 A I do. 14 Q And do you recognize this as the patent 15 that is at issue in this IPR proceeding? 16 A Yes. 17 Q Okay. And I want to direct your attention 18 to Column 3, so that is a ways down. And I want 19 to look at -- 20 MS. PARTRIDGE: I'm looking at Column 3, 21 which is quite a ways down, Jesse. Keep going, 22 way down, Column 3. So you've got to go past all
154 1 A Okay, thank you. 2 Q Okay. The only thing -- can we move to 3 page 4 of this article. And I'm -- just one point 4 here. Can you go down just a little bit, Jesse. 5 In this article that you wrote, you are relying on 6 Dr. Begault's book -- well, you talk about -- you 7 are relying on at least Dr. Begault's literature, 8 correct? That is on the right-hand side. Do you 9 see where it says: In his review of the 10 challenges and 3D audio implementations, Begault 11 points out there are currently three major 12 barriers to successful -- 13 A I see that. 14 Q Just -- 15 A I know you're -- I know you're an attorney 16 and you use the word "rely," but in my world, I'm 17 not relying. I'm just stating some things that I 18 read in his book. 19 Q Okay. And you've got this in a paper that 20 you published, correct? 21 A The one we're looking at right now, yes. 22 Q Right.	156 1 these exhibits and everything. I don't know why 2 there is a highlighting on here. We'll just use 3 it. We'll just go with it. 4 Q I am specifically -- I would like you to 5 to read, and when you are through reading it, not 6 out loud, read just from -- from lines 1 through 7 33, and then I want to ask you a question about 8 just a couple of things in between, okay? 9 A Okay. Let me read it. 10 Q You already read it or you are doing it? 11 A No, no. (Reviewing document.) 12 Okay, perfect. 13 Q So do you see where it starts at "spaced 14 microphones"? Do you see that? 15 A Yes. 16 Q And so do you see where it says: Spaced 17 microphones on a dummy or model human head, (e.g., 18 placing microphones in an eardrum or at the ear of 19 an artificial head or a printed 3D head.) 20 Do you see that? 21 A I do. 22 Q Does that describe binaural recording?

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157 1 A So those are some ways to create a 2 binaural recording. Hopefully they don't mean in 3 an eardrum, because that would be very painful. 4 Q Okay. But this is a way of providing a 5 binaural recording. These are a number of ways of 6 providing a binaural recording, correct? 7 MS. WANG: Objection to form. 8 A I'm just trying to look at this in 9 context. To me, this column reads about recording 10 in general, and so the paragraph starts with 11 various microphone techniques. So can I see a 12 little before this paragraph? I just want to know 13 how we got here. 14 Q Sure. 15 A I mean like the end of Column 2, for 16 example. 17 MS. PARTRIDGE: You are going to go the 18 other way, Jesse, go up. 19 A Okay let me just read that real quick. 20 (Reviewing document.) 21 Okay, you can scroll down again, please. 22 Okay, I'm -- so that is a list of	159 1 listener? 2 MS. WANG: Objection to form. 3 A It is a way of recording sound with two 4 channels, two microphones. If you play it back 5 from headphones, it will sound like it is 6 binaural. If you don't, then it is not. So it is 7 not a binaural recording unless you close the loop 8 and play it back over headphones. Otherwise it is 9 just a two-channel recording. 10 Q Okay. But you're recording it as binaural 11 sound, correct? 12 MS. WANG: Asked and answered. 13 A The recording -- it is only binaural if 14 you listen to it with headphones. You are 15 recording -- like the recording apparatus doesn't 16 know anything about binaural sound. It is just 17 recording two channels of audio. 18 Q If you record it like this and you play it 19 over headphones, it would be a binaural recording? 20 A Yes. 21 Q Okay. Now, going down to what you pointed 22 out, can we move -- can you look specifically
158 1 recording techniques with two microphones. Some 2 of them involve the human head. The mention of 3 binaural sound is only at the end of that in line 4 30 -- 30. 5 Q Okay. 6 A So it is not really tied to this list, 7 because it is -- it is talking about processing 8 things with HRTFs to make binaural sound. 9 Q Okay. I was going to ask you that in a 10 minute. But regarding 21 through 23, that is a 11 way of making -- that is binaural recording, 12 correct? 13 MS. WANG: Objection to form, asked and 14 answered. 15 A It is only binaural if -- it is not 16 mentioned here, but if the signals recorded in the 17 way -- from 21 to 23 are played back over 18 headphones; otherwise, it is not binaural. It is 19 just two microphone signals. 20 Q This is a way of recording binaural sound, 21 and then if you play it over headphones, it would 22 be a way of providing binaural sound to the	160 1 at -- well, I don't know if you did this one, but 2 specifically at lines 28 through 30? Are you 3 there? 4 A The "augmented stereo" line? 5 Q Yes. 6 A Starting there? 7 Q And what I'm interested in is: Recording 8 stereo sound and processing it to imprint 9 head-related transfer functions (HRTFs) to produce 10 binaural sound. That is binaural synthesis? 11 A That is one aspect, yeah. That is one way 12 of doing it. As we said earlier before the break, 13 you don't have to start with stereo, and that is 14 why they say e.g., so it is one way. 15 Q You certainly can start with stereo, 16 right? 17 A I'm sorry? You can -- 18 Q Certainly. You can start with stereo, run 19 it through HRTFs, and that would synthesize it 20 into binaural sound, correct? 21 A Yes. I'm using the word "stereo" here as 22 it is sometimes used colloquially to mean two

161 1 channels. Stereo only is stereo if you play it 2 back over loudspeakers, as we said early on today, 3 but it is often used this way. 4 Q Okay. You understand what it is saying 5 here, right? 6 A I'm sorry? You broke up. 7 Q You understand what it is saying here. 8 You said it is colloquial, but you understand that 9 it is recording or using non-binaural sound and 10 running it through HRTS, which would synthesize or 11 create binaural sound? 12 MS. WANG: Objection, mischaracterizes the 13 document. 14 A It is saying that it is recording two 15 channels sound and processing to imprint 16 head-related transfer functions to produce -- 17 yeah, that is -- that is right. And this would be 18 doing it by -- in a very analogous way to what we 19 were talking about before. The HRTFs would be 20 applied to the left and right or to the Channel 1 21 and Channel 2 of your two-channel recording. 22 Q And it is synthesis of -- to create	163 1 says. It is based on -- I guess I meant what I 2 was talking about in the morning session. 3 Spatial -- sound that is spatially rendered around 4 a listener. 5 Q And you say here it is based on digital 6 implementation of such HRTFs, correct? 7 A Yes. What is meant there is that -- and I 8 think it is what Dr. Begault talks about as well, 9 we process sound to create -- to synthesize the 3D 10 audio. 11 Q So -- 12 A What I'm talking about here. 13 Q Okay. So 3D audio is the same as binaural 14 synthesis? 15 A No, because 3D can also be done with 16 HRTFs, but over loudspeakers. So that is a 17 different way of doing it. It is called 18 transaural. We haven't talked about that, but it 19 is not the same. 20 Q So this -- what do you -- what do you mean 21 by HTRF over -- HRTF over a loudspeaker? 22 A No, I meant that you can process signals
162 1 binaural sound, correct? 2 MS. WANG: Asked and answered. 3 A The processing part can be thought of to 4 represent the synthesis. 5 Q I'm sorry, the processing part can -- 6 A Where it says: To process through HRTFs 7 to be produced by binaural sound, yes, that -- 8 that is similar to what I said about how to do it 9 by synthesis. 10 Q Okay. I said I wasn't going to do this, 11 but I'm going back to your article one more time, 12 so let's go back to Exhibit 2. And that is the 13 perfect place. Not to belabor this much longer, 14 so I don't know how else you want to -- how much 15 other you want to look at, but here in the top of 16 the paragraph where it says: The emerging field 17 of 3D audio. 18 Do you see that? 19 A Yes. 20 Q And so what did you mean by "3D audio" 21 when you are using it in this article? 22 A I meant audio that -- what the sentence	164 1 through HRTFs knowing that you will -- the 2 listener will be wearing headphones and that is a 3 way of creating binaural audio we have talked 4 about. You can also process signals through HRTFs 5 knowing that the result will be played over 6 loudspeakers and that is called transaural audio, 7 which I mentioned somewhere else in the article, 8 but that is clearly not binaural. So 3D covers 9 both of those and others. 10 Q 3D covers binaural and transaural audio? 11 A And -- and multichannel surround sound as 12 we have in movies today and back then. So 3D 13 audio is the umbrella term that I -- I think I 14 called it the umbrella term in the morning 15 session. 16 Q Anything else besides -- I'm not going to 17 belabor this much more. You said multichannel 18 recording? 19 A I said multichannel surround sound. 20 Q Oh, sorry. 21 A Binaural -- binaural audio and transaural 22 audio.

165 1 Q Anything else you can think of? 2 A Technically under the definition of 3D 3 covers -- it involves the placement of sound. 4 Stereo played over loudspeakers in the right 5 definition would also fall under that. It is just 6 that you wouldn't be able to have the full 7 coverage of angles, but you could certainly move 8 sounds around between the speakers so it would 9 fall under that as well, stereophonic. 10 Q So you're testifying stereophonic sound 11 falls under the definition of 3D? 12 MS. WANG: Mischaracterizes the witness' 13 testimony. 14 A Not the definition. The 3D audio covers 15 multiple types of implementations. And one of 16 them can be stereo, stereophonic sound as defined 17 by Olson and we mentioned in my declaration and 18 the others that we just talked about, binaural, 19 multi channel, surround sound and transaural. 20 Q But you wouldn't have the full range of 21 spatial orientation of sound with stereo, correct? 22 A You would not be able to cover 360	167 1 Basic Methods for Recording, Synthesis, and 2 Reproduction and it is by Dorte Hammershøi and 3 Henrik Møller. I don't know how to say that. It 4 is published in 2005. 5 Do you see that? 6 A I do. 7 Q Do you know Dorte Hammershøi? 8 A Not personally, but I know her work. 9 Q Okay. What is she -- is she someone who 10 is recognized in the industry as an expert? 11 A That is hard to say. She has published in 12 this area, yeah. I don't -- I don't -- can't 13 characterize it beyond that. 14 Q Okay. 15 MS. PARTRIDGE: Page -- can you turn to 16 page 245 Jesse, please? 17 A Just for the record, I don't think I have 18 seen this document before. 19 Q Okay. If you want to make it bigger and 20 look at it, I was just going to ask you about one 21 paragraph, but you are certainly free, we will go 22 off the record and let you -- let you read it if
166 1 degrees, but 3D audio is not -- does not specify a 2 number of degrees. I'm just trying to be 3 complete. Anything that spatially moves sound. 4 For example, I would not put monaural 5 audio under this -- or not mono, but monophonic. 6 Monophonic would be a single loud speaker, but I 7 would put stereophonic because you can have images 8 in space between the speakers. 9 Q In 3D? 10 A Sure. 11 Q Okay. Let's go back to -- let's see. 12 Where do I want to go to? Just one minute. 13 MS. PARTRIDGE: I want to add one more 14 exhibit, so this would be Exhibit 5, I believe. 15 Do you have -- can you find an article, Binaural 16 Technique, Basic Methods for Recording, Synthesis, 17 and Reproduction? It is by Dorte Hammershøi. 18 REMOTE TECHNICIAN: Stand by. 19 (Exhibit 5 marked.) 20 Q Dr. K, let me show you what's been marked 21 as Exhibit 5. And this is an article from Aalborg 22 University in Denmark called Binaural Technique,	168 1 you feel uncomfortable with answering my question, 2 okay? 3 A Okay. For sure, let's start with making 4 it bigger, once we are there. 5 Q Yeah, I got that. I'm actually looking at 6 a paper that I think you are younger than I am and 7 I can't read that and I have full cataract surgery 8 so... 9 A Wow. 10 Q Which I recommend if you can't see, never 11 mind. That is a longer issue. 12 Okay. So I am at this second paragraph 13 which starts with, The binaural synthesis. And I 14 wanted you to read this paragraph and I want to 15 see if you agree with it or not. If you need to 16 read the whole article, then, you know, we can 17 take a break and you can look at it or I can 18 decide, you know, what we will do. 19 A Okay. So you are looking at, The binaural 20 synthesis can however paragraph? 21 Q Yes, The binaural synthesis can, however, 22 be considerably improved by making use of an

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169 1 important difference between recording and 2 synthesis of binaural signals, so it is that 3 paragraph? 4 A Okay. That is stating a very well-known 5 fact in the industry, that head movements improve 6 localization. So I don't need to -- if that is 7 what we're talking about, that is fine. 8 Q I'm just asking you if you agree with that 9 statement? 10 A Yes, I do. 11 Q Okay. Great. Let me ask you one more 12 question from this article. The other author -- 13 can you go back up to the top, is Henrik Møller, 14 have you heard of him? 15 A Yes. In the same way I know that they're 16 at the same university and he has published some 17 work in this area as well. 18 Q And what is his reputation in the 19 industry? 20 A It is recognizable. I don't know how else 21 to characterize it. 22 Q It is what, I'm sorry?	171 1 Dr. K? 2 A Yes. 3 Q Okay. Can you -- can you just -- just 4 refamiliarize yourself with it and then I will ask 5 you a few questions. 6 A Okay. 7 Q So let me know when you are through. 8 A (Reviewing document.) Okay. 9 Q I'm going to direct your attention to the 10 first limitation which starts with capturing. And 11 then it goes, capturing with an electronic 12 earphone located at the head of a talking person 13 binaural sound that will be provided to a 14 listening person during a telephone call. 15 Do you see that? 16 A I see it. 17 Q And so this claim is basically covering 18 binaural recording, correct? 19 A I think that is overly generalizing what 20 it is covering. I talked a lot and put a lot of 21 work in talking about these claims in my report, 22 so it would be very helpful if we could use that
170 1 A He is a recognizable name in this 2 industry. 3 Q Okay. You have heard of both Professor 4 Møller and Professor Hammershøi, right? 5 A I have, yes. 6 Q Okay. Let's move back to the -- I want to 7 just do -- talk a little bit about the '090 8 patent, okay? And that is the patent that is at 9 issue in this lawsuit. I mean, not lawsuit, in 10 this IPR. There is another lawsuit that is at 11 issue in this IPR. 12 Are you ready? Let's go to the very back 13 of the patent I want to look at the claims, okay? 14 A Yes. 15 MS. PARTRIDGE: So Jesse, I say the back 16 of the patent but it is, like, the last two pages, 17 three pages of the patent, because we're going to 18 start on Claim 1. Go back up just a little bit. 19 Go back up one. We're going to Claim 1. There it 20 is, perfect. Go down and make it bigger, please. 21 Okay. 22 Q This is Claim 1 of the '090 patent, okay,	172 1 as a guide, if you know -- 2 Q I'm asking you at a high level whether 3 capturing with an electronic earphone located at 4 the head of a talking person binaural sound that 5 will be provided to a listening person during a 6 call is binaural recording? 7 A Those words are not sufficient for that, 8 because it doesn't say how many microphones the 9 earphone has and what the listener is wearing 10 during the telephone call. 11 Q Well, it does say an earphone, correct? 12 A Correct. 13 Q That is two ears, right? 14 A No, not necessarily. You have seen the 15 ones that they wear at the call centers, it is one 16 ear, so... 17 Q Okay. Well, assuming that the electronic 18 earphone is on both of these ears, this is talking 19 about binaural recording, correct? 20 A I mean, and also there are two microphones 21 one in each ear, which is also on here. It is 22 just not --

