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Transcript of Jack Lee, Ph.D.

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Case: Micron Technology, Inc. -v- Yangtze Memory Technologies Company, LTD.,
(PTAB)

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Phone: 888.433.3767 | **Email:** transcripts@planetdepos.com

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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5 1 Q. What is your occupation, Dr. Lee? 2 A. Right now, I am a professor 3 emeritus, Department of Electrical and Computer 4 Engineering in the University of Texas at 5 Austin. Emeritus professor, or professor 6 emeritus, is essentially a retired professor 7 with a recognition of emeritus. 8 Q. Do you have any other occupations 9 currently? 10 A. No. 11 Q. Do you have any materials in front 12 of you? 13 A. No. 14 Q. Other than the computer that you're 15 working on, do you have any other electronic 16 devices in front of you? 17 A. No. 18 Q. And do you understand that you're 19 under oath today? 20 A. Yes. 21 Q. So I think this is the recap for 22 you but just to summarize, I will be asking	7 1 I don't remember. 2 Q. You said that you are a retired 3 professor; is that correct? 4 A. Yes. 5 Q. Does that mean that you are not 6 currently working at the university? 7 A. What that means is that -- well, I 8 have been a professor at the University of 9 Texas for 35 years, and as of September 2023, I 10 retired from the University of Texas at Austin. 11 And so that is correct, I no longer 12 work at the University of Texas at Austin. 13 However, I still have an office there and -- 14 because of the recognitions of professor 15 emeritus title. 16 Q. You also consult in certain 17 litigation matters; is that correct? 18 A. That is correct. 19 Q. How long have you been providing 20 litigation consulting services? 21 A. Quite a long time. I first was -- 22 way back, I believe it was 2000, 2002, around
6 1 questions of you today and you'll be answering 2 those. I'll just ask that you wait for me to 3 finish, and I will also do my best to wait for 4 you to finish before I speak. Does that make 5 sense? 6 A. Yes. 7 Q. Is there any reason why you cannot 8 testify truthfully and fully today? 9 A. No. 10 Q. And if I ask a question that you 11 don't understand, I request that you ask for 12 clarification. Does that make sense? 13 A. Yes. 14 Q. And otherwise, I'll assume that you 15 understand the question. Does that make sense? 16 A. Yes. 17 Q. Dr. Lee, have you been deposed 18 before? 19 A. Yes. 20 Q. Approximately how many times? 21 A. I don't have the exact count. 22 There's more than 20, 25 maybe, yeah, or more.	8 1 that timeframe, I was asked to be a consulting 2 expert, not a testifying expert. Then I 3 believe that around 2005, I don't recall exact 4 date, the exact year, 2005, 2006 was the first 5 time that I was consulting as a testifying 6 expert. 7 Q. Approximately how many times have 8 you been retained as an expert witness in a 9 patent litigation matter? 10 A. I don't recall the exact number. 11 Probably more than 40, 45 cases. 12 Q. What is your consulting rate in 13 the -- at present IPR proceedings? 14 A. It's \$680 per hour. 15 Q. Is that your standard consulting 16 rate? 17 A. Currently, it is my standard 18 consulting rate. 19 Q. Approximately how much money do you 20 make annually from consulting in patent 21 litigation matters? 22 A. I don't -- I don't have a -- I

9 1 don't recall what the number is. 2 Q. Do you know if it was more than a 3 hundred thousand? 4 A. It varies from year to year. Some 5 year are better than others. So again, I 6 don't -- I don't recall what the -- what the 7 number is. 8 Q. Do you know approximately how much 9 you make from consulting in patent litigation 10 matters in the year 2024? 11 A. I don't -- I really don't have the 12 exact number, but probably over 100k. 13 Q. How many -- approximately how many 14 expert reports have you prepared in patent 15 litigation matters? 16 A. I'll say -- it's greater than -- 17 greater than 50 expert reports. 18 Q. And approximately how many times 19 have you testified at trial in patent 20 litigation matters? 21 A. All of the cases that I have have 22 gone to trial.	11 1 Q. Yeah. Within the set of patent 2 litigation matters for which you were retained, 3 have you ever refused to offer an opinion? 4 MR. SAGDEO: Objection, form. 5 A. I don't recall if I have -- if I 6 have refused to offer testimony after I've been 7 retained in a case. 8 Q. So is it possible that you have 9 never refused to offer testimony in a case that 10 you were retained for for patent litigation? 11 MR. SAGDEO: Objection, form. 12 A. Before I offer an opinion, if I 13 disagree with the positions of the law firm, I 14 would probably decline the case already. 15 Q. You have some patents to your name, 16 correct? 17 A. Yes. 18 Q. How many patents do you have? 19 A. It should be on my CV. Can you 20 bring up my CV? 21 Q. Yeah. Just one moment. 22 So I've shared an exhibit which
10 1 Q. Sorry, to clarify, you said that 2 all of the cases that you've been retained for 3 have gone to trial? 4 A. Yes, sir. 5 Q. Sorry, approximately how many cases 6 would that be, then, where you went to trial? 7 A. Four. 8 Q. Have you ever turned down a patent 9 litigation matter? 10 A. Yes. 11 Q. For what reason? 12 A. Various reasons. It could be 13 conflict of interest. It could be due to the 14 fact that the area is slightly out of my 15 expertise. It could be the position that the 16 law firm takes is -- that I don't agree with. 17 So there's various reasons. 18 Q. Within the set of cases where you 19 were retained, have you ever refused to offer 20 an opinion? 21 A. Can you repeat that question, 22 please?	12 1 I'll introduce in a moment through the chat. 2 Are you able to see that, Dr. Lee? 3 A. Not yet. Oh, yeah. Sure. Can I 4 download it? 5 Q. Yes, please. Let me know when you 6 have that downloaded. 7 A. Okay. Got it. 8 Q. So the document that I've shared is 9 marked as Exhibit 1004 in IPR2024-788. Do you 10 recognize -- 11 (Whereupon, an off-the-record 12 discussion was held.) 13 Q. Dr. Lee, do you recognize this 14 document? 15 A. Yes. 16 Q. And this document is a copy of your 17 CV that you provided in this set of IPRs? 18 A. Yes, I believe so. 19 Q. So looking at your CV, how many 20 patents do you have? 21 A. On page 5 of my CV, near the 22 bottom, it indicate that I have nine patent

13 1 issued. 2 Q. Do any of those patents relate to 3 the area of technology that's relevant to the 4 U.S. Patent No. 10,658,378? 5 MR. SAGDEO: Objection, form. 6 A. Can you clarify the question when 7 you say "related"? Because all the patent is 8 related to semiconductor devices, and the 9 patent that I have issued, '378, also 10 semiconductor device related. 11 So one can say that the patents 12 that I have are also in the same area as the 13 '378 patent, in the sense that they both -- 14 they all are in a area of semiconductor 15 devices. 16 (Reporter clarification.) 17 Q. So is it the case that all nine of 18 the patents that you have relate to 19 semiconductors? 20 A. Would you mind repeating the 21 question, please? 22 Q. All nine of your patents relate to	15 1 petition two. Is petition one the petition in 2 IPR2024-788? 3 A. Can you -- perhaps can you -- I 4 don't remember the exact number. Can you share 5 my declaration? I believe that has that 6 number, of both petition one and petition two. 7 Q. Sure. I'd be happy to do so. 8 A. Thank you. 9 Q. But to start with, and I'll give 10 you a minute to load this up before you 11 respond, but I've introduced a document that's 12 labeled as Exhibit 1003 in IPR2024-788. Please 13 let me know when you have that up. 14 A. Yes. Can you also share my 15 declaration for the petition two? 16 Q. Yes, yeah, just a moment. So 17 starting with this -- strike that. 18 So to clarify, do you mean that you 19 need both to answer the question I asked a 20 moment ago? 21 A. Yeah. The earlier one is petition 22 one, and the later one is petition two. So I
14 1 semiconductors? 2 A. Yes. 3 Q. What did you do to prepare for this 4 deposition? 5 A. Well, I read my declarations in 6 petition one and petition two. I read the 7 preliminary response from the patent owner in 8 both petition one and petition two. I also 9 read the decision granting institution, PTAB, 10 in both petition one and petition two. 11 Of course, I also reviewed all the 12 patents related to this case, including the 13 '378 patent and the prior arts. And I probably 14 also relayed -- reviewed some of the articles, 15 book chapters, and other documents that I cited 16 in my declarations. 17 And in preparation for this 18 deposition, I also discussed with counsel and 19 discussed various issues. 20 Q. I'd like to just unpack a couple of 21 items in your response just now. 22 You referred to petition one and	16 1 think it would be good to have the date so I 2 don't -- I can answer it accurately. If that 3 makes sense. 4 Q. So now also sharing a document 5 labeled as -- marked as Exhibit 1003 in 6 IPR2024-909. And please let me know when you 7 have that one up. 8 A. Yes. 9 Q. So Exhibit 1003 in IPR2024-788 10 is -- corresponds to what you previously 11 referred to as the first petition, correct? 12 A. That is correct. That's the -- if 13 I look at the last page of IPR ending with 788, 14 that is signed on April 30th, 2024, whereas the 15 petition that end with case number 909, the 16 signature date was May 19, 2024. 17 So therefore, the IPR ending with 18 788 is the -- what I referred to as petition 19 one earlier. And the IPR case number ended 20 with 909 is what I referred to as petition two 21 earlier. 22 Q. So in this deposition, I will refer

17 1 to Exhibit 1003 in IPR2024-788 as your first 2 declaration. Is that okay? 3 A. Yes. 4 Q. And I will refer to Exhibit 1003 in 5 IPR2024-909 as your second declaration. And 6 you'll understand what I mean when I say your 7 "second declaration"? 8 A. Yes. 9 Q. You also mentioned earlier the '378 10 patent. And am I correct that you are 11 referring to U.S. Patent No. 10,658,378? 12 A. I don't recall the exact number. 13 Can you share that with me on the screen? 14 Q. So I shared the document that's 15 been marked as Exhibit 1001 in IPR2024-788. 16 Please let me know when you have that up. 17 A. Yes, I have. 18 Q. Exhibit 1001 is the document U.S. 19 Patent No. 10,658,378. Do you recognize this 20 document? 21 A. Yes. The patent number is 22 22 10,658,378. That is correct.	19 1 responses and the institution decisions, are 2 there any other documents that you reviewed in 3 preparation for this deposition? 4 A. No, I don't think so. 5 Q. You reviewed your first declaration 6 before signing it, correct? 7 A. Yes. 8 Q. And did you find any inaccuracies 9 before you signed it? 10 A. I don't recall any errors. So yes, 11 I have reviewed and I believe that what is in 12 the declarations are my testimony, and I 13 don't -- I don't recall any errors or spelling 14 typos or anything in those declarations. 15 Q. And your first declaration reflects 16 the opinions you formulated in IPR2024-788? 17 A. Yes. 18 Q. And your second declaration 19 reflects the opinions you formulated in 20 IPR2024-909? 21 A. Yes. 22 Q. And just to be complete here, you
18 1 Q. And this is the patent for which 2 you offered opinions in these IPRs, correct? 3 A. That is correct. 4 Q. And when you referred to the '378 5 patent, this is the patent that you were 6 referring to? 7 A. Yes, sir. 8 Q. And it's the same '378 patent 9 that's at issue in both what you referred to as 10 the first petition and the second petition, 11 correct? 12 A. Yes. 13 Q. Other than the documents that are 14 cited in either your first declaration or your 15 second declaration, did you review any other 16 documents in preparation for this deposition? 17 A. No. But those -- the material 18 should be cited in both of my declarations. 19 Q. And actually, I should clarify. 20 Based on your prior answer, other than the 21 documents cited in your first and second 22 declaration and the patent owner preliminary	20 1 also reviewed your second declaration before 2 you signed that declaration, correct? 3 A. Yes. 4 Q. And did you find any inaccuracies 5 before you signed your second declaration? 6 A. No, I did not find any inaccuracy 7 or error before I signed the declaration ending 8 with number 909, what I call petition two, or 9 declaration. This is my second declaration. 10 Q. Is there any information you 11 requested but were not provided in connection 12 with declaration -- with your first 13 declaration? 14 MR. SAGDEO: Objection to form. 15 A. What exactly do you mean, did I 16 request it? I requested to whom? 17 Q. Is there any information that you 18 requested from anyone, including counsel, but 19 were not provided in connection with your first 20 declaration? 21 A. No. 22 Q. Is there any information that you

1 requested but were not provided in connection 2 with your second declaration? 3 A. No. 4 Q. Did you review the first petition 5 in preparing your first declaration? 6 A. Can you repeat the question again, 7 I'm sorry. 8 Q. Yes. Did you review the first 9 petition in the process of preparing your first 10 declaration? 11 A. I don't recall but I don't think 12 so. 13 MR. SAGDEO: And I just instruct 14 the witness not to reveal any privileged 15 information. 16 Q. Did you review the first -- strike 17 that. 18 Did you review the second petition 19 in the process of preparing your second 20 declaration? 21 MR. SAGDEO: Same instruction. 22 A. I don't think so. But I don't	21 23 1 of the invention at issue. 2 It went on, and I state, "The 3 factors include the scope and contents of the 4 prior art," two, "the difference or differences 5 between each claim of the patent and the prior 6 art," and three, "the level of ordinary skills 7 in the art at the time of the patent filed." 8 So that's the -- my understanding 9 of what is obviousness, and -- at least that's 10 part of it, because it went on to explain in 11 the next numbered paragraph 'til paragraph 33. 12 And I don't think you want me to read the whole 13 thing to you. 14 Q. I don't think that's necessary. 15 Just to confirm, though, your understanding of 16 obviousness is summarized in your first and 17 second declarations? 18 A. Yes. 19 Q. Do you have an understanding of 20 "anticipation"? 21 MR. SAGDEO: Objection, form. 22 A. Since I have -- since in this -- in
22 1 recall it -- 2 Q. I'm sorry, go ahead. 3 A. I don't think so but I don't recall 4 exactly -- exactly the timing. 5 Q. Dr. Lee, are you aware of the 6 differences between anticipation and 7 obviousness? 8 MR. SAGDEO: Objection, form. 9 A. I'm not a lawyer, so -- 10 Q. Is that the end of your answer? 11 A. On page 9 -- actually, on page 10, 12 I understand that -- well, first of all, I 13 stated on page 9 that I'm not an attorney, but 14 I have instructed in and applied the law as 15 described in this section. 16 So on page 10, it shows what is the 17 ability based on obviousness. The paragraph 20 18 stated that the patent is unpatentable and 19 invalid (sic) as obvious that the subject 20 matter of the claim as a whole would have been 21 obvious to a person of ordinary skill in the 22 art of the claim subject matter, as of the time	24 1 both declarations, I applied invalidity 2 argument of obviousness, I was -- we did not 3 discuss what is -- say it again, the term that 4 you mentioned? 5 Q. Anticipation. 6 A. Anticipation. So I did not look at 7 the -- what is anticipation, but I believe 8 that -- I believe that based on -- again, I'm 9 not an attorney, so it might be -- my 10 recollection might not be accurate. 11 But my understanding is that 12 anticipation is based on prior art and that the 13 prior art is expressly or explicitly disclose 14 every element of the claim invention, or 15 inherently discloses every element of the claim 16 limitations, that, unlike obviousness, I 17 believe that anticipation does not require or 18 does not allow combinations of various 19 references or various prior arts. That's my 20 recollection. 21 Again, since the -- in this 22 particular case, for petition one and petition