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173 1 Q Well, it does say capturing, right? 2 A It can be. 3 Q With electric earphone located at the head 4 of a talking person binaural sound. So it is 5 talking capturing binaural, and that is recording 6 binaural sound, correct? 7 A If there are two microphones and listening 8 to the telephone call with a listening person is 9 wearing a headset with two, one on each ear, yes, 10 but that is not that way in this part of the 11 claim. 12 Q Okay. And you also talked about this as 13 during a telephone call, correct? 14 A The patent talks about it you mean? 15 Q Yes, and this claim talks about it as 16 well, right? 17 A Yes. 18 Q This is talking about a telephone call 19 between a talking person and a listening person, 20 this claim, correct? 21 A Yes, that is what I was just reading, the 22 22 words there, yes.	175 1 mean, you're seriously telling me that? A 2 telephone call would include a voice exchange, 3 correct? That is exactly what a telephone call 4 is, right, an exchange of voices between a -- 5 MS. WANG: Form. 6 Q -- listener and a talker, correct? 7 MS. WANG: Form, asked and answered. 8 A I wouldn't use the word exchange. I would 9 just say two people are talking. They could be 10 talking over each other. They don't have to wait 11 for each other so they're -- 12 Q They're using their voices, right, to talk 13 to each other, correct? 14 A There can be a talking person and a 15 listening person. And they could be using their 16 voices, but other information could be going 17 across the telephone call as well, not just the 18 voice. 19 VIDEOGRAPHER: Sorry, counsel. Just to 20 let you know our court reporter has lost internet. 21 She has dropped off the call. We still have the 22 recording, but I just wanted to let you know in
174 1 Q Okay. And that means that there must be a 2 live voice exchange between the talking person and 3 the listening person? 4 MS. WANG: Objection to form. 5 A Where does it say that though? 6 Q That is what a telephone call means, 7 right? 8 A You have never been placed on hold? It 9 does not have to be a voice. 10 Q Well, this talks about a talking person 11 and a listening person on a telephone call, 12 correct? 13 A Right. 14 Q And that is a voice exchange, correct? 15 MS. WANG: Objection to form. 16 A Okay. So sorry, repeat your question. 17 You are saying do telephone calls include voice, 18 is that what you are asking? 19 Q Is exchange of voice a voice exchange? 20 MS. WANG: Objection to form. 21 A I'm not sure what voice exchange means. 22 Q Well, a telephone call would include -- I	176 1 case you wanted to go off record while we get a 2 replacement. 3 MS. PARTRIDGE: Let's go off the record 4 for five minutes. 5 (Recess, 3:55 p.m. to 4:16 p.m.) 6 VIDEOGRAPHER: We are back on the record. 7 The time is 4:16. 8 Q Hello, Dr. K. We're back. 9 A Yea. 10 Q I'm getting organized. We -- let's go 11 back -- I just want to make sure I understand your 12 testimony about -- I just want to go back first to 13 Claim 1, okay -- 14 A Yes. 15 Q -- of the '090 patent, so that is Exhibit 16 4. Okay. And here we were talking about the 17 claim includes a -- let's see -- a listening 18 person and a talking person on a telephone call. 19 Do you see that? 20 A I do. 21 Q And what I asked you was whether or not 22 this included -- would be live voice exchange.

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177 1 MS. WANG: Objection, form. 2 A So there is live voice exchange during a 3 telephone call, but I was trying to say before we 4 ended that other stuff like background noise and 5 things could also go through there. So it's not 6 the only thing is what I'm trying to say. 7 Q Okay. There's live voice exchange, but if 8 there's a siren in the back, then -- you know, 9 you'd also hear things like that as well? 10 MS. WANG: Objection to form. 11 A Right. Whether one person stops talking, 12 the call is still happening. 13 Q Okay. 14 A The purpose of the call is for two people 15 to talk. I agree with that. 16 Q Okay. Let's go to -- let me just ask you 17 one more thing about Claim 1. We talked about 18 limitation 1. It says: Capturing with an 19 electronic earphone located at the head of the 20 talking person binaural sound that will be 21 provided to a listener during a telephone call. 22 Okay. So at least this part of the	179 1 Q Okay. And let's see. Let me check off 2 that. Sorry, I'm -- and let me -- let's go to 3 Claim 15, please. 4 And here, it's -- it's talking about a 5 first person and a second person on an electronic 6 phone call. Do you see that? 7 A Just read it real quick. 8 Q Sure. 9 A I see it. 10 Q Okay. And so, again, this is a telephone 11 call, so there's at least a live voice exchange, 12 correct? 13 MS. WANG: Objection, mischaracterizes the 14 document. 15 A This -- in this claim it's called an 16 electronic phone call. 17 Q Okay. 18 A So I guess they use a different way. 19 Q Okay. But -- so telephone call, 20 electronic phone call, telephone call? 21 MS. WANG: Form. 22 A I believe there was -- there's a claim
178 1 limitation is talking about capturing binaural 2 sound, correct? 3 MS. WANG: Objection, form. 4 A Subject to the conditions that we talked 5 about, assuming there's two microphones and that 6 the person on the other side's earphone is to 7 transduce one in each ear. 8 Q Okay. But you can capture binaural sound 9 without someone listening to it, correct? 10 MS. WANG: Objection to form. 11 A Yeah. Now we're getting philosophical 12 again. Binaural sound only exists if somebody is 13 listening to it in their ears or -- either live or 14 recorded, but otherwise it's just two channels of 15 audio. 16 Q Okay. But you're capturing it in a method 17 that can provide binaural sound if the -- if the 18 listener has an earphone within each ear or two 19 earphones or an earphone? 20 A Yes. One in each ear, yes. 21 Q Okay. 22 A One in each ear.	180 1 construction term proposed by Eight KHz, but I'm 2 not going to look so I don't get scolded, but it's 3 there. 4 Q Okay. So -- but a telephone call includes 5 at least the live voice exchange, correct? 6 A Telephone call, yes. 7 Q Okay. And then -- but here, we're talking 8 about an electric phone call between a second -- 9 first person and a second person, correct? 10 A That's what it says. 11 Q Okay. And so would you consider Zoom an 12 electric phone call? 13 A Zoom. 14 Q Like right now we're exchanging -- we're 15 having a live voice exchange, correct? 16 A We are. I have to think about if we 17 actually call each other. That's the question I'm 18 thinking about. Is it possible for me to look at 19 the figure that you use, the claim construction 20 definition of Eight KHz? Could I just look at 21 that? 22 Q If you have your -- if you have it in your

181 1 declaration here, you can look at it. Otherwise, 2 I'll just go with your testimony that a telephone 3 call -- we can argue later about electric phone 4 call, but a telephone call includes at least live 5 voice exchange. Okay? 6 A Okay. 7 Q You would agree with that? 8 A Yes, let's go with that. 9 Q Okay. And you agree with that, correct? 10 A That a telephone call includes live voice 11 exchange, yes. 12 Q Okay. And so in Claim 15, the second 13 limitation talks about a -- there's a second -- 14 well, the first person -- I'm sorry. Strike that. 15 Let's go to the first limitation. The 16 first person has a wearable electronic device. 17 Do you see that? 18 A Yes. 19 Q And then the second person has a wearable 20 electronic device, and that second person captures 21 binaural sound. 22 Do you see that?	183 1 A Binaural voice. 2 Q I'm sorry, binaural voice. 3 And Claim 1 is talking about binaural 4 sound, correct? 5 A Let's go back and look. I don't know if 6 it is voice or sound. I don't recall. 7 MS. PARTRIDGE: Can you -- Jesse, can you 8 go to Claim 1, please. 9 A This says binaural sound. 10 Q Okay. Just a second. Okay. Let's go to 11 Claim 15. Okay. I'll give you a few minutes to 12 read this or however long you need to read this. 13 A Okay. Is there more on the page, or is 14 that it? 15 Q No. You need more. 16 A Okay. Will you scroll, please. 17 Q You know, I apologize. We already did 18 Claim 15. Can we go to Claim 8? Sorry. I'm 19 sorry Dr. K. 20 A No worries. 21 Q Are you ready? 22 A Yes.
182 1 A By the voice, yes. 2 MS. WANG: Mischaracterizes the document. 3 Q I mean, it says: Captures a binaural 4 sound. Correct? 5 A No. It says: Captures a binaural voice. 6 Q I'm sorry, sorry. 7 So it says it captures a binaural voice; 8 correct? 9 A That is what it says. 10 Q And this is at least the capturing part, 11 so it -- if there's someone on the other end 12 that's listening with an earphone, they -- that 13 would be recording binaural voice, correct? 14 A Now we're back to the qualifications of 15 the Claim 1. It's the person on the other side is 16 listening with an earphone that has a transducer 17 in each ear, like, on their ears or in their ears, 18 and the person -- and the wearable device the 19 second person is wearing is capturing with two 20 microphones, one in each ear, then, yes. 21 Q Okay. So this claim is talking about 22 binaural sound, correct?	184 1 Q Okay. Sorry. Every once in a while I get 2 an echo from your voice, but it's probably my 3 ears? 4 A Did you calculate the delay? 5 Q It's pretty bad. But it's basically 6 because I have nerve -- what it's called? My 7 nerves are messing up, and so I can't hear as well 8 because my nerves to my ears or something aren't 9 working, which is sad. 10 A Oh, wow, that is sad. 11 Q I'm not deaf yet, but getting there. 12 Okay. Let's -- we're at Claim 8, and with 13 Claim 8 let me -- it's talking first about wearing 14 an electronic earphone, correct? So it's the 15 first limitation. 16 A One -- the first individual is wearing an 17 electronic earphone. 18 Q Yes, right. And it's during an electronic 19 call, correct? 20 A And it's what? I'm sorry. 21 Q It's during an electronic call, correct? 22 So limitation 1 says: Commence an electronic

185 1 call -- 2 A Yes. 3 Q -- between a first individual wearing an 4 electronic earphone and a second individual that 5 are remote from each other. 6 A Right. 7 Q Okay. 8 A Okay. I see that. 9 Q So it's about an electronic call, correct? 10 A Well, the way it's written is about 11 commencing an electronic call, so, yes. 12 Q Okay. And, now, does this claim talk 13 about externalization of sound? 14 MS. WANG: Objection to form. 15 A This claim limitation or the whole claim? 16 Q The claim. 17 A It doesn't expressly state anything about 18 externalization. 19 Q All right. But is it talking about the 20 principle of externalization of sound, sound 21 externalization? 22 MS. WANG: Objection to form.	187 1 Q And the sound from the second user 2 originates -- or the second user originates from 3 that SLP, correct? 4 A The voice of the second user appears to 5 the first user as originating from the SLP. I 6 think that's what you are saying, right? 7 Q Right. 8 A I agree with that. 9 Q And is that sound externalization? 10 MS. WANG: Form. 11 A Sound externalization can have a part in 12 this, but it is not required. 13 Q Can have a what? I'm sorry. 14 A Can have a -- sound externalization can 15 have a role in this, but I don't know that it is 16 required. The claim doesn't say anything about it 17 being required or even mentions it. 18 Q Well, it says: The origin of the voice is 19 at a point external to the user. That is 20 basically what this claim is talking about, right? 21 MS. WANG: Objection to form, calls for 22 speculation.
186 1 A I don't see that. 2 Q Okay. What about the fact that there's a 3 sound localization point in an empty space located 4 away from and proximate to the first individual? 5 A Okay. So just -- to me, that indicates 6 where the sound is being told to localize from. 7 Q Okay: And is that a part of sound 8 externalization? 9 MS. WANG: Objection, vague. 10 A Those are kind of different concepts. 11 Q Okay. 12 A Sound externalization is something that -- 13 it's not -- one doesn't follow the other from this 14 claim. 15 Q Okay. And what about the fact that it 16 also includes that the sound of the second user 17 originates from the SLP? That's sound 18 externalization, correct? 19 MS. WANG: Objection, form. 20 A No. It's very specific, what it says. 21 It's that the person listening is perceiving the 22 sound to originate from the sound from the SLP.	188 1 A I'm sorry, but where does it say that? 2 Q Well, it says it in that first -- there is 3 a sound localization point, an empty space is 4 located away from or proximate to the first 5 individual. And that this -- and then to execute 6 the electric autonic process such that the origin 7 of the voice of the second individual appears to 8 the first individual to originate from a fixed 9 location that is the sound localization point in 10 empty space. 11 A Okay. 12 Q This is sound externalization, correct? 13 MS. WANG: Objection, form. 14 A I'm trying to see what they're actually 15 saying. This thing is -- this claim is clearly 16 not focused on sound externalization. It is 17 focused on placement of sound sources at fixed 18 locations. 19 Q That are external from the user, correct? 20 A That are away from and proximate, so... 21 Q Right. Which is not at the user, away 22 from and proximate, correct?

189 1 MS. WANG: Objection, form. 2 A I believe the proposed claim construction 3 here was at some distance, and that is something 4 like that and some distance from the user that 5 Eight KHz proposed, and I went with that. So 6 under that construction, I will agree that this is 7 external to the user. 8 Q Okay. And so does this -- I'm sorry, the 9 next limitation talks about offering an interval 10 time difference of the voice. 11 Do you see that? 12 A The last one? 13 Q Yes. 14 A I see it. 15 Q And you see that -- that this change is 16 altered, so that it alters an interval time 17 difference of the voice. The first individual 18 hears in response to the first individual moving 19 the head orientation with respect to the sound 20 localization point. 21 Do you see that? 22 A I see it.	191 1 A I'm sorry, where does it say binaural 2 voice? 3 Q Binaural voice. 4 A But where does it say that? I'm sorry. 5 Q I mean, this is talking about 6 externalization of sound using interval time 7 differences and head movements to alter those 8 interval time differences. This is definitely 9 things that are used with binaural sound, correct? 10 MS. WANG: Objection, form. 11 Q Or binaural voice? 12 A Again, I don't see where it says anything 13 about binaural voice. This is just -- it is just 14 talking about -- and the reason I say that, in 15 other claims they say binaural voice, but here 16 they don't say it. So that is why I want to be 17 careful. 18 Q So you don't -- so let's go back to C, to 19 the second limitation, which talks about: 20 Designate for the first individual a sound 21 localization point that simulates a location in 22 empty space from where an origin of a voice of the
190 1 Q So this takes into, or at least talks 2 about altering an ITD that we talked about 3 earlier, correct? 4 A Interval time differences. 5 Q Right. And that talks about head 6 tracking, correct? 7 A Again, not expressly. Somehow in response 8 to moving the head orientation. It doesn't say -- 9 it doesn't mention head tracking. My 10 understanding is that with claims, we have to be 11 very precise about the words that are used. At 12 least that is what I have done. 13 Q Well, this is certainly altering the ITD 14 based on the movement of the head orientation with 15 respect to the sound localization point. That is 16 what it says, correct? 17 A That is what it says, yes. 18 Q Okay. So this is basically talking about 19 binaural voice, correct? 20 MS. WANG: Objection, form. 21 Q It doesn't say sound in here. It says 22 voice, so it is binaural voice, correct?	192 1 second individual occurs for the second -- for the 2 first individual through the electronic earphone 3 such that the sound localization point in empty 4 space is located away from and proximate to the 5 first individual. 6 Do you see that? 7 A I do. 8 Q So the person who is hearing the voice of 9 the speaking person, it is hearing that external 10 to themselves, right? 11 A To the extent that we go with the Eight 12 KHz definition of away from and proximate, yes. 13 Q Okay. So what is externalization of 14 sound? 15 A Again, it has different functions and 16 different applications. It is -- well, it is the 17 perception of sound that doesn't appear to be in 18 the center of your head. 19 Q And that is what -- at least this 20 limitation that we just read, Limitation 2 is 21 talking about, right? 22 A Well, not exactly, because I can think of

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193 1 places where it doesn't appear to be in the center 2 of my head, but it doesn't have to be a far 3 distance away. It is kind of a relative term, 4 right, away from and proximate. 5 Q It is external, right? 6 MS. WANG: Asked and answered. 7 Q It is external, correct? 8 MS. WANG: Asked and answered. 9 A According to Eight KHz, that is the 10 definition I used in my -- in my report. 11 Q And the sound originates externally from 12 the listener, correct? 13 A The sound appears to the listener. There 14 is no actual sound, right? It is in that room. 15 The sound is synthesized. It appears to the 16 listener to be away from and proximate. 17 Q Which is external to the user, correct? 18 MS. WANG: Asked and answered. 19 A Using that definition from Eight KHz, yes. 20 Q Can you have a voice that is externalized, 21 but not binauralized? 22 MS. WANG: Objection to form.	195 1 definition, yes. 2 Q Not coming from inside the head. The 3 user's perceiving the voice to come from an 4 external point, correct? 5 A Right, but that doesn't -- that doesn't 6 lead to the next statement being, therefore, it is 7 binaural. That can be done in different ways. 8 Q How else? 9 MS. WANG: Asked and answered. 10 A So we have two signals, one in left ear 11 and one right ear and we can do all kinds of 12 things to them that are -- that play with those 13 signals to produce externalization. 14 Q Could it also be binaural sound? 15 A Can it be binaural sound? That is -- that 16 is one way to achieve that, but as I'm saying, 17 there are other ways as well. That is why I'm not 18 concluding that this is talking about binaural 19 sound only. 20 Q Can that be stereo sound? 21 A Can what be stereo sound? 22 Q Can -- you said that it didn't have to be
194 1 A Yes. 2 Q What is that? 3 A What is that? 4 Q How can you have that? 5 A You can manipulate the signals going to 6 the left and right headphone to produce 7 externalization without having full binaural 8 recording. 9 Q Okay. So does this limitation talk about 10 binaural sound or binaural voice? 11 MS. WANG: Objection, form. 12 A It does not mention it. 13 Q I understand that, but we're talking about 14 externalization of sound. We have established 15 that, right? 16 A We have established that away from and 17 proximate is what the -- 18 Q Right. 19 A -- user. 20 Q And we've also established that that is 21 external to the user, correct? 22 A Based on the -- based on the Eight KHz	196 1 binaural sound. It could be binaural sound, 2 correct? 3 A No. It could be binaural, but it could be 4 other things as well. 5 Q I'm sorry? 6 A It could not be stereo -- it could be 7 other things. There are other -- other processes 8 that we could follow to externalize sound that 9 don't involve HRT and don't involve binaural. It 10 could not be stereophonic because at least in this 11 claim, we are talking about headphones, not 12 loudspeakers, and stereophonic requires 13 loudspeakers. 14 Q Okay. So it is not stereophonic sound, 15 but it could be binaural sound? 16 A It could be binaural or other things as 17 well. 18 Q I'm sorry, did you say interaural? 19 A No, it could be binaural or it could be 20 other things as well. 21 Q What other things? 22 A I don't know if they have a name. I know

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197 1 there are processes that you do -- you can process 2 signals, so that when they arrive at your ears, 3 externalize the sound without being binaural. 4 Q And what would that be called? 5 MS. WANG: Asked and answered. 6 A I don't know of a name. It involves 7 multiple things like adding reverberation, adding 8 other things, filtering. I don't -- I am not 9 aware of a name for it. I'm just aware of the 10 effect because I have experienced it. 11 Q Okay. Let me go back to -- I want to go 12 back to something I forgot to put an exhibit on, 13 Exhibit 5. 14 MS. PARTRIDGE: I think that was the 15 article, right, Grace? Aalborg University, and 16 I'm sorry, Ms. Wang. 17 MS. WANG: That's right. 18 MS. PARTRIDGE: I'm sorry, I meant to call 19 you Ms. Wang. I'm not trying to -- 20 MS. WANG: That is okay. 21 Q We're back at Exhibit 5, which is the 22 binaural technique article. Do you see that,	199 1 disagree with? 2 A No. I agree. 3 MS. PARTRIDGE: Okay. Okay. Can we take 4 a five-minute break, please? I'm just changing 5 topics, so I want to get organized. Okay? 6 THE WITNESS: Sure. 7 VIDEOGRAPHER: We are going off the 8 record. The time is 4:48. 9 (Recess, 4:48 p.m. to 5:06 p.m.) 10 VIDEOGRAPHER: We are back on the record. 11 The time is 5:06. 12 Q Good afternoon. Okay. Let's turn to -- 13 I'm going to go to Exhibit 1, and it's paragraph 14 84 of your declaration in this suit -- in this 15 IPR. And if you can -- yeah, go up a little bit. 16 This is regarding Bedingfield, are you there, 17 Dr. K? 18 A I see it. 19 Q Okay. And I'm going to be asking you 20 specifically about the second sentence of your 21 declaration. And can you -- I'm sorry, the second 22 sentence of paragraph 84. Can you read that
198 1 Dr. K? 2 A I do. 3 Q Can we go back to page 245, and I 4 apologize, I forgot to ask you about one other 5 thing in this article. We talked earlier -- can 6 you see that, Dr. K, or do you need that larger? 7 A I can see it. 8 Q Okay, good. 9 So you remember we talked about the second 10 full paragraph earlier. Can we -- can -- I want 11 to direct your attention now to the third full 12 paragraph that starts with: Binaural reporting. 13 Can you read that, please? 14 A Okay. Yes, give me a second. (Reviewing 15 document.) Okay. 16 Q Do you agree with that paragraph? 17 A Is there a specific part of it that you 18 would like me to agree or disagree with? I mean, 19 it is stating -- 20 Q Well -- 21 A -- several things. 22 Q Do you have any parts of it that you	200 1 sentence, please? It starts with "Bedingfield 2 generally." 3 A Bedingfield generally discloses all the 4 limitations of the independent challenged claims 5 except for capturing binaural sound or voice and 6 maintaining the voice's origin at a fixed SLP 7 while the user moves and changes head orientation. 8 Q So according to your declaration, 9 Bedingfield doesn't disclose capturing binaural 10 sound or voice, correct? 11 MS. WANG: Objection, mischaracterizes the 12 document. 13 A I guess that's what I said there. I think 14 I should have had the word "expressly." So it 15 doesn't expressly state that. 16 MS. PARTRIDGE: Yeah. Let me ask. 17 Ms. Wang, how are you saying I'm mischaracterizing 18 the document? 19 MS. WANG: You said Bedingfield doesn't 20 disclose capturing binaural voice or -- I'm 21 sorry -- binaural sound or voice. 22 MS. PARTRIDGE: Yeah. That's exactly what

201 1 he says. Bedingfield generally discloses all 2 limitations of the independent challenged claims 3 except for capturing binaural sound or voice. 4 So what is your objection there? 5 MS. WANG: It's -- you -- you 6 mischaracterized the sentence. 7 MS. PARTRIDGE: How did I mischaracterize 8 it? 9 MS. WANG: Just read it correctly. The 10 way that you just read it is correct. 11 MS. PARTRIDGE: How am I mischaracterizing 12 it? 13 MS. WANG: When you said Bedingfield -- 14 when you characterized his declaration as stating 15 that Bedingfield does not disclose capturing 16 binaural sound or voice. 17 MS. PARTRIDGE: And that's exactly what it 18 says. So be careful with your objections, okay, 19 because I'm not mischaracterizing anything. Okay, 20 Ms. Wang? Thank you. 21 MS. WANG: Ms. Partridge, I agreed with -- 22 with you when you read -- you read it correctly.	203 1 Q Go ahead. 2 A Yes. That's what I said in that sentence 3 there. 4 Q All right. That Bedingfield does not 5 disclose capturing binaural sound or voice, 6 correct? 7 MS. WANG: Asked and answered. 8 A I followed by saying, and that was the 9 reason for the... 10 Q Okay. You also say that: Bedingfield 11 discloses all limitations of the independent 12 challenged claims except for maintaining the 13 voice's origin at a fixed SLP while the user moves 14 and changes head orientation, correct? 15 MS. WANG: Objection, mischaracterizes the 16 document. 17 Ms. Partridge, you didn't use the word 18 "generally." The word "generally" is in that 19 sentence. 20 Q Okay. Start over. We'll just start over. 21 So you have here: Bedingfield generally 22 discloses all the limitations of the independent
202 1 MS. PARTRIDGE: Okay. 2 MS. WANG: But when you were 3 characterizing it, you were mischaracterizing it. 4 MS. PARTRIDGE: Okay. If he wants to 5 explain how he can say something exactly the 6 opposite than what he says in his declaration, 7 then we'll talk about that. Okay? 8 Q So here, Dr. K, you say: Bedingfield 9 generally discloses all limitations of the 10 independent challenged claims except for capturing 11 binaural voice -- sound or voice. 12 Did I read that correctly? 13 A Yeah. 14 Q Okay. So what you're saying here is 15 Bedingfield does not disclose capturing binaural 16 sound or voice, correct? 17 A That's what I said, and that was the 18 reason for the combination with Andrea. 19 Q What did you say? That's what you said? 20 You're agreeing with me that's what -- what you 21 say -- 22 A That's what I --	204 1 challenged claims except for capturing binaural 2 sound or voice. 3 Did I read that correctly? 4 A Yes. 5 Q And what you wrote here and what you mean 6 here is Bedingfield does not disclose capturing 7 binaural sound or voice, correct? 8 MS. WANG: Asked and answered. 9 A I agreed with that part and explained that 10 I used the combination with Andrea to include 11 that. 12 Q Okay. You need Andrea to get this piece 13 of capturing binaural sound or voice, correct 14 because it's not in Bedingfield? 15 A It's -- I guess what I was trying to say a 16 few minutes ago was that a POSITA reading 17 Bedingfield would know that some of the language 18 in the specification regarding spatialization of 19 sound had -- could be done -- would be done with 20 binaural voice, but he doesn't use those words. 21 That's what I was trying to convey here. 22 Q So Bedingfield -- where do you -- where do

205 1 you say any of that here? 2 A I don't. That was -- 3 Q What you say here -- 4 A I was trying to -- wait a minute. Yeah, 5 go ahead. 6 Q What you say here is Bedingfield does not 7 disclose capturing binaural sound or voice, 8 correct? 9 MS. WANG: Mischaracterizes the document. 10 A I think we agreed on what I said there. 11 We just -- you read the sentence, and I said that 12 sentence. 13 Q You agreed with me, correct, that 14 Bedingfield does not disclose capturing binaural 15 sound or voice? 16 MS. WANG: Asked and answered, 17 mischaracterizes the document. 18 A I'm agreeing with you that this sentence 19 is what I wrote, all of -- all of it. 20 Q I mean, you need Andrea because you don't 21 have capturing binaural sound or voice in 22 Bedingfield, correct?	207 1 orientation, correct? 2 MS. WANG: Asked and answered, 3 mischaracterizes the document. 4 A That is what I said -- 5 MS. PARTRIDGE: You need to be careful -- 6 just a sec. You need to be careful with your 7 objections, Ms. Wang, because I have read the 8 rules of what you can do in these proceedings, and 9 we will point this out to the Board if you're not 10 careful with it. 11 You've got to quit coaching the witness. 12 You can't do it. Okay? You may object for form. 13 Q Okay. Go ahead, Dr. K. 14 A I was trying to interject here that, yes, 15 that is what I wrote, but, again, a POSITA reading 16 Bedingfield would see -- and I think I mentioned 17 it further down somewhere -- that the -- I think 18 it's Figures 14 and 15 does maintain at least head 19 orientation, but to the extent that it wasn't 20 mentioned, that the user movement was mentioned we 21 used an additional -- I used additional reference 22 for that.
206 1 MS. WANG: Asked and answered. 2 A Andrea makes that argument stronger 3 because it expressly discloses binaural 4 microphones. But what I'm trying to say is that 5 outside of this sentence, just reading 6 Bedingfield, a POSITA would know that there is 7 discussion about binaural voice from the way 8 Bedingfield describes things in his -- in the 9 specification. 10 Q Okay. But here -- 11 A And I was trying -- I was saying he 12 doesn't use the word -- he doesn't use the word 13 "binaural." I agree with you. 14 Q Okay. But here in your testimony, what 15 you say in this declaration is that basically, 16 generally, that Bedingfield does not disclose 17 capturing binaural sound or voice? 18 MS. WANG: Asked and answered. 19 A That is what I said. 20 Q Okay. And you also say: Bedingfield does 21 not disclose maintaining the voice's origin at a 22 fixed SLP while the user moves and changes head	208 1 Q Okay. So you say that Bedingfield -- so 2 show us where in -- 3 MS. PARTRIDGE: Let's put Bedingfield up, 4 and we'll mark this as Exhibit 6. And that just 5 should say Bedingfield, but if it doesn't, Jesse, 6 it will be U.S. Patent 8,406,439. 7 (Exhibit 6 marked.) 8 MS. PARTRIDGE: You know, I'm sorry. Let 9 me go back real quickly. Go back to Exhibit 1 and 10 go back to paragraph 84 that we were just talking 11 about. Sorry, Jesse. 12 Q Now, I think you said about -- both of the 13 parts of this sentence that I asked you about, you 14 said that somewhere later you talk about in your 15 declaration where Bedingfield talks about binaural 16 sound. Can you find that for me in your 17 declaration, please? I need to understand it. 18 A No, that's not what I said. I was talking 19 about the second part where the user changes head 20 orientation. 21 Q Okay. So you don't have anything else in 22 your declaration about Bedingfield actually

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209 1 disclosing capturing binaural sound or voice, 2 right? 3 A I would have to look, because it has been 4 a while. So if you allow me to look at my -- I 5 don't know which claim you're referring to here 6 in -- specifically. But if you give me a few 7 minutes to look I'll be happy to answer. 8 Q Sure, go ahead. 9 A (Reviewing document.) 10 Okay. I found the part about the head 11 orientation, but I don't see anything further 12 about binaural Bedingfield. 13 Q Okay. That was what I was going to ask 14 you next. Head orientation, where did you find 15 that? 16 A I'm -- I start talking about it in 17 paragraph 120 in reference to the Figures 14 and 18 15 that I mentioned and also -- yeah, 14 and 15. 19 Q Let me get there. Just a sec. 20 A Yeah. 21 Q Okay. You're talking about paragraph 120 22 of your declaration. And this is where -- let	211 1 Q Okay. 2 A So that shows Bedington's (sic) user 3 turning their head while maintaining the 4 orientation -- changing orientation of the head 5 while maintaining the SLPs of the -- of the 6 participants in this -- diagram is what it is 7 called. 8 Q So -- sorry, I apologize. 9 So where is it talking about measuring 10 head orientation? I'm just trying to find that. 11 You said it was in paragraph 120? 12 A So the -- I saw the diagram, and that is 13 what is depicted in that diagram. I am trying to 14 find where I said. Okay, sorry. Sorry. The 15 diagram is up there for a different reason, to 16 show the wearable. If we go to paragraph 142 -- 17 Q We're getting there. Just taking me a 18 second. 142. 19 A Starting there, yes. So he describes 20 wearable speakers that are worn on the head, and 21 that detects the orientation of the listener. 22 Q Where are you? I'm sorry. Oh, I see --
210 1 me -- let me just make sure, you're talk -- this 2 is where you're saying you discussed further 3 about -- when you say that Bedingfield generally 4 discloses all the limitations of the independent 5 challenged claims except for maintaining the 6 voice's origin at a fixed SLP while the user moves 7 and changes head orientation, correct? 8 A Yeah. You are reading from paragraph 120? 9 Q I was reading from -- I was just making 10 sure -- getting orientated -- that is not a 11 word -- oriented. We were talking about two 12 different pieces of Bedingfield. And I believe 13 you told me that regarding the capturing binaural 14 sound or voice, there was nothing else that you 15 have in your declaration, but regarding 16 maintaining the voice's origin at a fixed SLP, 17 while the user moves and changes head orientation, 18 this is why we're going to paragraph 120? 19 MS. WANG: Objection, form. 20 A Yes. I was using that to indicate that -- 21 it is between paragraph 120 and paragraph 121 I 22 pasted there Figures 14 and 15.	212 1 A Yes. 2 Q -- the back -- the bottom of that. 3 So where does it say that they're 4 maintaining an SLP while the user changes its head 5 orientation? I don't see that part. 6 A Besides the Diagrams 14 and 15 that we saw 7 earlier, if you scroll down to paragraph 144 on 8 the next page, now I'm trying to find the right 9 one. It is towards the end of paragraph 144, so 10 kind of in the middle of paragraph 144: In 11 Bedingfield's system, the perceived SLP are fixed. 12 With respect to SLP, fixed -- sorry, such that the 13 orientation and movement of the listener's head is 14 with respect to the SLP. And we can go back to 15 Bedingfield and read that quote as needed. 16 And then further down where it says: See 17 also Figures 14 and 15 depicting a listener moving 18 to change focus direction and different 19 participants while the sound field changes to 20 reflect the new sound field orientation, in 21 quotes, for the listener. 22 Q So I see -- I kind of lost it again. I