25 1 two, I apply the law of obviousness. So I did 2 not explain what is anticipation. So I might 3 be missing some details of what is 4 anticipation. So correct me if I'm -- if I was 5 wrong, but again, I'm not an attorney like you. 6 Q. In these IPRs, did you find that 7 any of the claims of the '378 patent were 8 anticipated by prior art? 9 MR. SAGDEO: Objection, form. 10 A. I'm sorry, are you saying that, is 11 there any plain limitations that we could have 12 applied anticipation? 13 Q. I'm -- to clarify, I'm asking 14 whether, in these IPR proceedings, you have 15 offered any opinions that the claims of the 16 '378 patent are anticipated by prior art. 17 A. So you're saying that, are there 18 any IPR other than these two that I offered an 19 opinion that '378 patent is invalid due to 20 anticipation? Is that your question? 21 Q. No. No, in these two IPRs, have 22 you offered an opinion that the '378 patent	27 1 information. 2 Q. Dr. Lee, are you following that 3 instruction? 4 A. Yes. 5 Q. Dr. Lee, have you ever designed 6 memory devices? 7 A. Yes. 8 Q. In what context have you designed 9 memory devices? 10 A. I'm not sure if I understand the 11 question. 12 Q. Did you design memory devices in 13 connection with any of your past employment? 14 A. Yes. 15 Q. Where were you employed when you 16 designed memory devices? 17 A. Well, I have been with the 18 Department of Electrical and Computer 19 Engineering at the University of Texas at 20 Austin since 1988 to 1993 -- to 2023, or 21 35 years. 22 As you can see in my CV, there
26 1 claims are anticipated by prior art? 2 A. No, I don't think so. That is why 3 that in paragraph 19 to 33, I -- I'm sorry, to 4 39 -- wait -- let me rephrase that. Let me 5 start from the beginning. 6 No, I do not think I applied 7 anticipation in patent -- in petition number 8 one and petition number two to invalidate the 9 claims of '378. In the sections of 10 understanding of the law, I only describe what 11 is obviousness. 12 So that was -- that is the -- 13 obviousness is what we applied, what I applied 14 in invalidating the claims that are at issues 15 of the '378 patent. 16 Q. Why did you not include any 17 opinions on anticipation in your first and 18 second declarations? 19 MR. SAGDEO: Objection, form. 20 And you know, I'm actually going to 21 instruct the witness not to answer 22 because that calls for privileged	28 1 are -- which has more than 600 publications, 2 and many of those related to semiconductor 3 memory devices. 4 Q. Are you saying that in connection 5 with some of those publications, you designed 6 memory devices? 7 A. Well, not only designing of memory 8 devices, but also fabricating the memory 9 devices and testing the memory devices, and 10 understand the memory devices and report the 11 findings of the characteristics and 12 understanding of memory devices in the form of 13 general publications or conference proceedings. 14 Q. Is there a particular portion of 15 memory devices that you focus on, or is your 16 work directed to the entire device? 17 A. I'm not sure I understand your 18 question. What do you mean by "portion of the 19 memory devices"? 20 Q. Is there a part of the device less 21 than the whole that your work focuses on, or is 22 your work directed to the entire device?

29 1 A. Well, it depends on the research. 2 Some we look at the entire device, some we look 3 at a portion of the memory device, such as the 4 certain layers or process steps related to the 5 fabrications of the memory device. 6 Q. What types of materials have you 7 used in the memory devices that you designed? 8 A. Say it again. 9 Q. What types of materials have you 10 used in the memory devices that you've 11 designed? 12 A. What types of the material? Are 13 you meaning -- do you mean the substrate 14 material, or the material involved in 15 fabricating the memory devices? 16 Well, let me answer your question 17 perhaps this way, that the memory devices that 18 I looked at consist of various material. 19 Silicon, S-I-L-I-C-O-N, S-L-I-I-C-O-N. 20 Silicon. Okay. 21 It consists of semiconductor 22 material such as silicon, or III-V material	31 1 "conductor," it could be metal, such as copper, 2 aluminium, tungsten, T-U-N-G-S-T-E-N. 3 It could be semiconductor which is 4 polysilicon. It could be metal compound such 5 as titanium nitride, N-I-T-R-I-D-E. So there's 6 various material that can be used that are 7 involved in building semiconductor memory 8 devices. 9 (Reporter clarification.) 10 Q. Did any of the memory devices that 11 you designed include stacks of metal layers in 12 the memory structure? 13 A. Stack of metal layers? What do you 14 mean by "stack of metal layers"? You mean 15 within the device, we have various stack of 16 metal layers? I believe so, yes. 17 Q. And did you include dielectric 18 materials between those metal layers? 19 (Reporter clarification.) 20 A. Yes. In order to make sure that 21 different layers of conductive material are not 22 shorted together, in general, we have to put in
30 1 such as gallium arsenide. Gallium arsenide, 2 G-A-L-I-U-M, and arsenide, A-R-S-E-N-I-D-E, 3 sorry. And there are other materials which 4 include insulating material, conductive 5 material, and other materials within the 6 device. 7 (Reporter clarification.) 8 Q. I assume for the conductive -- 9 strike that. 10 I assume for the metal layers in 11 the device you used -- strike that. 12 For the conductive portions of the 13 device, did you use metal materials? 14 A. Yeah, it could be metal, or it 15 could be other ceramic material which is -- 16 which is -- which could be a conductive 17 material. It could be compound, such as 18 titanium nitride. 19 It could be semiconductor, like 20 doped polysilicon, D-O-P-E-D, poly, P-O-L-Y, 21 silicon, S-I-L-I-C-O-N. Polysilicon is one 22 word. So it could be -- when you say	32 1 dielectric material. Dielectric is 2 D-I-E-L-E-C-R-I-C. 3 Dielectric materials also are known 4 as insulators, such as silicon dioxide, silicon 5 nitride, or what is called the high-k 6 dielectrics. 7 Q. So a single memory device can have 8 multiple metal layers and multiple dielectric 9 structures? 10 A. Yes. 11 MR. BONNY: We've been going for 12 about an hour, Dr. Lee. Do you want to 13 take a break or continue? 14 THE WITNESS: Sure. 15 MR. BONNY: Let's go off the 16 record. 17 THE VIDEOGRAPHER: We are going off 18 the record. The time is 11:57. 19 (Whereupon, an off-the-record 20 discussion was held.) 21 THE VIDEOGRAPHER: And we're back 22 on the record. The time is 12:11.