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213 1 see where you say: See also Figures 14 and 15, 2 that the rest of that -- the sentence after that. 3 A Yes. 4 Q But you told me another one, the one 5 above, and I just missed that part. 6 A Oh. Well, I talk about it in -- five 7 lines down in paragraph 144. I discuss it, 8 Bedingfield's system, the perceived locations are 9 fixed such that -- you see that sentence? That 10 is -- I was just reading from that before this. 11 Q So I see that you say that -- 12 A The reason I am pointing to this is 13 because the claim talks about head orientation, 14 and that is what Figures 14 and 15 graphically 15 show, and what he says. We can go into the 16 specification, which is different from movement. 17 Q And so when you say in Bedingfield's 18 system, the perceived locations SLP are fixed such 19 that the orientation movement of the listener's 20 head is in respect to the SLP, and then you 21 quote -- is -- the quote after that is from 22 Bedingfield?	215 1 speakers the SLP? 2 A No. That is not a term of art. That is 3 what a POSITA will understand is an SLP. We can 4 look at the exact definition, which I don't recall 5 word for word in the '090 patent, but that is what 6 I used. 7 Q Okay. But Bedingfield doesn't talk 8 about -- I mean, SLP is a term of art in your 9 industry, right? 10 A No, it is not. 11 Q Oh, it is not? What is SLP? 12 A I'm sorry? 13 Q What is SLP? 14 A We would have to -- let's go the '090 and 15 look at it. They define it there. 16 Q And it is your testimony that SLP is 17 not -- not something that is defined in 3D audio 18 or binaural sound? 19 A No, I had never heard of it before reading 20 this patent. 21 Q But it is certainly not in Bedingfield, 22 correct?
214 1 A Yes. 2 Q But I don't see in that quote how that is 3 talking about maintaining the SLP. And is that 4 just something that you are saying that 5 Bedingfield says? Because I don't see where 6 Bedingfield is saying that in that quote 7 afterwards. 8 MS. WANG: Objection, form. 9 A We can go look at that section because I 10 didn't -- I don't think I wrote anything -- it's 11 17 lines now that I quote. But I think the best 12 way to see it is through the -- he's talking about 13 Figures 14 and 15, the SLP, there is three of them 14 in that example. 15 Well, there is three listeners. One of 16 them could be the SLP that we're talking about or 17 more. And as -- as the user turns their head, 18 the -- the other participants don't move. So with 19 respect to one of those being the SLP, Bedingfield 20 discloses that head orientation changed, but the 21 SLP did not. 22 Q Does Bedingfield call one of those	216 1 A The words "SLP" are -- don't appear 2 anywhere outside the '090 patent, as far as I 3 know, because it is not a term of art. 4 But the meaning, if we were to go to the 5 '090 and I could show you the definition is what I 6 used, and that is certainly in Bedingfield. 7 Q So you say that there is talk because you 8 said that initially, and in paragraph 84 that 9 Bedingfield generally discloses all the 10 limitations in the independent challenged claims 11 except for capturing binaural sound or voice and 12 maintaining the voice's origin at a fixed SLP 13 while the user moves and changes head orientation, 14 correct? But then you tell me that is -- 15 A Yes. 16 Q -- there is mention of maintaining the 17 voice's origin at a fixed SLP while the user moves 18 and changes head orientation in Bedingfield, 19 except that Bedingfield doesn't use the term 20 "SLP," correct? 21 A But what I said was that there is 22 definitely discussion in Bedingfield's disclosure

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217 1 of head orientation for all the reasons that we 2 just talked about in those figures. 3 He does not expressly state that the user 4 can move -- by "move," I don't mean just rotating 5 their head -- move in another direction 6 physically, even though the diagrams that he shows 7 don't -- he doesn't teach away from that and 8 wasn't there specifically saying move, and that 9 was the reason for the combination with balance. 10 Q Okay. Just a second. Just give me a 11 second. I'm sorry, I'm just trying to get 12 oriented with all these papers. 13 I'm sorry, just got my papers all mixed 14 up. Here. 15 So let me just tie this together for a 16 second. So in paragraph 87 you're talking about 17 that -- sorry, not 87 -- 84, you're talking about 18 that Bedingfield generally discloses all the 19 limitations in the independent challenged claims, 20 except for, and I'm going to the second part: 21 Maintaining the voice's origin at a fixed SLP 22 while the user moves and changes head orientation,	219 1 anything about a fixed SLP? We can put 2 Bedingfield up and you can look at it. Where is 3 Bedingfield? Did we get Bedingfield pulled up 4 before as Exhibit 6? Let's go to Exhibit 6. 5 Okay. 6 And, Dr. K, I've marked as Exhibit 6 to 7 your deposition U.S. Patent 8,406,439 to 8 Bedingfield. Do you see that? 9 A I do. 10 Q And this is the patent that we were just 11 talking about in paragraph 143 of your 12 declaration, correct? 13 A Yes. 14 Q And so -- 15 A Sorry. 16 Q I'm sorry, Dr. K, what did you say? 17 A It was 144. I think you said 143. 18 Q 144? 19 A Yes. 20 Q Okay. And this was part of the support 21 for -- that there is a fixed SLP? I'm sorry. 22 From this portion, you concluded that the
218 1 correct? So I'm just orienting us. That is 2 what -- I'm going back to paragraph 144. 3 A Yes. 4 Q Okay. And there you cite Bedingfield -- 5 you say that in Bedingfield's system, the 6 perceived locations SLP are fixed such that the 7 orientation of movement of the listener's head is 8 with respect to the SLP. 9 Do you see that? And you cite -- 10 A Wait, I see that. 11 Q I'm sorry, you cite Bedingfield at 13, 12 Column 35 through 52, correct? 13 A Yes. 14 Q Okay. And from that portion, you 15 concluded that the perceived locations of the SLP 16 are fixed such that the orientation and movement 17 of the listener's head is with respect to the SLP, 18 correct? 19 A Not just from that. The above -- 20 everything in this paragraph in Column 4, 55 to 21 56, and Figures 14 and 15 and their description. 22 Q Okay. Does Column 4, 55 through 56 say	220 1 perceived locations, SLP, are fixed such that the 2 orientation and movement of the listener's head is 3 with respect to the SLP, correct? 4 MS. WANG: Objection, form. 5 A Using the section to talk about the fact 6 in several places in Bedingfield he talks about 7 maintaining a fixed location for the participants, 8 which according to the definition in the '090, 9 is -- I forget the exact words, but we can look at 10 it. 11 Q Okay. Do you want to go -- 12 A And so -- yeah, let's go to the '090. I 13 believe it is -- it might already be there. It 14 was to the left of their column. I saw it before, 15 yeah. The previous page when we were talking 16 about Claim 1 -- yes, right there. Yes, right 17 where the arrow is, line 40 of the left column -- 18 no -- yes, yeah, as used here in sound 19 localization point. So line 42, I guess, is a 20 particular location or position that is determined 21 to be a location and origin or a place of 22 emanation of sound.

221 1 Q Okay. 2 A So I'm using that definition to form my 3 opinion. 4 Q Okay. And what I'm asking you is, where 5 is that in Bedingfield? 6 A Right, so what I'm talking about here -- 7 Q And so -- 8 A Go ahead. 9 Q So let's go to Bedingfield, and I want you 10 to show me where in Bedingfield it shows the 11 perceived locations SLP are fixed such that the 12 orientation and movement of the listener's head is 13 with respect to the SLP. 14 And in your paragraph 144, you cite 15 Bedingfield at Column 13, lines 35 through 52. 16 A And also Figures 14 and 15 and also Column 17 14, 20 through 43. So what I'm trying to say, 18 there are multiple places. 19 Q Where do you -- where do you get 14, 20 20 through 43? Okay. I see it. 21 A The last line. 22 Q Okay. So what about above? You said also	223 1 location and speaking to each other, the listener 2 will hear sounds from the participants unless they 3 have a specific balance, volume, and timbre for 4 each speaker. And I guess the line -- line 64 5 it -- through a communication system in a 6 substantially similar manner as if the listener 7 was present between all the participants. So 8 that's one part that led me to -- 9 Q Okay. So where's the fixed SLP in this 10 part? 11 A Well, in a -- in a conference the 12 participants are not moving. The listener is in 13 this -- in this scenario. 14 So the participants, if we go to -- let's 15 go to Figure 1. Right. So the listener wearing 16 the headphones is 102. And without rehashing the 17 entire patent, what Bedingfield teaches is that 18 the listener has placed three other participants 19 in locations shown, participant 104, 106, and 108. 20 And then -- sorry to jump around, but if 21 we go to Figure 15 -- 22 Q So wait. Where's the fixed SLP in Figure
222 1 the stuff above. Are you talking about Column 4, 2 55 through 56? That's in paragraph -- 3 A Yes, right. I'd have to go back and look 4 at each of those to see, but it was -- I remember 5 that my opinion was formed from multiple parts of 6 Bedingfield, and I think these are what's 7 quoted -- what are quoted here in this paragraph. 8 So we can look at each one separately, but I took 9 them in combination of all of -- all of those in 10 the specification, so... 11 Q Okay. So where in Column 4 -- let's go to 12 Column 4 -- 13 A Uh-huh. 14 Q -- lines 55 through 66. That's the first 15 one you quoted -- or you cited here in paragraph 16 144. 17 A Yeah. And these are all kind of -- maybe 18 not this -- they're all referring to various 19 figures as well, but yes. 20 Q Okay. 21 A So -- but it says if the -- for example, 22 if a listener and participants are in the same	224 1 1? 2 A The SLP is at the location of each of 3 those participants because that's where the 4 user -- that's what Bedingfield teaches, is that 5 the listener 102 has placed them at locations from 6 which the sound appears to emanate. I am slightly 7 paraphrasing the '090 definition of SLP, but 8 that's -- that was the intent. 9 Q Okay. So this is a conference call, 10 right? 11 A This is a conference call, yes. 12 Q All right. And so how does that disclose 13 fixing the SLP at a certain point? 14 A So participant -- the listener 102 has 15 fixed ESLP. And we can pick one of those three 16 other ones if we don't want all three to be SLPs. 17 For participant 104, for example, by the methods 18 that Bedingfield teaches, to place the sound so 19 that it is perceived by listener 102 to come from 20 that direction of fixed location for 104. 21 Q Okay. Let's go on to Figure 15. 22 A Yeah. Go to Figure -- so Figure 14 right

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225 1 above it is a topdown view of what we just said. 2 I think of it as that. The participant 1402 has 3 placed the other three at some angles or some 4 locations and SLPs. And then when the participant 5 turns their head in Figure 15, the predesignated 6 SLPs 1404 or 1406 or 1408 or all of them don't 7 change. They remain fixed. 8 Q So your testimony is 1404, 1406, and 1408 9 are fixed SLPs in Figure 15? 10 A Yes. 11 Q And then in Figure 1, so the SLP is fixed 12 at 102? 13 A No. 102 is the same user we just saw in 14 Figure 14, the bottom -- the SLP -- think of 15 Figure 14 as a topdown view of this room. The 16 listener is 102, and they have fixed the SLPs at 17 104, 106 and 108. 18 Q Can listener 102 move in Figure 1? 19 A Well, it's hard to move in a figure, but I 20 suspect that it -- there's nothing to preclude 21 that listener from moving to another location, and 22 everything that Bedingfield teaches, including	227 1 through, and Figure 1. 2 MS. PARTRIDGE: Okay. Let me go off the 3 record for just five minutes. Okay. Thank you. 4 VIDEOGRAPHER: Okay. We are going off the 5 record. The time is 5:49. 6 (Recess, 5:49 p.m. to 5:56 p.m.) 7 VIDEOGRAPHER: We are back on the record. 8 The time is 5:56. 9 Q Okay. I'm in Exhibit 1, your declaration, 10 and I am going to move to paragraph 147. And I'll 11 give you a chance to read that. 12 A Okay. 13 Q Okay. And let me go -- let me ask you -- 14 I think I'm just going to ask you one question, 15 but I'm sure it will be more. 16 But -- so in here I want to ask you about 17 ITD. We talked about it a little bit earlier, and 18 I want to talk about the context where the ITD is 19 zero. Okay? And I want to -- and I remember -- 20 or you may remember we talked about echo as well 21 earlier. 22 A Yes.
226 1 what we just discussed in Figure 14, says that 2 there's tracking, and so the SLPs would stay 3 fixed. 4 It's also the desire of Bedingfield to 5 maintain the impression that they're all in the 6 same room, and, therefore, if listener 102 were to 7 move, the others would have to stay where they are 8 at a fixed SLP. 9 Q Again, Bedingfield doesn't say anything 10 about SLP, correct, specifically? 11 A Well, the SLP definition is so generic 12 that it's -- he does. If we go back to it, it is 13 sound emanating from a location in space or 14 something to that effect, so it clearly talks 15 about that. 16 Q Okay. Did we talk about all the places in 17 Bedingfield that you believe the fixed SLP is 18 disclosed or that the perceived locations, SLP, 19 are fixed such that orientation and movement of 20 the listener's head is with respect to the SLP? 21 A I believe so. That's all the references 22 in paragraph 104, which I think we just went	228 1 Q And my question is, is it possible -- if 2 the ITD is zero, is it possible by using echo to 3 make or -- make a user or have a user perceive a 4 sound that's behind him by using echo when the ITD 5 is zero? 6 A Okay. I have to understand how we're 7 using echo. That's a little vague for me. What 8 does that -- what are you -- 9 Q I'm sorry, I'm having trouble hearing you. 10 A I'm not sure what "using echo" refers to 11 exactly. 12 Q Can -- so -- okay. So we'll try this. 13 Let's -- the ITD is zero. Okay? 14 A Okay. 15 Q And so that would mean that the sound is 16 located directly right in front or directly to the 17 rear of the listener, correct? 18 A Yes. 19 Q Okay. So are you still able, in that 20 situation where the ITD is zero, to move the sound 21 behind the listener by changing the delay time, 22 for example, by setting a delay time to what is