33 1 Q. Dr. Lee, what is your understanding 2 of the meaning of the term "on" in the '378 3 patent? 4 A. Meaning of the term "on" in '378. 5 So in '378, column four, line 30 -- sorry, line 6 20 to 40, it explained that the -- in that 7 paragraph, in that section, the '378 patent 8 provide spatially relative term such as "on," 9 as you can see that they are intended to 10 encompass different orientation, right? 11 Including rotating 90 degree or at any 12 orientations. 13 So in the section, basically 14 explained what is the meaning of "on," "above," 15 and "over" in the '378 disclosure. It state 16 that it should be interpreted in the broadest 17 manner, such as -- such that "on," not only 18 meaning directly on something, but also 19 included the meaning of "on," something with 20 intermediate features or a layer there between. 21 And that "above" or "over," not 22 only meaning -- not only the meaning of above	35 1 A. Again, it clearly -- I thought you 2 said something. No? It clearly stated in 3 column four line 23 that "on," "above," or 4 "over," or that "on" meaning directly on 5 something, but also including -- also includes 6 the meaning of on something with an 7 intermediate features or a layer there between. 8 Q. And is it your opinion that "on" is 9 not limited to any orientation? 10 MR. SAGDEO: Object to form. 11 A. That's correct that in column four 12 line 34, it explained that the spatially 13 relative terms, such as "on," "above," or 14 "over," encompassed different orientations. 15 For example, over there it says "rotating 16 90 degrees or at other orientations." 17 Q. So taking your interpretation of 18 the term "on," which you've said allows for 19 intermediate features and is not limited to any 20 orientation, is it your opinion that any 21 structure in a memory device is on every other 22 structure?
34 1 or over something, but can also include the 2 meaning it is above or over something with no 3 intermediate feature or layer there between 4 that is directly on something. 5 Furthermore, in the next paragraph, 6 basically, it says that the spatially relative 7 terms are intended to encompass different 8 orientations that divide in use or operation, 9 in addition to the orientation depicted in the 10 figures. 11 The apparent apparatus may be 12 otherwise oriented, "(rotated 90 degrees or at 13 other orientation), and the spatially relative 14 descriptor used herein might likewise be 15 interpreted accordingly." 16 So the meaning of "on" in the '378 17 patent and its disclosures are clearly 18 explained in column four of the '378 patent. 19 Q. So the term "on" in your view does 20 not include -- or require, rather, does not 21 require direct contact? 22 MR. SAGDEO: Object to form.	36 1 MR. SAGDEO: Object to form. 2 A. I'm not sure I understand your 3 question. Can you repeat that again? 4 Q. Yes. Is it your opinion that any 5 structure in a memory device is on every other 6 structure? 7 MR. SAGDEO: Object to form. 8 A. Can you give me an example? I'm 9 not sure. I mean, this is such a general 10 question that you're saying that any layer or 11 structure can be, quote, "on" at any -- on any 12 other structure in the memory device. Is that 13 what you're saying? 14 Q. That's what I'm asking you. 15 A. I have not considered such general 16 argument that any structure in a memory device 17 can be said "on" at any other structures or 18 layer in the memory device, but I did conclude 19 that parts that are relevant to the claim 20 limitations that we considered, using the 21 description that we just cited in column four 22 of the '378 patent.

37 1 Q. Can you please turn to Exhibit 1001 2 which is the '378 patent? 3 A. Yes. 4 Q. And can you please turn to figure 5 two? 6 A. Hold on one second. Let me -- let 7 me rotate. Okay. 8 Q. You have figure two in front of 9 you? 10 A. Yes. 11 Q. I'd like to just ask about a couple 12 of the features in figure two of the '378 13 patent. To start with, is isolation structure 14 233 on the alternating -- is isolation 15 structure 233 on the alternating 16 inductor/dielectric stack 210? 17 (Reporter clarification.) 18 A. I have not considered that because 19 the claim limitation involved the term "on" is 20 related to whether the isolation structure is 21 with the substrate, or whether the substrate is 22 with an isolation structure.	39 1 say that it is not directly on but diagonally 2 on 210. 3 But again, I did not consider the 4 questions of whether 233 is on 210 or not. But 5 I focused on the relevant element involved in 6 the claim imitations. 7 Q. Applying your understanding of the 8 term "on" from the '378 patent, is -- are bit 9 lines 250 on the isolation structure 233? 10 MR. SAGDEO: Object to form. 11 A. Are you referring to figure two? 12 Q. Yes. In figure two -- and let me 13 ask a different question actually. 14 In figure two, is the isolation 15 structure 233 on the bit lines 250? 16 MR. BONNY: Object to form. 17 A. In my declaration, I have not 18 considered whether the region 233 is above the 19 layers 250. However, based on the description 20 in column four, that spatially relative terms 21 are intended to encompass different 22 orientations of the device, including rotating
38 1 So I have not considered whether 2 the 233 in figure two, whether it is on the 3 region 210. That's what you're asking; is that 4 right? 5 (Reporter clarification.) 6 Q. That's right. Yeah, I'm just -- I 7 know you've explained your understanding of the 8 term "on." And so now I'm asking you to apply 9 that term as you understand it. 10 And it sounds like you're not able 11 to tell me whether 233 is on 210? 12 MR. SAGDEO: Objection to form. 13 A. Why -- what is written on column 14 four, that the 233, which is the STI, shadow 15 trench isolation -- shadow trench, T-R-E-N-C-H, 16 isolation -- whether it is on the element 210, 17 which is layers of word lines -- word lines, 18 W-O-R-D, lines -- and dielectric layers. 19 I suppose if you rotate figure two 20 90 degrees, one could say that 233, although 21 not directly on 210, but is above 210. And so 22 in the broadest manner, I guess one could still	40 1 90 degree or at any other -- or other -- 2 sorry -- rotate 90 degrees or at other 3 orientations. 4 So I suppose that one can rotate 5 figure two, or the device described in figure 6 two, say, in 45 degree, either plus or minus 45 7 degree, and 233 will be on the bitlines 250. 8 B-I-T-L-I-N-E-S. 9 (Reporter clarification.) 10 Q. Applying your understanding of the 11 term "on" from column four of the '378 patent, 12 are there any structures in figure two that are 13 not on every other structure? 14 MR. SAGDEO: Objection, form. 15 A. I have not considered that scenario 16 and that hypothetical question, but the way the 17 column four described what is considered to be 18 on, which include rotating the apparatus 90 19 degree or at any other orientation, 20 specifically for figure two, it might be. 21 But at this point, I cannot 22 identify whether any structure is -- I mean,

41 1 personal of ordinary skill in the art would 2 apply that definition. That -- that "on" is so 3 general that it's just not -- does not 4 include -- does not limit it to directly on, 5 and it can be rotating the apparatus by 90 6 degree or at any orientation. 7 Such broad description of the 8 meaning of "on," "above," or "over" in such 9 broadest manner would seem to suggest that, at 10 least specifically for figure two, that any 11 element, by rotating the structure in figure 12 two at different orientation, could probably 13 consider it "on" at other elements. 14 But once again, that was not the 15 issue that I was considered in invalidating the 16 claim in these petitions, petition one and 17 petition two. 18 Q. Are you able to think of any 19 examples, and it doesn't have to be limited to 20 figure two, but are you able to think of any 21 examples of a structure that's not on another 22 structure?	43 1 look at this. So I can think of it in 2 semiconductor fabrications. Particles that are 3 involved in vacuum chamber during processing, 4 they are suspended in space, right, during some 5 deposition process such as chemical vapor 6 deposition, and they're not in contact with any 7 other structure in the substrate. 8 So I would think that that might be 9 an example of a structure or particle that is 10 not on any other structure, for example. 11 Q. Are you saying that "on" requires 12 direct contact? 13 MR. SAGDEO: Object to form. 14 A. Well, I'm saying that when -- 15 during the deposition, when the film is in the 16 transient state, as it moves through the gas 17 phase, before it lands on the substrate, one 18 might consider that, during the deposition, 19 that it's not glorifying the meaning of "on" 20 because they are suspended in space. 21 In column four, the description 22 seems to describe spacial relative terms of
42 1 MR. SAGDEO: Object to form. 2 A. Let me take a look at -- sorry. 3 Sorry, I'm taking some time at this point. Are 4 you saying including structure that I -- 5 outside of this -- of this '378 patent? 6 Q. I'm wondering, under the meaning of 7 "on" from the context of the '378 patent, are 8 you able to come up with any examples or 9 hypotheticals where one structure is not on the 10 other structure? 11 MR. SAGDEO: Object to form. 12 A. Not included outside of '378, 13 right? 14 Q. To clarify, I'm fine with -- I'm 15 not interested in any example in the '378 or 16 otherwise, but under your interpretation of 17 "on" from column four of the '378 patent. 18 So using that interpretation of 19 "on," can you provide any examples anywhere of 20 a structure that's not on another structure? 21 MR. SAGDEO: Objection, form. 22 A. Let's see. Okay. Let me take a	44 1 layers that are within the structure of the 2 device. So when you have a layer that is 3 floating and suspended in space, column four 4 doesn't seem to include such situation in 5 explaining the meaning of "on." 6 Q. Are there any other examples that 7 you can think of outside of the vacuum chamber 8 situation? 9 MR. SAGDEO: Object to form. 10 A. So it appears that column four 11 described a broad definition of "on" that 12 allows for direct or indirect contact, that is 13 indirect contact with intermediate layers of 14 different orientations. 15 So in addition to a particle in 16 space during vacuum deposition, such as 17 chemical vapor deposition process, perhaps 18 another structure may be that when you have 19 electrostatic levitations, right, or 20 electromagnetic levitations, in which a layer 21 or a structure is held in a position in space 22 such that it is not physically on, either

45 1 directly on or indirectly on any other 2 structure, such as a substrate. 3 So that could be another example 4 where you have electrostatic or 5 electromagnetics levitations. So again, I have 6 not considered such hypothetical question in a 7 scenario, but top of my head, those are the two 8 examples that I can think of. 9 Does that make sense, sir? 10 Q. So just to clarify then, for the 11 purposes of applying the term "on," based on 12 your understanding of column four of the '378 13 patent, it sounds like as long as two 14 structures are directly or indirectly 15 contacting one another as part of the same 16 physical structure, like a memory device, then 17 they would be considered on each other? 18 MR. SAGDEO: Object to form. 19 A. You're throwing in a term "art of." 20 I did not say that. I'm saying that a person 21 of ordinary skill in the art reading column 22 four, that column four give a broad definition	47 1 I only considered the relevant layers and 2 structures related to the claim limitations. I 3 have not and I did not consider such broad 4 hypothetical questions about any layers or any 5 other example in the universe. 6 Q. All right. I'd like to switch 7 topics now. I have shared the document that's 8 been marked as Exhibit 1006, which is U.S. 9 Patent No. 10,354,980 to Mushiga, 10 M-U-S-H-I-G-A. 11 Please let me know when you have it 12 up, Dr. Lee. 13 (Reporter clarification.) 14 A. This is the '980 patent to Mushiga? 15 Q. That's correct. 16 A. Yes, I just had it open. 17 Q. This is one of the prior art 18 references that you opined on in your first 19 declaration, correct? 20 A. That is correct. 21 Q. Could you please turn to figure 11 22 and rotate --
46 1 of "on" that allows for direct or indirect 2 contact, "indirect contact" meaning having 3 intermediate layers or different structures and 4 different orientations. 5 So to answer your question, the two 6 examples that I give are structure that are 7 levitated above the substrate, such as 8 particles in the vacuum chamber during the 9 depositions, or structure that are levitated by 10 electrostatic force or electromagnetic force. 11 At this point, those are the two 12 examples that I can think of, but it appears 13 that, based on the understanding of person of 14 ordinary skill in the art reading such broad 15 explanation of what "on" is, that a device that 16 has layers that are either directly on or 17 indirectly contacting the substrate, it 18 probably allows that any layers or any 19 structure in the device perhaps can be 20 considered on other layers or any structures of 21 the device. 22 But once again, in my declaration,	48 1 A. Sorry, let me -- doesn't seem to be 2 rotating, it seems like. Figure 11? Yes, I 3 got it. 4 Q. Are you familiar with the various 5 components that are shown in figure 11 of 6 Mushiga? 7 A. Yes, I'm familiar with various 8 layers, especially the one that I used for 9 invalidity document in my declaration -- 10 (Reporter clarification.) 11 Invalidity analysis. 12 Q. Do you see backside insulating 13 layer 306? 14 A. Yes. 15 Q. What is the function of that 16 structure? 17 A. What is what? 18 Q. What is the function of backside 19 insulating layer 306? 20 A. Well, 306 is an insulating layer. 21 And it's on the backside of the substrate. So 22 it is used to insulate the semiconductor