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229 1 required for creating echo? 2 MS. WANG: Objection, form. 3 A I'm trying to think of any way to do that, 4 and I'm -- okay. So I'm sorry. This is a very 5 hypothetical problem for me. So ITD is zero. So 6 the sound source is in the front or behind in a 7 binaural listening environment so the user is 8 using headphones in your hypothetical? 9 Q So let me start over with the 10 hypothetical, so sorry. 11 The ITD is zero, but the sound is in 12 front. Okay? 13 A Okay. 14 Q Or the sound's being perceived by the 15 listener as in front. Is it -- can you move the 16 sound behind the listener by changing the delay 17 time? 18 MS. WANG: Objection, form. 19 Q For example, by changing the delay time of 20 echo to what would be perceived as a delay for 21 echo? 22 MS. WANG: Objection, form.	231 1 Q Okay. Now, is the term "HRTF" or 2 "head-related transfer function" used in 3 Bedingfield? 4 A Term in -- or the acronym is not. Mention 5 of what entailed -- is entailed in HRTF is, and 6 that's what I'm saying here. 7 Q Okay. But the term -- the acronym "HRTF" 8 or the term "head-related transfer function" is 9 never used in Bedingfield, correct? 10 A What I'm saying is a POSITA reading this 11 would know that they're talking about HRTF, but it 12 wasn't written. 13 Q Okay. And is -- when you talk about -- in 14 paragraph 173, are you saying that Bedingfield 15 discloses the use of HRTF because it accounts for 16 using relative strength and attenuation of 17 different frequencies? 18 A I'm quoting an exact sentence. Is that 19 what you just read from? I lost you. 20 Q Well, in -- where you say here -- 21 A I see. It's the sentence after? 22 Q Right. Do you see where you're talking
230 1 A The effect of echo -- and we talked about 2 this. It's hard to think of a single echo, right? 3 The echo is -- there are multiple echos that 4 happen in a physical environment or in a simulated 5 one. 6 So the effect of adding echos to a 7 direct -- to a sound is to change its frequency 8 response because you're adding multiple copies of 9 the same sound, and that would produce a change in 10 the -- some frequencies would be attenuated. 11 Others would be boosted depending on the pattern 12 of the echos. 13 So theoretically in this hypothetical, if 14 you change the response with echos to correspond 15 to the frequency response of a sound source behind 16 the listener, you would be able to mimic that. 17 Q Let's move to paragraph 173 of your 18 declaration, and that is Exhibit 1. 19 A Yes, I recall this. 20 Q Okay. And you read the paragraph, so I 21 want to ask you a few questions about it. 22 A Yeah.	232 1 about attenuated and the lower frequencies seem 2 more apparent? So, yeah, I'm sorry, the next 3 sentence. So a POSA would have understood that 4 Bedingfield's reference to using relative strength 5 and attenuation of different frequencies for each 6 direction of a sound for sound localization is the 7 same as HRTF, which was well-known in the art? 8 A Yes, I see that. So what I'm referring to 9 there is attenuating and -- boosting and cutting, 10 let's call it, of different frequencies changes 11 the spectral content, or the spectrum as it is 12 called. 13 And if you go back at the definition that 14 I used, the Eight KHz definition of an HRTF, that 15 is what the -- I don't remember the exact words, 16 but that is -- they're talking about it being a 17 spectral. 18 Q So you're -- 19 A I don't remember the exact word. 20 Q I'm sorry, I didn't mean to interrupt you. 21 A No, no, go ahead. That is fine. 22 Q But -- so you're making the conclusion or

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233 1 the opinion that Bedingfield discloses use of HRTF 2 because it accounts for using relative strength 3 and attenuation of different frequencies? 4 MS. WANG: Objection, form. 5 A So I am using this sentence to explain 6 what he is saying in the quote above, in the 7 sentence above. 8 For example, where most frequencies are 9 received with equal strength in the position 10 behind the listener's ear where high frequencies 11 are attenuated and so on. 12 So frequencies are changing between front 13 and back according to Bedingfield for a source in 14 the front and a source in the back. 15 And when frequencies change, that to a 16 POSITA means there are spectral changes. And if 17 we look at the definition of Eight KHz, that 18 language is in there. So I was trying to put it 19 in that context that the spectrum is changing, and 20 therefore, spectral changes caused by -- if you 21 let me -- if you will allow me to pull it up, we 22 can look at exactly the way they work it.	235 1 frequencies. And so modifying the spectrum means 2 changing some strength of some frequencies, 3 some -- making them stronger or -- or attenuating 4 them, which is what Bedingfield is talking about. 5 So he is disclosing here changes -- 6 transforming the spectrum, and according to the 7 Eight KHz definition, that is -- that is what I 8 used to -- as the HRTF definition. 9 Q But we talked about for a long time this 10 morning that you did not provide a definition of 11 HRTF in your declaration in this proceeding. 12 MS. WANG: Objection, form. 13 A Well, I mentioned that I used the 14 definition by Eight KHz. 15 Q You did not. That was for a different 16 one, but we talked about -- 17 A Well, I understand -- sorry, if I can 18 just -- I believe in the first or second paragraph 19 of my declaration I talk about -- that I am -- I 20 will have to look at the exact one, I'm in 21 parallel working on three patents, the '090, '628, 22 and '196.
234 1 Q I will go to your declaration. Your 2 declaration talks about this some, too, where you 3 talk about the items for HRTF. 4 A Okay. 5 Q So I'm just trying to make sure I 6 understand. You're basing it on Bedingfield's 7 reference. You were basing your conclusion that 8 Bedingfield discloses HRTFs based on -- that 9 Bedingfield's reference is using relative strength 10 and attenuation of different frequencies for each 11 direction of sound, for sound localization, which 12 is the same as an HRTF. 13 So you're relying on relative strength and 14 attenuation of different frequencies to say that 15 there are HRTFs in Bedingfield, correct -- that 16 HRTF is disclosed in Bedingfield, correct? 17 MS. WANG: Objection, form. 18 A So I guess let me be clear. According to 19 the definition that I used for HRTF, the language 20 in there is functions that modify the spectrum. 21 And I don't remember the rest of the sentence, but 22 the spectrum in the art is known as the	236 1 And so because I was working on all three 2 at the time, the knowledge of the definitions 3 proposed by Eight KHz was on my mind as I was 4 writing these. I may not have cut and pasted 5 every single one in one. 6 Q Where is the definition of -- where is 7 your definition of HRTF in your declaration for 8 this matter, for the '090 patent? 9 A As I just said, it is not there. It is in 10 the '628, but because I was working on all three 11 at the time as I write, I think paragraph 2, my 12 assumption was that these claim constructions came 13 from a master document that Eight KHz provides. I 14 don't know. I didn't see it. I was just given 15 what was provided. 16 And so if it was all there, I in hindsight 17 should have cut and pasted everything, but I did 18 not. I thought it was obvious that I'm using it 19 in others that I mentioned I worked on that are 20 related, that it is included in all of them. 21 Q I'm just trying to find your definition 22 for HRTF in this declaration.

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237 1 MS. WANG: Objection, form. 2 A I'm sorry, were you asking me something? 3 Q Yes. There is no definition for HRTF in 4 your declaration for the '090 matter. 5 A Yes. I think we agreed on that. I was 6 just trying to explain why that is. 7 Q Okay. Well, let's turn to paragraph -- 8 you just confused me because we talked this 9 morning for a long time about the definition for 10 HRTF, and you wouldn't give it to me. 11 So let's go to paragraph 52 of your 12 declaration. Are you there? 13 A I see it. 14 Q So this isn't a definition of HRTF, right? 15 MS. WANG: Objection, form. 16 A Well, we talked about this. To the extent 17 the definition means something you would find in a 18 dictionary that is one or two lines, this is not 19 it, but this describes my understanding of HRTF 20 combined with what I just said from the claim 21 construction. 22 Q Okay. So there is a list of factors here.	239 1 about spectrum modification is what I mean here 2 that it is the same. 3 Bedingfield is talking about spectrum 4 modification, modifying the spectrum. 5 Q Okay. And -- well, Bedingfield you say 6 here is talking about using relative strength and 7 attenuation of different frequencies, right? 8 A That is the spectrum. 9 Q Okay. So those are the things -- that is 10 what you are relying on from back -- from 11 Bedingfield to say that a POSITA would have 12 thought this was the same as an HRTF, correct? 13 A Yes. 14 Q Okay. So let's go to 52. This is your 15 definition of HRTF. We're going to the third 16 sentence. 17 A "This is due," that one? 18 Q I'm sorry? 19 A Which sentence is that? "This is due to 20 other factors"? 21 Q Just a second. You said that -- that -- I 22 believe you said that this list, when you -- what
238 1 So first, let me -- you based the disclosure in 2 Bedingfield -- so Bedingfield's reference to using 3 relative strength and attenuation of different 4 frequencies of a sound for sound localization is 5 the same as HRTF. That is what you say in 6 paragraph 173, so you're -- 7 A I didn't -- sorry, I didn't say it is the 8 same. I said that language would indicate to a 9 POSITA that Bedingfield is talking about HRTFs. 10 Q Well, you did say it is the same. We can 11 go back to 173. 12 MS. PARTRIDGE: Jesse, go back to 173. 13 Q 173, the last sentence is: A POSITA or 14 POSA would have understood that Bedingfield's 15 reference to using relative strength and 16 attenuation of different frequencies for each 17 direction of a sound for sound localization is the 18 same as an HRTF, which was well-known in the art. 19 Do you see that? 20 A Okay. Yeah, I did. I did say that. As I 21 think I talked before, the part of the HRTF 22 definition that I used from Eight KHz that talks	240 1 starts with: Such factors include reverberation, 2 reflection, refraction. 3 Do you see that sentence? 4 A Yes. 5 Q These are attributes of HRTF, right? 6 A Yes. 7 Q Okay. So can you read that sentence, 8 please? 9 A Such factors include reverberation, 10 reflection, refraction, attenuation, and even the 11 shape of the listener's ears, head, shoulders, and 12 torso, which as the POSA would have readily 13 recognized, all affect the sound that reaches the 14 listener's ears, depending on the environment. 15 Q Okay. And then you are also quoting -- I 16 don't know what you are quoting there, Exhibit 17 1009, and also describe some other factors, right, 18 that are -- that you look at regarding HRTF, 19 correct? 20 A Yes. I don't remember offhand the 21 numbering, which reference that is. 22 Q Okay. So what are those factors?

241 1 A The ones that are listed, reverberation, 2 reverberation delay, reflections, decay time, 3 reflection delay, and other reverberation 4 parameters. 5 Q Okay. So Bedingfield discloses or talks 6 about attenuation, correct? 7 A Talks about attenuation of certain 8 frequencies. 9 Q Right. You said there are many, many, 10 many -- looks to me like many other factors that 11 go into HRTF besides just as attenuation, correct? 12 That is what you say in paragraph 52? 13 A Right, and I say includes. So this is 14 part of the reason it's difficult to answer about 15 HRTFs out of context. All of these can have a 16 role, depending on the problem that is being 17 addressed with HRTFs. 18 Q Okay. Is ITD also a factor for HRTF? 19 A Well, with ITD, information is included in 20 the HRTF when it is measured. 21 Q And ILD? 22 A ILD as well.	243 1 Q So can you have attenuation and not have 2 an HRTF? 3 A Attenuation of a frequency? 4 Q Right. 5 A Yes. 6 Q So how can you say that Bedingfield 7 discloses HRTF when it only discloses very few of 8 the factors? Attenuation, you say it may include 9 reverberation of the factors that you list as 10 important to HRTF? 11 MS. WANG: Objection to form. 12 A I didn't say attenuation includes 13 reverberation. I'm not sure what we were talking 14 about, but my conclusion from Bedingfield was 15 because I was reading it in the context of his 16 disclosure of his specification, he talks about 17 positioning sources behind the listener, so 18 wearing headphones, and this is sprinkled all 19 throughout, but Column 3, if I recall, has most of 20 that. 21 And so a POSITA would look at that and 22 understand that placing sources front and back and
242 1 Q Okay. But you're relying on attenuation 2 as disclosed in Bedingfield to say that that -- 3 that a POSITA would understand that is HRTF, 4 correct? 5 A Well, not the word "attenuation." Relying 6 on the effect of attenuation and strengthening of 7 certain frequencies that Bedingfield talks about 8 it is to change the frequency spectrum, and the 9 definition that I used from Eight KHz is that HRTF 10 is -- I do not remember the exact words, but 11 functions that transform the frequency spectrum. 12 So that is what I'm relying on. 13 Q So does Bedingfield disclose 14 reverberation? 15 A He talks about echo, yes. 16 Q Does it disclose reflection? 17 A I would have to go back and look at that 18 column. I'm pretty sure he talks about 19 reverberation and other room effects, but I need 20 to look at Bedingfield in that column. 21 Q What about refraction? 22 A I don't recall.	244 1 talking about spectrum modifications, that would 2 indicate that it is -- that he's talking about 3 HRTFs. 4 Q Well, you talked about in your declaration 5 that's relative strength and attenuation of 6 different frequencies as disclosed by Bedingfield, 7 correct? 8 A In that paragraph, yes. But I think I 9 quoted -- if you go back to Column 3, I forget the 10 line numbers, but in there he talks about sources 11 front and back and left to right. Give me one 12 second. 13 Q Well, where you talk about HRTF and 14 Bedingfield is paragraph 173, and in 173, you talk 15 about higher frequencies are attenuated at a 16 lower -- you talk about using relative strength 17 and attenuation of different frequencies of sound. 18 Those are the only things that you disclose in 19 paragraph 173 of your declaration. 20 A I think I'm quoting a specific passage, 21 but -- and if we go back to 173, I don't remember 22 if there is a quote in Column 3, what lines are

245 1 quoted there. I think it involves more. 2 Give me one second to close the curtain 3 because the sun is coming in. 4 Q I'm sorry, what you did you say? 5 A I said I have to close my curtain because 6 the sun was coming in. Sorry, I'm back. 7 Q When you move away a little bit, I have a 8 little trouble hearing you. 9 Let's go to -- so let's go back because 10 you said that you relied on the district court's 11 claim construction for the definition of HRTF, 12 right? 13 MS. WANG: Objection, form. 14 A I actually don't know where that -- if 15 that came from the district court or not. I was 16 provided those by counsel. 17 Q Okay. 18 A But I'm not sure I -- 19 Q You said you relied on the claim 20 construction and the Eight KHz -- 21 A Yes. 22 Q -- for the definition of HRTF, correct?	247 1 A I think I answered that this morning as 2 well. It is literally described -- it is actually 3 a pretty good description, transfer functions that 4 are modified by the head or related to the head. 5 Q Okay. So if the proposed claim 6 construction that you relied on was not adopted by 7 the Court, does this mean that your analysis is 8 wrong? 9 A No, because I think when I talk about 10 getting all of the declarations, I talked about 11 that I used a combination of that and plain and 12 ordinary. So I don't think it is wrong. 13 Q Okay. So what is the plain and ordinary 14 meaning of HRTF? 15 MS. WANG: Objection, form. 16 A It is what I just said. It is the 17 transfer functions that are modified by the head. 18 Q The transfer functions that are modified 19 by the head? 20 MS. PARTRIDGE: Jesse, can you put up 21 Exhibit 5, please? And let's go to the front. 22 Exhibit 5 is the article by Dorte Hammershøi and
246 1 A Correct. 2 Q Okay. So the district -- the court -- the 3 claim construction for HRTF is that HRTF is given 4 its plain and ordinary meaning. What is the plain 5 and ordinary meaning of HRTF? 6 A Okay. I need to ask a question. Did 7 that -- that decision, that court decision, did 8 that come after I wrote my report? I just don't 9 know the timing. 10 Q I don't know. You're the one that you 11 said you relied on it. 12 A I did not say I relied on the court. I 13 said I relied on the proposed constructions that I 14 was provided. So I don't know when those -- I 15 don't know the timing of all of those. So I did 16 not rely on plain and ordinary. I relied on what 17 I read this morning in the '628. 18 Q The proposed claim construction in the 19 '628? 20 A Yes. 21 Q Okay. What is the plain and ordinary 22 meaning of HRTF?	248 1 Henrik Moller from Aalborg University in Denmark. 2 Can you show him the first page, please? 3 Q Do you remember we talked about this 4 article previously, Dr. K? 5 A Yes, I remember. 6 Q Okay. Let me direct your attention to 7 page 240. And can you read the paragraph that 8 starts -- it is the second full paragraph on that 9 page in the general definition. Do you see that? 10 Can you just read it to yourself? 11 A Okay. Okay. 12 Q Do you agree with that paragraph? 13 A I think it paraphrases what I said before, 14 ITD and ILD, where ILD is the same as IID are 15 included in the HRTF. So yeah, I agree with that. 16 Q Okay. So what does it mean to you when it 17 says, the very last sentence: Thus it can be 18 derived from the HRTFs where the opposite is 19 generally not the case. What does that mean? 20 A If you have the HRTFs, that means you have 21 ITD, ILD, and spectral modifications. And you can 22 mathematically operate on the HRTFs to find what