49 1 substrate from any other potential conductor or 2 semiconductor. 3 Q. And how was backside insulating 4 layer 306 formed? 5 A. Well, it's formed by depositions of 6 insulating material, for example, silicon oxide 7 deposition. 8 (Reporter clarification.) 9 Q. Do you see insulating material 10 liner layer 303 in figure 11? 11 A. You mean 302? 12 Q. Yes. I'm sorry. I misspoke. 13 Do you see insulating material 14 liner layer 302 in figure 11? 15 A. Yes. 16 Q. What is the function of component 17 303 -- sorry, 302. What is the function of 18 component 302? 19 A. Well, the insulating material liner 20 302 is also an insulator which can be deposit, 21 for example, a plasma-enhanced physical or 22 physically deposition, so-called PECPD process.	51 1 Q. What is the function of 760? 2 A. 760 is also an insulator. So it's 3 providing an insulating function so that 4 conductive material would not be shorted 5 inadvertently. 6 Q. Are you able to tell which specific 7 conductive material 760 is providing insulation 8 for? 9 A. Well, 76- -- you mean 760? 10 Q. Yes, 760. 11 A. 760 provided insulations wherever 12 it contact to conductor material. 13 Q. Do you see first retro-stepped 14 dielectric material portion 165? 15 A. Right, yes. 16 Q. What is that structure? 17 A. 165 is also an insulator, which 18 provide an insulation to avoid conductor 19 regions shorted together. So it's providing an 20 insulation function. 21 Q. Do you see second retro-stepped 22 dielectric material portion 265?
50 1 So the purpose of this 302 layer is 2 to make sure that the structure -- to make sure 3 that conductors are not shorted together, for 4 example, region 310, which is a metal film 5 layer, that it should not be shorted to the 6 region nine, which is a semiconductor layer I 7 believe. 8 So with the insulating layer 302, 9 that basically is used to prevent a shorting of 10 these two regions, 310 and number nine. 11 Q. And component nine is a 12 semiconductor layer, correct? 13 A. Yes. Number nine is a 14 semiconductor substrate layer. So -- 15 Q. Did you say -- go ahead. 16 A. So that the insulating material 17 liner 302 is providing an electrically 18 isolation of adjacent regions. 19 (Reporter clarification.) 20 Q. Do you see insulating material 21 layer 760? 22 A. Yes.	52 1 (Reporter clarification.) 2 A. Yes. 3 Q. What is that structure? 4 A. That structure is also a insulating 5 layer, which provide insulation function to 6 ensure that adjacent conductors would not be 7 inadvertently shorted together. 8 Q. Do you see inter-tier dielectric 9 layer 180? That's I-N-T-E-R dash T-I-E-R. 10 (Reporter clarification.) 11 A. Yes. 12 Q. What is the function of that 13 structure? 14 A. The structure 180 is also a 15 dielectric layer, which provide an insulation 16 function that it insulate adjacent conductive 17 material so that they don't inadvertently short 18 it together. 19 Q. Is structure two -- strike that. 20 Is structure 760 deposited before 21 the staircase structure is formed? 22 A. Can you repeat that again? Is 760

53 1 deposit before which layer? 2 Q. Is 760 deposited before the 3 staircase structure is formed? 4 A. I believe so. 5 Q. Is layer 165 deposited after the 6 staircase structure is formed? 7 A. I believe so. I'm not -- I have to 8 go back and look at it because this is not a 9 method claim, but I believe that isolation 10 region 165 was deposited after the staircase. 11 Q. Is that also true for structure 12 265? 13 A. Yes, I believe that 265 was 14 deposited after the staircase was deposited. 15 Q. Do you see second insulating cap 16 later 270? And that's cap, C-A-P. 17 (Reporter clarification.) 18 A. 270? 19 Q. Yes. 20 A. Yes. 21 Q. What is the function of 270? 22 A. 270 is what is called an insulating	55 1 A. 284 is also a dielectric layer, 2 which means it, sort of, is used to serve a 3 function of insulation and to prevent adjacent 4 conductive material to be shorted 5 inadvertently. 6 Q. And lastly, do you see additional 7 interconnect level dielectric layer 290? 8 (Reporter clarification.) 9 A. Yes. 10 Q. What is the function of 290? 11 A. 290 is also a dielectric layer 12 which is used to serve the function of 13 insulation and to prevent adjacent conductive 14 material shorted inadvertently. 15 Q. Can you please turn to paragraph 16 204 of your first declaration? 17 A. 204. 18 Q. Which is Exhibit 1003 in 19 IPR2024-788. 20 A. Yes. 21 Q. And in particular, I'd like to 22 point you to the figure that's at the end of
54 1 cap layer. So it's also serving a function of 2 insulation, that they provide an insulation 3 between adjacent conductive material so that 4 those conductive material would not be shorted 5 inadvertently. 6 Q. Is the first contact level 7 dielectric layer 280? 8 A. Yes. 9 Q. What is the function of 280? 10 A. 280 is also a dielectric layer, 11 also called insulating layer. So it provide 12 the function of insulation, which prevent 13 adjacent conductive material be shorted 14 inadvertently. 15 Q. Does second contact level 16 dielectric layer 282 have that same function? 17 A. 282 is also a dielectric layer. So 18 it served the function of insulation. 19 Q. Do you see line level dielectric 20 layer 284? 21 A. Yes. 22 Q. What is the function of 284?	56 1 that paragraph on the following page. 2 A. Meaning the top page of the next 3 page? 4 Q. Correct. At the top of page 129, 5 you have an annotated version of figure 11, 6 correct? 7 A. Yes. 8 Q. And in that figure, you labeled a 9 portion of the device as a dielectric 10 structure? 11 A. Yes. 12 Q. What was your process for 13 determining which components to combine as what 14 you have labeled as a dielectric structure? 15 MR. SAGDEO: Object to form. 16 A. What do you mean, "the process"? 17 Q. How did you -- how did you 18 determine which dielectric structures to 19 combine as the claimed dielectric structure? 20 A. So in paragraph 204, near the end 21 of the paragraph, I said "dielectric 22 structure," which include elements 760, 165,

57 1 180, 265, and 586, are the dielectric 2 structure. 3 And so I formed the grouping of 4 this dielectric, basically is used to serve the 5 functional and structural integration taught by 6 Mushiga, and it's understood by a person of 7 ordinary skill in the art. 8 So I determined that those elements 9 together will meet the limitations of the 10 claimed element of dielectric structure in 11 claim 15 point H. H as in Henry. 12 (Reporter clarification.) 13 Q. Just to make sure I understand, you 14 chose the particular dielectric structures in 15 the Mushiga reference that you could combine to 16 read on limitation 15.H of the '378 patent? 17 A. That is correct. 18 MR. BONNY: I think we've been 19 going for about another hour and a half, 20 so this would be a good time for a 21 break. Can we go off the record? 22 THE WITNESS: Okay. How many	59 1 there below. 2 Q. If there are multiple layers in 3 that passage that you just read, are each of 4 those individually a substrate, or is it 5 collectively a substrate, or both? 6 A. Well, as I explained in paragraph 7 172 in my petition one, my declaration of 8 petition one, Exhibit 1003, there I said that 9 Mushiga discloses a first semiconductor 10 substrate eight on which other layers are 11 added. 12 So layer eight, highlighted in 13 yellow in figure 11 on page 105 of my 14 declaration, Exhibit 1003, is what disclose by 15 Mushiga as a substrate. 16 Q. So my question wasn't about 17 Mushiga. I was asking about the '378 patent 18 and its disclosure. 19 Let's just move on to the next 20 question. 21 What is an alternating 22 conductor/dielectric layer stack as we cited in
58 1 minutes? 2 THE VIDEOGRAPHER: Sorry, I was on 3 mute. We went off the record at 13:25. 4 (Whereupon, an off-the-record 5 discussion was held.) 6 THE VIDEOGRAPHER: We are back on 7 the record. The time is 13:35. 8 Q. Dr. Lee, I'd like to ask about some 9 of the terms in claim 15 of the '378 patent. 10 So feel free if you'd like to pull up 11 Exhibit 1001 and turn to claim 15. 12 A. Okay. 13 Q. Claim 15 recites a substrate with 14 an isolation structure. What is a substrate? 15 A. So in column four, line 41, it 16 describe what is a substrate. It says that the 17 substrate -- the term "substrate" refer to a 18 material on which subsequent material layers 19 are added or otherwise disposed, and that a 20 substrate can be a layer, it can include one or 21 more layers therein, and/or can have one or 22 more layers thereupon, there above, and/or	60 1 claim 15 of the '378 patent? 2 A. Well, those are the word lines and 3 insulating layers separating word lines as 4 shown in figure 11. I believe is label 132 and 5 232 as the insulating layers, and 146 and 246 6 is electrically conductive layers. 7 Q. I'm sorry, which figure -- are you 8 referring to figure two? 9 A. Oh, I thought you were talking 10 about my -- the Mushiga. 11 Q. Oh, sorry, so these questions I'm 12 not asking anything about Mushiga. I'm just 13 asking about the '378 patent. 14 So in the '378 patent, what is an 15 alternating conductor/dielectric layer stack? 16 A. So if you're referring to figure 17 two? 18 Q. If you want to refer to figure two, 19 that's fine. But I'm just wanting to 20 understand what your understanding is of the 21 term "alternating conductor/dielectric layer 22 stack."

61 1 A. So the -- what that refer to is the 2 dielectric -- I mean, the -- it refer to the 3 word line. The word lines, for example, in 4 figure two -- 206 is a conductive layers, and 5 these conductive layers are separated by 6 dielectric layers 208. 7 So those are the -- what claim 15 8 refer to as the alternating conductor 9 dielectric layers. 10 Q. So the alternating 11 conductor/dielectric layer stack includes 12 multiple conductor structures and multiple 13 dielectric structures? 14 MR. SAGDEO: Object to form. 15 A. As I mentioned, it's in -- for 16 example, column eight, they specifically said 17 that the arrayed device can include a polarity 18 of mainstream 204 that extend through a 19 polarity of conductive -- conductor layer 206 20 and dielectric layer 208 pairs. 21 The polarity of 22 conductor/dielectric layer pairs are referred	63 1 border, or alternatively called the side wall 2 surface, is -- is the dielectric -- is the -- 3 for example, if you look at figure -- figure 4 two in '378 patent, that the side wall is 5 between structure 210 and insulating layer 232 6 as the side wall, that is the side wall surface 7 of the dielectric structure. 8 Q. What is the function of the 9 dielectric structure in the '378 patent? 10 A. Like any other dielectric 11 structure, the side wall -- the insulating -- 12 the dielectric structure is to serve the 13 function of insulations to avoid neighboring 14 conductor be shorted inadvertently. 15 Q. What are the functions of the 16 channel structures recited in claim 15 of the 17 '378 patent? 18 (Reporter clarification.) 19 A. Well, the channel structure are 20 basically the memory stack structure. It's 21 where the memories are stored in the NAND 22 memory chip. That's what is called the channel
62 1 to as alternating conductor dielectric stack 2 210. 3 So a person of ordinary skill in 4 the art reading the claim terms and alternating 5 conductor/dielectric layer stack to mean the 6 word lines separated by polarity of dielectric 7 layers. 8 Q. Claim 15 recites that the 9 alternating conductor/dielectric layer stack -- 10 (Reporter clarification.) 11 I'll just re-ask the question to 12 get a clean record. 13 Claim 15 recites that the 14 alternating conductor/dielectric layer stack 15 abuts a side wall surface of the dielectric 16 structure. Do you see that? 17 A. Yes. 18 Q. What is a side wall surface of the 19 dielectric structure? 20 A. Well, '378 identify what is a side 21 wall -- what is a dielectric structure. And 22 the border, the border, one can think that the	64 1 structure. 2 Q. Just to clarify, did you say "NAND 3 memory structure," as in N-A-N-D? 4 A. Yes. 5 Q. In claim 15, the channel structures 6 must extend vertically through the alternating 7 conductor/dielectric layer stack, correct? 8 A. That's what the claim says. 9 Q. What does "vertically" mean in that 10 context? 11 A. "Vertically" means 90 degree with 12 respect to the orientation of the substrate. 13 Q. What are the functions of the slit 14 structures, S-L-I-T, in claim 15 of the '378 15 patent? 16 A. So -- let's see. I'm looking for 17 an explanation in 1001, the '378 patent. I 18 don't think you can explain specifically what 19 the function is, but in general, for 3D NAND, 20 the split structure is basically providing the 21 mechanical support, what -- one of the many 22 function, it provide mechanical and structural

65 1 support for various structure. 2 It also -- because the slit 3 structure consists of -- yeah, consists of 4 conductive layer, for example, 114 in figure 5 1A, and so it serve, not only for supporting 6 the structure of the NAND, but it also 7 functioned as a common source contact for an 8 array of NAND strain. 9 And it also served as a function of 10 dividing a 3D memory device into multiple 11 memory blocks. So I'm reading this in 12 figure -- in column six, line 25, 24 to 29. 13 So there it says that a function is 14 a common source contact for an array. It's 15 also served as a structure that divide the 16 memory device into multiple blocks, and so that 17 it can operate more effectively. 18 But in addition, it also provides 19 structural support. I don't know if this 20 patent talk about that. And also provides heat 21 dissipation. 22 (Reporter clarification.)	67 1 various purposes, such as connecting to 2 peripheral circuits. 3 I'm trying to locate the section 4 that specifically describes that in 5 Exhibit 1001. So for example, in figure two, 6 element 234 is an example of through array 7 contact that, according to the specification, 8 column five line 35 through 40, is an 9 interconnect structure that allows contacts to 10 various memory array structure to be fabricated 11 in a number of -- in a number of -- in a 12 limited number of steps, a single step or two 13 steps, thereby reducing the process of 14 complexity and manufacturing costs. 15 So in essence, the through array 16 contact simply provide electrical connection 17 between the 3D memory array and the peripheral 18 circuits. So that's essentially the structure 19 and the functions of through array contacts or 20 the patent contact, T-A-C, TACs. 21 (Reporter clarification.) 22 Q. In claim 17 of the '378 patent,
66 1 Q. And what is the function of the 2 local contact recited in line 15 of the '378 3 patent? 4 A. So in column 11 line 15, around 15, 5 it says that local contact is essentially 6 provide a conducting layer with memory array 7 structures, such as the NAND string 204, 8 S-T-R-I-N-G-S, 204, slit structures 226, 9 conductive layer or word line 206, and the 10 staircase structure 212. 11 So the local contact basically is 12 an interconnect to connect the memory array 13 structure to, for example, external -- external 14 input, outputs. 15 (Reporter clarification.) 16 Q. And what is the through array 17 contact in claim 15 of the '378 patent? 18 A. So the function of through array 19 contact is, basically it's a vertical 20 electrical conductivity. So for example, in 21 figure 1A is the region 120. So it served as 22 basically vertical electrical contacts for	68 1 what is your understanding of the term "through 2 array contact region"? 3 MR. SAGDEO: Object to form. 4 A. Well, I think that perhaps through 5 array -- let's see -- so through array contacts 6 are the actual electrical -- electrical -- 7 vertical electrical conductivity, whereas 8 through array contact regions include the 9 isolation around it. So it's a region consist 10 of the TAC, the contact itself, and the 11 insulation around it. 12 So for example, in figure 1A of the 13 '238 patent, the TAC I believe is 126, the TAC 14 structure is 126, and it is formed within the 15 TAC regions 120. So 120 included the 16 dielectric structure 124. 17 Did I answer your question? 18 Q. I think so. So it's -- the TAC 19 region includes those items you listed, and 20 it's next to the alternating 21 conductor/dielectric layer stack? 22 A. No. I didn't say that. I said