249 1 the ITD and ILD are. 2 But if you just had the -- if you -- what 3 they mean is if you just had -- if you were just 4 given ILD and ITD information, you would not be 5 able to reconstruct the HRTFs because you don't 6 have the spectral modifications. 7 MS. PARTRIDGE: Okay. Let me go off the 8 record. This will be just five, okay? 9 THE WITNESS: Great. 10 VIDEOGRAPHER: We are going off the 11 record. The time is 6:29. 12 (Recess, 6:29 p.m. to 6:35 p.m.) 13 VIDEOGRAPHER: We are back on the record. 14 The time is 6:35. 15 Q So can you put up, please -- it is 16 called -- it is United States Patent Application 17 Publication to Ballas, B-a-l-l-a-s. I don't know 18 if you need the publication number, but it is U.S. 19 2003/0059070. 20 (Exhibit 7 marked.) 21 REMOTE TECHNICIAN: Stand by. 22 Q And, Dr. K, I'm going to show you what has	251 1 Do you see that? 2 A Yes. 3 Q So Ballas -- and we can go through this, 4 and I will talk to you about it, but Ballas is 5 talking about using something like speakers 6 mounted in a location near the temple of a 7 listener's head, but he's -- he's talking about 8 not using earphones, correct? 9 A Yes. 10 Q And so Ballas is teaching away from using 11 earphones, correct? 12 MS. WANG: Objection, form. 13 A I don't know about teaching away. This 14 is -- he's just talking about a specific 15 implementation that uses HRTF processed audio with 16 tracking to play over these little speakers near 17 the temple, either side of the head. 18 Q Right, rather than in earphones, correct? 19 A Right. 20 MS. WANG: Objection, form. 21 Q And so when you are talking here -- it 22 says here that it is -- is this binaural sound
250 1 been marked Exhibit 7, which is United States 2 Patent Application Publication U.S. 2003/0059070 3 to Ballas. 4 Do you see that? 5 A I do. 6 Q And are you familiar with this reference? 7 A Yes. It is one of the ones I listed as 8 prior art. 9 Q Okay. So I just want to ask you a few 10 questions about Ballas. And first I'm going to 11 direct your attention to the abstract which is on 12 the first page right there, and I want to talk to 13 you about -- do you see where on the abstract it 14 says: A method and apparatus for producing 15 virtual sound sources that are externally 16 perceived and positioned at any orientation in 17 azimuth and elevation from a listener is 18 described. In this system, a set of speakers is 19 mounted in the location near the temple of a 20 listener's head such, for example, on an 21 eyeglasses frame or inside a helmet rather than in 22 earphones.	252 1 that Ballas is talking about here? When it talks 2 about it is externally perceived and positioned at 3 any orientation in the azimuth? 4 A This is the -- this is what we talked 5 about earlier, what is called a transaural sound, 6 so it is HRTF-based audio that comes from 7 speakers, but that is not -- none of that is what 8 I used Ballas for. 9 Q Okay. So Ballas doesn't disclose binaural 10 sound, correct? 11 A Ballas discloses transaural sound with 12 HRTF tracking. 13 Q But it does not disclose binaural sound? 14 A Right. I don't think he uses the word 15 "binaural." 16 Q Well, he's not talking about binaural, 17 right? 18 A Right. He's talking about HRTF to deliver 19 sound as the user moves. In his application, it 20 was a military application, sound is delivered 21 through these little speakers on a frame. That 22 has a couple of instances of that -- examples of

253 1 that. 2 Q So this was -- and, again, it is talking 3 about transaural sound, but not binaural sound, 4 correct. 5 A It is talking about HRTF -- I don't think 6 he uses the word "transaural" either. A POSITA 7 would understand that, but he's talking about HRTF 8 processed audio that plays from little 9 loudspeakers on either side of the head, and 10 tracking -- head tracking to adjust the filters as 11 the user moves. 12 Q Yeah, and this is not binaural sound, 13 correct? 14 A It is not, but that wasn't part of my 15 declaration. I didn't use Ballas to establish 16 binaural sound. 17 Q Okay. But -- okay. 18 And then also let's move to paragraph 14 19 of -- I'm sorry, of Ballas. 20 MS. PARTRIDGE: That is on the second 21 page, Jesse. 22 Q And I'm in paragraph 14 at "Moreover," and	255 1 Again, Ballas is teaching away from the 2 use of headphones, correct? 3 MS. WANG: Objection, form. 4 A I guess "teaching away" must be a legal 5 term. To me that just says Ballas says my 6 invention is about this instead of headphones. 7 Q Okay. I was wondering why you weren't 8 responding. So I was muted accidentally. Sorry. 9 A I'm not ignoring you. 10 Q Yes, you are. It is my perception of 11 being ignored. It is a joke. 12 Okay. Let me start again. I'm not sure 13 where I stopped talking. Well, I didn't stop 14 talking, but where I got muted. 15 Again, in paragraph 17, again, Ballas 16 talks about that he wants to mount these speakers 17 on either side of the head, for example, on a 18 eyeglasses frame or inside a helmet rather than 19 headphones, correct? 20 A Yes. 21 Q Okay. And then -- and Ballas discloses 22 two speakers that are positioned on the temple of
254 1 do you see it says: Moreover, existing spatial 2 audio systems are designed for use via headphones. 3 This requirement may result in certain limitations 4 on their use. For example, spatial audio may 5 be -- spatial audio may be limited to these 6 applications for which a user is already wearing 7 some headgear or for which the advantage of 8 spatial -- spatial audio outweigh the 9 inconvenience of a headset. 10 So, again, he is talking about -- his 11 patent is directed to not using earphones or 12 headphones, correct? 13 A Correct. I think I already agreed to 14 that. It is not what I used Ballas for. 15 Q Right. And also in paragraph 17, just to 16 pile on, he says -- can you go down to 17: 17 Accordingly, the present invention provides a 18 solution to overcome the above problems. In the 19 present invention, a pair of speakers is mounted 20 in a location near the temple of the user's head, 21 such for an example on an eyeglass frame or inside 22 a helmet rather than in headphones.	256 1 the user, are very close to the temple of the 2 user, correct? 3 A Yes. It shows that in his figures they're 4 on either side of the head. 5 Q Okay. So what is crosstalk cancellation? 6 A Crosstalk cancellation is a method through 7 which this idea of transaural audio that I 8 mentioned is achieved. So it is a method of -- 9 when you have loudspeakers, and I think we talked 10 about this earlier, loudspeakers play -- when they 11 play sound, that sound reaches both ears because 12 they're not headphones on top of the ears. 13 So when you want to produce the effect of 14 binaural sound, even though you don't have 15 headphones, in other words, the ability to 16 spatialize sounds externally as we talked about to 17 use HRTFs to place them, you have to do some 18 additional processing to make sure that the 19 crosstalk terms that the left speaker talking to 20 the right ear and the right ear talking to left -- 21 and the right speaker talking to the left ear 22 those are undesirable and they have been

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257 1 cancelled. So crosstalk cancellation is a 2 mathematical way of doing that. 3 Q So when the speaker is far away from the 4 listener, is -- is crosstalk cancellation as much 5 of an issue? 6 A I'm sorry, when the speaker -- say that 7 again, I missed it. 8 Q If the speakers instead of, you know, 9 being here they're much further away is crosstalk 10 cancellation as much of an issue as when they're 11 nearer to your head? 12 A Yes. It is actually a bigger issue -- 13 Q Okay. 14 A -- because when they're near your head, 15 you head does some natural crosstalk cancellation 16 by virtue of being there, blocking some of that 17 sound. 18 Q Okay. So does Ballas -- so the closer -- 19 let's see, I'm sorry. 20 So does Ballas contemplate or disclose 21 anything about crosstalk cancellation? 22 A I don't recall seeing that in his	259 1 captures binaural sound and voice, that one? 2 Q Okay. So you agree that Andrea discloses 3 capturing binaural sound and voice, correct? 4 A It has two microphones next to the ears, 5 so it captures binaural everything. 6 Q So is this binaural recording the binaural 7 recording part that we talked about with creating 8 binaural sound? 9 A Assuming that what was captured is 10 listened to by -- over headphones, then yes. 11 Q So does Andrea disclose the second prong, 12 binaural synthesis using HRTF? 13 A I did not see that in Andrea nor did I use 14 that. 15 Q Okay. Let's move to Li and I want to 16 direct your attention to paragraph 87 of Exhibit 17 1, that is your declaration. 18 A Uh-huh. 19 Q Otherwise known as a declaration. 20 MS. PARTRIDGE: And can you go, Jesse, to 21 87, please? 22 Q And I'm in the second sentence of 87 of
258 1 specification. A POSITA would understand that is 2 what would be needed in that system. I didn't 3 rely on any of that. That is not -- that is not 4 part of anything that I talked about in my 5 declaration. 6 Q Are earphones or headphones a way to deal 7 with crosstalk cancellation? 8 A If you have headphones connected to a set 9 of binaural microphones, then you don't have 10 crosstalk, and so you don't need crosstalk 11 cancellation. 12 Q Okay. Let me -- let me move to Andrea, 13 which is -- let me just see if I can do it with 14 your declaration instead of putting it up, okay? 15 A Okay. 16 Q Let's move to paragraph 91 of your 17 declaration. 18 Well, let's start with 90 and I'm looking 19 at the second sentence of 90. Can you read that, 20 please? I'm sorry, the second sentence of 90, 21 yes? 22 A Andrea discloses a wearable device that	260 1 your declaration and it says, Li generally 2 discloses all the limitations of the independent 3 challenged claims except for capturing binaural 4 sound or voice and maintaining the voice's origin 5 at a fixed SLP while the user moves and changes 6 head orientation. 7 Did I read that correctly? 8 A Yes. 9 Q And so you -- your opinion is that Li does 10 not disclose capturing binaural sound or voice, 11 correct? 12 MS. WANG: Objection, form. 13 A That is what I said -- sorry. That is 14 what I said there. I should have -- I've learned 15 to use the word expressly, which I didn't use 16 there. 17 So a POSITA reading Li would see 18 microphones for capturing sound and understanding 19 that binaural capture required microphones that 20 are spaced at head width. Li would be able to be 21 used for that. But that is -- so what I'm saying 22 is he doesn't use the words "recording binaural

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261 1 sound," but the system that Li discloses would be 2 -- a POSITA would know that that could be used for 3 that. 4 Q But you say here that Li does not disclose 5 capturing binaural sound or voice, correct? 6 A As I said I should have said did not 7 expressly disclose. 8 Q Does Li even say anything about -- does it 9 even use the word binaural? 10 A I believe so. I'm sorry, I don't 11 remember. I will have to look. 12 Q Okay. 13 A I'm pretty sure at least in the abstract 14 he talks about it. And I'm sure in other places, 15 too. 16 Q And so -- 17 A Sorry, sorry. I'm just remembering now. 18 If we -- is the diagram here in my declaration or 19 further down, I don't remember the Figure 3 I 20 believe, no? Was it the one where it goes to the 21 architecture. The one on the front page of it. 22 Q I'm sorry, I just don't understand what	263 1 we're not going to read it. 2 So I just -- in paragraph 87 we talked 3 about where you said that Li generally discloses 4 all limitations of independent challenged claims 5 except for capturing binaural sound or voice and 6 maintaining the voice's origin and a fixed SLP 7 while the user moves and changing head 8 orientation, correct? 9 A Yes. 10 Q And then I just want to direct your 11 attention to 245, because I'm just trying to 12 figure out -- I just need to understand your 13 declaration or testimony. 14 MS. PARTRIDGE: Jesse, can you go to 245, 15 please, paragraph? 16 Q I will direct your attention to -- do you 17 see where it says, it is about three sentences 18 down, Li even contemplates binaural recording of a 19 sound. 20 Do you see that? 21 A Yes. 22 Q And I'm just trying to figure out what
262 1 you are saying. What are you talking about? 2 A I'm looking for the diagram to point you 3 to where he talks about binaural sound in Li. 4 Q Do you want me to put up Li so you can 5 look for it? 6 A Yes, please. 7 MS. PARTRIDGE: Before I do that, Mr. 8 Someone, can you tell me how much time I have 9 left, please or how much time I have used? 10 VIDEOGRAPHER: You've been on the record 11 for 5 hours and 50 minutes. 12 MS. PARTRIDGE: Okay. Let me go off the 13 record for five minutes while we start with Li, 14 okay? 15 THE WITNESS: Okay. 16 VIDEOGRAPHER: We're going off the record, 17 the time is 6:54. 18 (Recess, 6:54 to 6:59 p.m.) 19 VIDEOGRAPHER: We are back on the record, 20 the time is 6:59. 21 Q Let's just use your declaration. I don't 22 want to go into Li, so -- I'm going into Li, but	264 1 your testimony is about what -- about Li and 2 binaural recording of sound? 3 A It is what I wrote there. In the 4 specification it talks about placing microphones 5 in the inner ear locations. That is how one would 6 make -- that is one of the ways one would use 7 microphones to create binaural recordings for 8 somebody to listen to over headphones. 9 Q So it just seemed like those two 10 provisions in those two paragraphs, paragraph 87 11 and 245 were inconsistent, because in 85 you say 12 that is not -- it does not disclose capturing 13 binaural sound or voice? 14 A I guess it is in the same spirit as the 15 other ones we talked about. Like Bedingfield he 16 may not have written I am capturing binaural sound 17 so it is not expressly disclosed, but between all 18 the references to binaural in his figures and the 19 specification and this, what we just read here the 20 POSITA would understand that that would be 21 included, the Li system that could be used would 22 be used for binaural recording.

265 1 Q Okay. Let's move to paragraph 320 of your 2 declaration. 3 Do you see paragraph 320 of your 4 declaration? 5 A Yes. 6 Q In that, what I'm trying to figure out is 7 you say Li discloses an electric -- electronic 8 phone call, electric call that takes place and is, 9 therefore, commenced by Li's computer system 10 between a first user, first individual wearing an 11 electric earphone and a second user, second 12 individual who is remote from the user. 13 Do you see that? 14 A Yes. 15 Q And then you are referring to Section 8C2, 16 and I'm just -- I'm trying to make sure you are 17 referring to paragraphs 241 to 248 of your 18 declaration? 19 A The Section 13, not 8. 20 Q I could have said it like that, but, you 21 know, that would have been too weird. That is a 22 joke. I actually know Roman Numerals.	267 1 A Okay. 2 MS. PARTRIDGE: And let's so, I'm sorry, 3 Jesse, 243. 4 Q And in 243 you're disclosing a number of 5 places in Li, but you are -- do you see where 6 you're disclosing a set 22 dash, 22 -- Column 22, 7 lines 1 through 5? 8 A Yes. 9 Q And what I'm trying to find out is what is 10 your support that Li discloses a conference call 11 and I'm trying to find out what your support is. 12 Do you want me to put up Li, so you can 13 look at that or do you know? 14 A Yeah, that would be helpful. He does 15 mention conference calls as an example somewhere 16 in the specification, I just need to find it. 17 Q Okay. 18 A I believe that is Column 22, if I recall. 19 Just one second. If we go to Column 22, that is 20 one place. I can't remember the other ones, I 21 have to go look at them. 22 MS. PARTRIDGE: Let's put up Li. Jesse,
266 1 A I'm going to have to go there. I don't 2 have these sections off the top of my head. 3 Q You see I don't have the section either, 4 that is why I'm confused. 5 So Section 13 it looks like it is 6 paragraphs 241 through 248, where your -- of your 7 declaration, where you are supporting that -- your 8 conclusion that Li discloses a telephone call, 9 okay? 10 A Sorry, are we jumping around? I don't 11 have my report memorized, so I need to see it. 12 MS. PARTRIDGE: Okay. You can keep -- go 13 back a little bit more, Jesse, just a little bit. 14 A little bit more than that. Just to show you. 15 Keep going, go until there is a heading. Jesse, 16 keep going up another heading, a big heading okay. 17 Stop. 18 Q So now we have got 13 there, right, 19 section? 20 A Yes. 21 Q Okay. So I'm going to Section 243 -- to 22 paragraph 243, which is in this section?	268 1 can you find for me, United States Patent 2 9,131,305. 3 (Exhibit 8 marked.) 4 MS. PARTRIDGE: Did I say '305, and it is 5 to Li, L-i. 6 Q Dr. K, let me show you what has been 7 marked Exhibit 8 and it is United States Patent 8 9,131,305 to Li. This is the reference that we 9 have been talking about when we talk about Li; 10 correct? 11 A Yes. 12 Q Okay. And so is it your testimony that Li 13 discloses a telephone call? 14 A A telephone call, so he discloses a 15 conference call. 16 Q Okay. 17 A And I think -- I believe, if we go to 18 Column 22 that is what I was referring to. And I 19 also believe that -- so that is an electronic 20 call. And my recollection we can go look at it, 21 the Eight KHz proposed constructions is that 22 electronic call and telephone call are the same,

269 1 if I recall correctly. 2 So all of that led me to opine that he 3 discloses -- or to answer your question, I don't 4 think I opined about the telephone call. Oh, I 5 did, yes, an electronic phone call. 6 Q So it is your testimony that Li discloses 7 a telephone call, correct? 8 MS. WANG: Objection, form. 9 A Yes, if we go back -- 10 Q I'm sorry? I'm sorry, what did you say? 11 A If we go back to paragraph 243, I think 12 that is what it said there, of my declaration. 13 Q Right. That -- that you're saying that an 14 electric phone call is the same as a telephone 15 call, correct? 16 A Electronic, yeah. 17 Q And then -- 18 A I'm not, so I'm sorry just to clarify, I'm 19 not saying that. I am using the proposed 20 construction. 21 Q But you're saying you came in here in this 22 sentence, the second sentence specifically Li's	271 1 Q Okay. And then so what is your support 2 for that Li discloses a telephone call? 3 A If we go to Column 22 of Li, it is that 4 quote here, the reference 22, lines 1 through 25, 5 I believe is the one. 6 Q So you're referring me to Column 22, lines 7 1 through 5? 8 A Yes. 9 Q Can you read that, please? 10 A Moreover, the configurable 3D sound 11 system 900 provides a method of communication 12 among multiple people, for example, in a 13 conference call by placing different speaking 14 users at different spots to mimic a real 15 conference room environment. 16 Q And is this what you are referring -- what 17 you are relying on to say that Li discloses a 18 telephone call? 19 MS. WANG: Objection, form. 20 A That is part of what -- he does mention -- 21 he mentions conference call as an example. I 22 think if you scroll down a bit, if I recall it is
270 1 system 900 includes headphones or a headset or 2 microphone array system and individual microphones 3 which together enable an electric phone call, open 4 paren, a telephone call, closed paren, between 5 users. 6 That is your opinion, correct? 7 A Electronic phone call, yes. You keep 8 saying -- taking me back a long time. 9 Q Okay, let me reread it. 10 So specifically Li's system 900 includes 11 headphones or a headset, a microphone array system 12 and individual microphones, which together enable 13 an electronic phone call, open paren, a telephone 14 call, closed paren, between users. 15 That is your testimony, correct? 16 A Right. And the, paren, telephone call is 17 me mapping to the claim language. 18 Q Okay. But the basis of your opinion here 19 is that electric phone call is the same as a 20 telephone call, correct? 21 A Which is based on me adopting the opinion 22 in the claim construction proposed by Eight KHz.	272 1 on the left side Column 21, a little more. Let's 2 go all the way to the bottom of that call. I know 3 it is there somewhere. Yes, there it is, line 60. 4 So he's giving examples of what this 5 system can be used for. He says, it enhances the 6 performance of radio dramas and conference calls, 7 and the 3D binaural sound recording and so on. So 8 that is another place where he talks about 3D 9 binaural sound recording. 10 Q And so you are saying that in column -- 11 heck, I don't -- I can't remember -- so Column 21 12 at lines 57 through 60, you are also relying on 13 that to say Li discloses a telephone call based on 14 conference calls? 15 A Right, that and the top of Column 22. And 16 I don't remember if there was anywhere else that 17 it is mentioned, but at least those. 18 Q And you don't know if they're anywhere 19 else that you relied on for that? 20 A I don't recall. 21 Q And you testified earlier that a telephone 22 call includes what you use here as an equivalent

273 1 with an electric call includes a live voice 2 exchange, right? 3 MS. WANG: Objection to form. 4 A I don't know which part of my testimony 5 you are referring to. I was saying that Eight KHz 6 defined telephone call, electronic call and 7 electronic phone call as all being the same thing 8 and I used that definition. 9 Q And we also discussed earlier that a 10 telephone call includes a live voice exchange, 11 correct? 12 MS. WANG: Objection to form. 13 A I'm going from memory here, but I believe 14 the way it was defined by the proposed 15 construction it was voice communication so... 16 Q So live voice communication? 17 MS. WANG: Objection to form. 18 A I'm trying to recall something that I 19 don't have in front of me. I used the exact words 20 that were used in that, so we can -- 21 Q Okay. Well, we talked earlier about the 22 fact that -- we talked about a telephone call,	275 1 MS. WANG: Objection to form. 2 A When you say "these," are you referring to 3 the ones in paragraph 243? 4 Q I'm referring to the ones you told me in 5 22, 1-5 and 21 around line 60? 6 A Okay. So I was pointing to those as 7 places where he actually calls it out as a 8 conference call, but my opinion of that is 9 discussed in 243 where I have other -- other 10 quotations as well. I don't recall which one of 11 them does, but I think it was the totality of 12 those that led me to this. 13 Q Okay. Now, have you reviewed the Board 14 decision to not institute in the IPR regarding the 15 '196 patent? Have you reviewed that decision? 16 A Oh, boy. Maybe, I don't know, I don't 17 recall. There is so many documents that are part 18 of this. 19 Q Yeah, I hear you. 20 MS. PARTRIDGE: So Jesse, let's pull up 21 the opinion. There is an opinion it says denying 22 institution of inter partes review.
274 1 remember? And you testified that a telephone call 2 includes live voice exchange. It may include 3 other stuff, but it includes a live voice 4 exchange, correct? 5 A Yes, I remember that. I just wanted to 6 make clear that in that discussion I was agreeing 7 with you, but technically the opinion that I used 8 and that is in my own, I know, declaration is the 9 proposed claim construction by Eight KHz for 10 electronic phone call. 11 Q Okay. And I was just talking about the 12 telephone call part of it. 13 A Okay. 14 Q So is there anywhere else in Li that you 15 are relying on to -- to support your conclusion 16 that Li discloses a telephone call? 17 A I don't recall anywhere else, but it is 18 hard to answer without going through Li all over 19 again. 20 Q Okay. So these are the primary places 21 that you relied on in Li to conclude that Li 22 discloses a telephone call, correct?	276 1 (Exhibit 9 marked.) 2 REMOTE TECHNICIAN: Would you happen to 3 know the file name? 4 MS. PARTRIDGE: Pat? Does someone know 5 the file name so Jesse can pull this up, help me. 6 Let's go off the record for a minute and 7 let's see what I can find out. 8 VIDEOGRAPHER: We are going off the 9 record, the time is 7:21. 10 (Recess, 7:21 to 7:22 p.m.) 11 VIDEOGRAPHER: We are back on the record, 12 the time is 7:22. 13 MS. PARTRIDGE: Okay. So let's show -- 14 Jesse, can we show that? 15 Q Okay. Let me show you what has been 16 marked as Exhibit 9, Dr. K. It is the decision -- 17 the decision denying institution. 18 MS. PARTRIDGE: Can you go down, Jesse, 19 I'm sorry? 20 Q Decision denying institution of inter 21 partes review. Do you see this -- do you see this 22 document?

277 1 A I see it. 2 Q Okay. And this is in the IPR2023-01004 3 and it is regarding the '196 patent. 4 Do you see that? 5 A I do. 6 Q Have you reviewed this decision? 7 A As I said before, maybe, I just don't -- 8 not recently. 9 Q Okay. Are you aware that in this decision 10 the Board considered the very same conference call 11 argument and the very -- the embodiment that you 12 talk about and held that this conference call 13 embodiment does not disclose a voice exchange? 14 MS. WANG: Objection to form. 15 A No. As I said, I have a very vague 16 recollection of seeing this. I'm not convinced 17 that I've read it. 18 Q Okay. So let's go to page 20. Is that 19 page 20? I just can't see, okay. 20 So page 20 and you can see at the bottom 21 here the Board says, Assuming without deciding 22 that Li renders obvious a voice of a computer	279 1 communication among multiple people, for example, 2 in a conference call by placing different speaking 3 users at different spots to mimic a real 4 conference room environment. 5 And then there are quotes I won't read. 6 Petitioner does not provide any further 7 explanation as to how a voice exchange would occur 8 during such a conference call when modified to use 9 the processed voice of a speaker, which the 10 remainder of Li describes as recorded in advance 11 and sound tracks. Absent additional explanation, 12 we are not persuaded that Li's brief reference to 13 a conference call is sufficient. 14 Q Okay. And then let me direct you to page 15 24. Okay. And at the very top of page 24, can 16 you read the first paragraph into the record, 17 please? 18 A Finally, we agree with patent owner that 19 Dr. Kyriakakis' opinion that he reads Li as 20 disclosing that the sound source... takes place 21 during a voice exchange between the computer 22 program and a user person is conclusory and
278 1 program as petitioner contends, we are not 2 persuaded that petitioner has made a sufficient 3 showing that Li teaches or suggests a voice 4 exchange between a computer programmer -- a 5 computer program and a user. 6 Do you see that? 7 A I see it. 8 Q So does that change your opinion? And 9 then also on page 22, can you turn to page 22, 10 please? And in the first paragraph, not first 11 full paragraph, but the first paragraph it talks 12 about -- do you see where it talks about 13 petitioner and Dr. -- 14 A Yes. 15 Q -- Kyriakakis? 16 Do you see what it says? Read that to the 17 end of the paragraph, please, into the record? 18 A Read it out loud? 19 Q Yes. Read that one out loud, please? 20 A Okay. Petitioner and Dr. Kyriakakis rely 21 on a single sentence in Li that the configurable 22 3D sound system 900 provides a method of	280 1 unsupported. Quoting, again, the only support for 2 Dr. Kyriakakis' opinion is the very brief 3 conference call excerpt in Li, which we find 4 insufficient for the reasons explained above. 5 Q Okay. So does that change your opinion 6 that Li discloses a telephone call? 7 A No, not at all. 8 Q Why not? 9 A I interpreted Li based on what he talks 10 about technically. And I believe that he's 11 talking about a conference call. He's certainly 12 talking about voice communication or 13 person-to-person communication even in the other 14 examples that he doesn't call conference call. 15 For example, the music collaboration when 16 those are people that are virtually collaborating 17 with each other and exchanging music. They could 18 be talking to each other if it is a singer and 19 somebody else. So it is all about using Li's 20 system for communication. So the fact that a 21 conference call is the only referenced one, I was 22 not aware that there is a limit on how many times

281 1 it needs to be referenced before it is relevant. 2 Q Okay. So does Li talk about live voice 3 exchange? 4 A Well, that is what a conference call 5 entails, correct? 6 Q And a telephone call, right? 7 A And a telephone call. 8 Q Can you point to -- oh, let me see, just a 9 second if I have anything else. 10 MS. PARTRIDGE: Let me go off the record 11 for a few minutes and see if I can close this up 12 for today, okay? 13 THE WITNESS: Okay. 14 VIDEOGRAPHER: We are going off the 15 record, the time is 730. 16 (Recess, 7:30 to 7:43 p.m.) 17 VIDEOGRAPHER: We are back on the record, 18 the time is 743. 19 Q Okay. Do you understand, Dr. K, that you 20 need to read statements of the patent within the 21 context of the patent, correct? 22 A I need to read -- yes.	283 1 Q Okay. Okay. And let's turn to Li 17 -- 2 Column 17 and I want to direct your attention to 3 line 20 through 22. One more up, 17, Column 17, 4 okay. Are we there? And then let's look at lines 5 20 and -- 20 through 22 and in lines 20 through 6 22. 7 Can you see that Dr. K? 8 A Yeah, I can see it. 9 Q It states, The soundtracks recorded by the 10 microphone array system 902 are stored in a memory 11 or a storage device, open paren, not shown, closed 12 paren. 13 Do you see that? 14 A Yes. 15 Q So this is disclosure of a recorded voice, 16 right? 17 A Well, it is a disclosure of both. It is a 18 disclosure of microphones live capturing something 19 and then storing that recording into a -- I always 20 call it storage system, storage device. 21 Q So does this mean that the sound is live 22 when it is stored in memory?
282 1 Q Okay. And interpret those statements in 2 the patent in that context, correct? 3 A Okay. 4 Q You agree? 5 A You broke up. 6 Q I'm sorry, do you agree? 7 A It sounds like you're using legal terms, 8 but it sounds reasonable. 9 Q Okay. So are you aware that Li always 10 talks about recorded and prerecorded sound for 11 voice? 12 A Well, he says that in the abstract, I 13 believe, right? Recorded and prerecorded, those 14 are not the same thing. He says it in several 15 places, but... 16 Q But the whole point of Li is talking about 17 recorded and prerecorded voice, correct? 18 A Right. Recorded as we said several times 19 in other contexts here has to do with capturing, 20 to me that means live. And prerecorded means it 21 was recorded in advance and it is being played 22 back.	284 1 A When it is stored, no, it is not live. 2 Q And then so let's go to 34, lines through 3 62. Do you see where it says, the microphone 4 array system 902 can be configured in a computing 5 device 901 with a universal serial bus, open 6 paren, USB, closed paren, interface for 7 applications in 3D sound recording. The multiple 8 channel sound can be saved in one file and a 9 portable device using the 3D sound processing 10 application 1602. Users can play the recorded 11 audio as a 3D binaural sound or a 3D surround 12 sound. 13 Do you see that? 14 A Yes, I see that. 15 Q Does this mean that the recorded sound is 16 live when users can play the recorded audio after 17 it was saved? 18 A This particular sentence says after it was 19 saved. Of course it is not live, but I think 20 we're in the context of this patent he has both, 21 live and -- so recorded and prerecorded. 22 So you are pointing me to examples where

285 1 it has been prerecorded and I agree that those are 2 it, but you can't do a conference call that he 3 talks about the music performance prerecorded, so 4 those are live. 5 Q Okay. So let's go to Column 1. Okay. 6 Column 1, lines 54 through 55. 7 And that says, When a stereo recording is 8 played back, the recording from one microphone 9 goes into the subject's left ear while the 10 recording from the other microphone is channeled 11 into the subject's right ear. 12 Do you see that? 13 A Wait, I'm sorry, you lost me. 54, oh, I 14 see. Hang on one second to reread it. Yes, I see 15 it. 16 Q Okay. So does this mean the recording is 17 live when the users can be played back? 18 MS. WANG: Objection to form. 19 A So in this section if we -- this is the 20 introduction section when he is talking about the 21 differences between monaural stereo and binaural 22 at the top of this paragraph. And then -- so I'm	287 1 application records both audio and spatial 2 information such that the recorded sound can be 3 processed and reproduced to 3D sound. 4 And is the recorded sound, the recorded 5 sound live? 6 A This doesn't tell me, because this -- this 7 processing could be happening in realtime in his 8 system. So he could -- yes, it can be live. 9 Q So you're saying that even though it says 10 that you're playing the recorded sound that the 11 recorded sound could be live? 12 A I'm saying that prerecorded sound is not 13 live. I'm saying that recorded sound could mean 14 that it is currently being recorded in the sense 15 that the microphones are capturing it. So he 16 makes a distinction between recorded and 17 prerecorded, as we said, at least in the abstract 18 probably other places, otherwise he would have 19 just used one word. 20 Q So it is your testimony that recorded 21 sound could be live sound? 22 A In the context of this patent and because
286 1 not sure what the question is. He's talking about 2 different ways to use microphones to record live 3 and then store among other things. 4 Q So when it is being played back, is it 5 live? 6 A Live, I was using live to indicate 7 communication happening as in the music example 8 that he has and in the conference call example. 9 So there is no two-way -- you can't talk back to a 10 recording, of course, but that is not the only 11 thing that he has -- that he has in this patent. 12 Q I'm asking you about these specific 13 paragraphs. And so when -- or those specific 14 provisions here where it is Column 1, lines 54 15 through 56, when it is being played back is that 16 live? 17 A That is what he -- in the abstract and 18 elsewhere calls prerecorded, so it is not live 19 two-way communication. 20 Q Okay. What about -- let's move Column 18, 21 lines 16 through 20. 22 And line 16, the 3D sound processing	288 1 he uses recorded and prerecorded to make a 2 distinction, yes. 3 Q So how are you saying that the difference 4 between recorded and prerecorded means that 5 recorded is live? 6 A Because in the art we talk about a 7 microphone is currently recording sound. That 8 means it is picking up live sound and delivering 9 it somewhere. If it is -- if it delivers it to a 10 storage device and then we stop and listen to what 11 was stored on the storage device, that would be 12 prerecorded, and therefore, not live. 13 Q But it is your testimony that recorded 14 sound can be live? 15 A Right. I think the microphone on my 16 computer right now is recording my sound and 17 sending it to you -- to the group. 18 Q But the recorded sound itself is live, not 19 when it is recording, the recorded sound itself? 20 A I don't understand the distinction. 21 Q So it is your testimony that recorded 22 sound can be live?

289 1 A And that prerecorded is not in the context 2 of Li's patent using his language. 3 Q So let's move to 7, Column 7, lines 33 4 through 37. And here it says, Configurable 3D 5 sound system disclosed herein allows individual 6 users to record and reproduce 3D sound for 7 playback on their headsets and home theater 8 systems, therefore, allowing users to experience 9 immersive 3D sound. 10 Does this -- 11 A Okay. 12 Q Okay. Does this mean, again, that the 13 recorded sound is live? 14 A It doesn't say. It can be. 15 Q And how do you -- how do you -- how would 16 you form your opinion that the recorded sound can 17 be live? 18 A Well, put it a different way. I would 19 form my opinion that it is not live if as in a 20 couple of the examples you showed me, it says it 21 was stored on a memory device or something of the 22 type and played back from there. But if it is	291 1 MS. WANG: I have a few. 2 MS. PARTRIDGE: Okay. 3 EXAMINATION 4 BY MS. WANG: 5 Q So Dr. K, can we go to paragraph 243 of 6 your declaration? 7 A Do you want to put that up? Should I open 8 it locally? 9 Q I think it is -- it doesn't matter. I 10 think it is fine for you to open it locally unless 11 Ms. Partridge has a issue with that. 12 MS. PARTRIDGE: I think that is fine. 13 Well, actually I think you should put it up. It 14 is Exhibit 1. 15 Q While we're pulling it up, Dr. K, you 16 recall your testimony from earlier today that 17 there were various places in the -- that you cited 18 in forming your opinion that Li discloses a 19 telephone call. Do you recall that? 20 Sorry, did you give an answer? I didn't 21 hear anything. 22 A Oh, yes. I do recall that.
290 1 just, like, if I had a binaural microphone sitting 2 here next to me and it was recording, it would be 3 live sending it to you. 4 Q Okay. 5 A Obviously his example of the music is 6 live. He has a whole figure on that. Musicians 7 are playing together and also the conference call 8 examples that we looked at. So his systems can do 9 both. 10 Q Okay. 11 MS. PARTRIDGE: Why don't we go off the 12 record for a minute and then we're almost through. 13 VIDEOGRAPHER: We are going off the 14 record, the time is 7:59. 15 (Recess, 7:59 to 8:07 p.m.) 16 VIDEOGRAPHER: We are back on the record. 17 The time is 8:07. 18 Q Welcome back, Dr. K. 19 A Thank you. 20 Q So I don't have anymore questions at this 21 time. 22 A Okay.	292 1 Q Can we go to paragraph 243, this is on 2 page 126. And you -- yeah. 3 You recall, Dr. K, testifying about this 4 paragraph earlier today? 5 A Yes, yes, I do. 6 Q And part of your testimony was that you 7 were relying on different parts of Li and you 8 included citations to those various portions of Li 9 in this paragraph; is that right? 10 A Yes. We went to one of them, but we 11 didn't go to all of them during that part of the 12 testimony. 13 Q So if we can scroll to the bottom of this 14 paragraph. 15 Dr. K, one of the citations here in the 16 second to last line of this paragraph is the 17 reference to Column 3, lines 6 to 8. And you 18 provide the quote from the consumers often used 19 headphones for audio rendering on a mobile device. 20 Do you see that? 21 A I do. 22 Q And this is a portion of Li, for example,

293 1 that you rely on to form your opinion that Li 2 discloses a telephone call, correct? 3 A Yes, yes. I believe -- I believe that is 4 consistent with my -- everything in paragraph 243 5 with the majority of my opinion. 6 Q Let's go to the Ballas reference, please. 7 That is exhibit -- I think it is Exhibit 7, yes. 8 Do you recall your testimony, Dr. K, from 9 earlier today that Ballas discloses a helmet that 10 has speakers positioned on or near the temple of 11 the user? 12 MS. PARTRIDGE: Objection, 13 mischaracterizes the reference. 14 A Yes, I recall. 15 Q Can I direct your attention to paragraph 3 16 of Ballas? Can you see that? 17 A Paragraph 3, yes. 18 Q Would you agree that in paragraph 3 in 19 this section Ballas discloses that in the past -- 20 and I'm just reading from the first sentence -- in 21 the past binaural sound from headphones was the 22 most common approach to spatialization.	295 1 about crosstalk. So I think without repeating 2 everything, I think the idea was when you -- I was 3 talking about when you have loudspeakers, you can 4 use HRTFs as Ballas teaches and others to process 5 incoming sound, so that it has some of the 6 characteristics of monaural sound by cancelling 7 these crosstalk terms that we talked about. 8 So that is what I think what he's saying 9 here, it comes as close to binaural sound using 10 what is to be expected. But it is the whole 11 sentence, that whole paragraph. 12 Q Can we go to Exhibit 2? This is 13 Dr. Begault's declaration to the '196 IPR. Sorry, 14 not Exhibit -- which one is Dr. Begault's 15 declaration? Yeah, that one. Exhibit -- maybe 16 that is Exhibit 3, sorry, okay. 17 Could we go to paragraph 20? 18 Dr. K, do you recall your testimony from 19 earlier today that you disagree with Dr. Begault's 20 first and second sentences of this paragraph? 21 A Yes, I do recall. 22 Q You testified that you disagree with
294 1 Do you see that? 2 MS. PARTRIDGE: Objection, leading. 3 A Yes, I see it. 4 Q Does this portion -- does this portion of 5 Ballas help to inform your opinion regarding 6 Ballas' disclosure of binaural sound? 7 A Give me one second to read a little bit 8 more from this paragraph. 9 Okay. I guess, the last sentence of this 10 paragraph is also useful. I think we talked about 11 it in using the transaural reference, which is 12 basically rendering binaural sound after some 13 processing knowing that it is going to play from 14 speakers. 15 Q Can you explain that a little bit more? 16 A Sure. 17 Q You reference -- sorry. 18 You reference this last sentence of 19 paragraph 3 of Ballas. How does that inform your 20 understanding of the transaural reference? 21 A It is kind of this whole -- this whole 22 paragraph. He talks about crosstalk and we talked	296 1 Dr. Begault because in binaural recording it is 2 possible for a user to arbitrarily manipulate the 3 spatial characteristics of the recorded sound; is 4 that right? 5 MS. PARTRIDGE: Objection, leading. 6 Objection, mischaracterizes testimony. 7 A That is right, and I gave a scenario how 8 that would happen. 9 Q And for your testimony regarding the 10 second sentence, can you further explain why you 11 disagree with the second sentence? 12 MS. PARTRIDGE: Objection, leading. 13 Objection, mischaracterizes testimony. 14 A I read the second sentence to be tied to 15 the first, which where Dr. Begault said that the 16 user cannot manipulate the spatial 17 characteristics. And to me that meant what he 18 said in the second sentence, that the sound 19 localization point is fixed because it can't be 20 manipulated. 21 So by disagreeing with the first sentence 22 in approving or providing, sorry, a method of

297 1 manipulating the spatial characteristics, that 2 would mean that the sound localization points can 3 be moved. Because I didn't see the whole 4 reference here, I believe what he meant by fixed 5 was that they are fixed during the capture of the, 6 let's see, the HRTFs. 7 I don't believe he's talking about head 8 tracking fixing. So my reference to fixed here 9 was that I can move it to another fixed location 10 by manipulating the binaural recording in the way 11 that I talked about earlier. 12 Q Let's go to Exhibit 5. This is the 13 Hammershøi paper. Let's go to page 245. There 14 were a couple of paragraphs there that we were 15 looking at earlier today. Thanks. 16 So Dr. K, there is two paragraphs here 17 that you testified about. Do you recall your 18 testimony regarding the two paragraphs starting 19 with the binaural synthesis can however, and the 20 paragraph starting with -- with binaural recording 21 and static synthesis. 22 Do you recall your testimony?	299 1 Q Do any of these portions of Dr. 2 Hammershøi's paper that we just looked at on pages 3 240 and 245 change your opinion that you disagree 4 with Dr. Begault's statements in paragraph 21 of 5 his '196 declaration? 6 A No, not at all. 7 Q In your -- let's leave this up for a 8 little bit more. 9 And Dr. K, in your declaration you provide 10 your opinion that it would be obvious to combine 11 various prior art references including Bedingfield 12 with Andrea and Li with Andrea for capturing 13 binaural sound; is that right? 14 A Yes, that's right. 15 Q Do any of the portions of Dr. Hammershøi's 16 paper that we just looked at change your opinion 17 as to whether it would be obvious to combine 18 Bedingfield or Li with Andrea for capturing 19 binaural sound? 20 A No. 21 Q In your declaration, you also provide your 22 opinion that it would be obvious to combine
298 1 A Yes, I believe I was asked whether I 2 agree. I don't remember -- let me read the second 3 one for one second. Yes, so yes, I believe I was 4 asked whether I agree what is being mentioned here 5 by head tracking and so on. 6 Q And you testified that you agreed with 7 these paragraphs; is that right? 8 A I did. 9 Q There was another paragraph that you were 10 asked about on page 240, so if we can go to that 11 paragraph, please. It is the paragraph that 12 starts with, In the general definition of the 13 HRTF. Sorry, go down to 240. It is that 14 paragraph right there, In the general definition 15 of the HRTF. 16 Do you see that, Dr. K? 17 A I see it. 18 Q You testified earlier today that you also 19 agree with this paragraph. 20 Do you recall that? 21 A Yes. The ITD and ILD are included in 22 HRTFs, so yes, I did agree.	300 1 Bedingfield, Bedingfield Andrea, Li, or Li Andrea 2 with Ballas to track the user's head orientation 3 and movement and adjust the sound so that the 4 sound appears fixed even as the user's head moves; 5 is that correct? 6 A Yes. 7 Q Do the portions of Dr. Hammershøi's paper 8 that we just looked at change your opinion as to 9 whether it would be obvious to combine any of 10 those references with Ballas for tracking the 11 user's head movement and orientation and adjust 12 the sound so that the sound appears fixed even as 13 the user's head moves? 14 A Is the question do they change my opinion? 15 Q That is the question. 16 A No, they do not. In fact, if we could go 17 back to the other one I believe the one that talks 18 about tracking actually strengthens my opinion. 19 Q We can go -- let's go to -- let's go -- 20 are you referring to page 245? 21 A Yes, right. 22 Q Okay.

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301 1 MS. WANG: Can we go back to those two 2 paragraphs that we were looking at on 245, same 3 document, just page, just go down five pages. 4 Q Can you point to which paragraph it is 5 that actually strengthens your opinion? 6 MS. PARTRIDGE: Objection, leading. 7 A They both do. They both -- to paraphrase, 8 they're both saying that tracking the listener's 9 head movements greatly improves the performance of 10 HRTF rendered sound binaurally. And this is just 11 not just here, this is a well-known fact to a 12 POSA. This tracking the listener's movements and 13 addressing HRTFs has been known for some time even 14 before this I would say to improve, so they 15 strengthen my opinion. 16 MS. WANG: I have no further questions. 17 MS. PARTRIDGE: Give me a sec. 18 MS. WANG: Let's go off the record. 19 VIDEOGRAPHER: We are going off the 20 record, the time is 8:23. 21 (Recess, 8:23 to 8:25 p.m.) 22 VIDEOGRAPHER: We are back on the record,	303 1 CERTIFICATE OF SHORTHAND REPORTER 2 I, Susan S. Klinger, Certified Reporter 3 within and for the States of Texas and 4 California do hereby certify: 5 That DR. CHRIS KYRIAKAKIS, the witness whose 6 deposition is hereinbefore set forth, was duly 7 sworn by me before the commencement of such 8 deposition and that such deposition was taken before 9 me and is a true record of the testimony given by 10 such witness. 11 I further certify that the adverse party, 12 META PLATFORMS, INC., was represented by counsel 13 at the deposition. 14 I further certify that the deposition of 15 DR. CHRIS KYRIAKAKIS, occurred virtually via 16 Zoom on Thursday, March 28, 2024, commencing at 17 11:03 a.m. to 8:25 p.m. 18 I further certify that I am not related to 19 any of the parties to this action by blood or 20 marriage, I am not employed by or an attorney to any 21 of the parties to this action, and that I am in no way 22 interested, financially or otherwise, in the outcome
302 1 the time is 825. 2 MS. PARTRIDGE: I have no further 3 questions. You are free to go. 4 VIDEOGRAPHER: If there is nothing further 5 for the record then this marks the end of the 6 videotaped deposition of Chris Kyriakakis. We are 7 going off the record. The time is 8:25. 8 (Deposition adjourned at 8:25 p.m.) 9 10 11 12 13 14 15 16 17 18 19 20 21 22	304 1 of this matter. 2 3 IN WITNESS WHEREOF, I have hereunto set my 4 hand this 29th day of March, 2024. 5 6 7 8 9 10  11 Susan S. Klinger, RMR-CRR, CSR 12 Texas CSR 6531, Exp: 10/23/25 13 California CSR 14487, Exp: 11/30/24 14 15 16 17 18 19 20 21 22

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Transcript of Dr. Chris Kyriakakis
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