69 1 that in column six line 14, TAC structure is 2 the 126, which is the vertical electrical 3 conductor itself, while 120 is the TAC regions, 4 which include the dielectric structure 124. 5 So basically, you have a dielectric 6 region, and inside the dielectric region 7 there's 126 -- which I say TAC structure. So 8 the TAC structure is the conductor itself, and 9 the TAC regions include the TAC structure and 10 the dielectric structure. 11 Does that make sense? 12 Q. Yeah. I think so. Does the TAC 13 region include anything else? 14 MR. SAGDEO: Object to form. 15 A. In the example of figure 1A and 16 related figures, the TAC region seems to 17 include only the TAC structure and the 18 surrounding dielectric structure. 19 Q. I wanted to switch to your second 20 declaration, Exhibit 1003 in IPR2024-909. In 21 that declaration, in your second declaration, 22 you only opined on one ground of invalidity	71 1 the way that the crystallographic orientation 2 of the deposit material matches that of the 3 substrate. 4 So epitaxial layer is the deposit 5 crystalline layer formed on a crystalline 6 substrate through a process called epitaxial 7 growth. 8 Q. Claim one of the '378 patent also 9 recites an etch, E-T-C-H, stop plug. What is 10 that structure? 11 (Reporter clarification.) 12 A. Well, in general, an etch stop 13 structure is to prevent the etch from removing 14 material that are not intended to be removed. 15 Q. Going back to the term "epitaxial 16 layer," for that term, does the epitaxial 17 crystallographic orientation have to match the 18 substrates exactly? 19 A. In general, that epitaxial growth 20 is allowing -- involving a deposition of a 21 single crystal material on a single crystal 22 substrate in such a way that the orientation of
70 1 based on the Toyama reference, correct? 2 Toyama, T-O-Y-A-M-A. 3 (Reporter clarification.) 4 A. I believe so, yes. 5 Q. Why didn't you include a ground 6 based on the Mushiga reference? 7 MR. SAGDEO: I'm going to instruct 8 the witness not to answer as that calls 9 for privileged information. 10 Q. Dr. Lee, are you following that 11 instruction? 12 A. Yes, sir. 13 Q. Claim one of the '378 patent 14 recites an epitaxial layer, E-P-I-T-A-X-I-A-L. 15 Do you see that? 16 A. Yes. 17 Q. What is an epitaxial layer? 18 A. Well, as I explained in paragraph 19 59 on my declaration, epitaxial growth in 20 semiconductor manufacturing, basically 21 involving a deposition of crystalline structure 22 of the materials on a crystalline substrate in	72 1 the deposit material matches that of the 2 substrate. 3 Q. Sorry, just a moment. 4 Does -- claim one also recites a 5 contact layer. What is a contact layer as used 6 in claim one of the '378 patent? 7 A. Claim one of '378? Are you talking 8 about claim one? 9 Q. Yes. So in the final limitation of 10 claim one of the '378 patent, the claim recites 11 one or more contact layers and goes on. 12 So in that context there, what is a 13 contact layer? 14 A. Well, a contact layer in claim 1.J, 15 it says that one or more contact layers under 16 one or more TACs, T-A-C-S, the one or more 17 channel structure, and the slit structures. 18 So in column 11 line 51, it says 19 that a contact layer 242 can include dielectric 20 layers, can include a dielectric layer and a 21 polarity of contact. 246, for example, vias, 22 V-I-A-S, in the dielectric layer.

73 1 Q. All right. I just have a couple of 2 questions about claim 18 of the '378 patent. 3 So claim 18 recites in part an "etch stop plug 4 interposed between each local contact of the 5 local contacts and each channel structure of 6 the channel structures." 7 Do you see that? 8 A. Claim 18. Yeah, I see that. 9 Q. "Each local contact" in claim 18 is 10 referring back to the local contacts recited in 11 claim 15, correct? 12 A. That's right, yeah. Each -- each 13 local contact is referred to what is described 14 in claim 15, because claim 18 said that the 3D 15 memory device of claim 15, further comprising 16 an "etch stop plug interposed between each 17 local contact of the local contacts and each 18 channel structure of the channel structures." 19 So therefore, yes, the claim 18 20 depends on claim 15. 21 Q. And similarly, the phrase "each 22 channel structure" in claim 18 refers back to	75 1 MR. SAGDEO: If counsel has no 2 questions -- 3 THE WITNESS: Okay. I'm sorry. 4 MR. SAGDEO: -- we're done. 5 THE WITNESS: Okay. Thank you. 6 (Continued on next page 7 to include jurat.) 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
74 1 the channel structures recited in claim 15, 2 correct? 3 A. That is correct, that claim 18 4 depends on claim 15. 5 MR. BONNY: I think I may be 6 wrapping this up. I just want to take a 7 break to gather my thoughts. So can we 8 go off the record, please? 9 THE VIDEOGRAPHER: Yes. We are 10 going off the record. The time is 11 14:23. 12 (Whereupon, an off-the-record 13 discussion was held.) 14 THE VIDEOGRAPHER: We are back on 15 the record. The time is 14:28. 16 MR. BONNY: I have no further 17 questions for Dr. Lee. 18 THE WITNESS: I -- during the 19 break, I was looking at my declaration 20 for petition two. Okay. 21 MR. BONNY: Sorry, there's no 22 pending question.	76 1 MR. BONNY: Yes, I have no further 2 questions. 3 MR. SAGDEO: No redirect. 4 THE VIDEOGRAPHER: Okay. If 5 there's nothing further, this concludes 6 the deposition of Jack Lee. The time is 7 14:29. 8 9 (Whereupon, at 2:29 p.m., the 10 examination of this witness was 11 concluded.) 12 13 _____ 14 DR. JACK LEE 15 16 Subscribed and sworn to before me 17 this ____ day of _____, 2025. 18 19 _____ 20 NOTARY PUBLIC 21 22

77 1 EXAMINATIONS 2 MR. BONNY 4 14 3 4 --- 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	79 1 I further certify that I am not related to 2 any of the parties to this action by blood or 3 marriage, I am not employed by or an attorney to 4 any of the parties to this action, and that I am 5 in no way interested, financially or otherwise, 6 in the outcome of this matter. 7 8 Witness my hand this 4th day of February, 2025. 9 10 <u><i>Dorene Glover</i></u> 11 DORENE GLOVER 12 13 14 15 16 17 18 19 20 21 22
78 1 CERTIFICATE 2 STATE OF NEW YORK) 3 ss.: 4 STATE OF NEW YORK) 5 I, DORENE GLOVER, a Notary Public for 6 and within the State of New York, do hereby 7 Certify: 8 That JACK LEE, Ph.D., the witness whose 9 deposition is hereinbefore set forth, was duly 10 sworn by me before the commencement of such 11 deposition and that such deposition was taken 12 before me and is a true record of the testimony 13 given by such witness. 14 I further certify that the adverse party, 15 Petitioner, was represented by counsel at the 16 deposition. 17 I further certify that the deposition of 18 JACK LEE, Ph.D., occurred remotely via 19 videoconference on Tuesday, January 28, 2025, 20 commencing at 11:00 a.m. to 2:29 p.m.. 21 22	80 1 STATE OF NEW YORK) 2 ss.: 3 COUNTY OF BRONX) 4 5 I wish to make the following changes, for 6 the following reasons: 7 8 PAGE LINE 9 ____ CHANGE: 10 11 REASON: 12 13 ____ CHANGE: 14 15 REASON: 16 17 ____ CHANGE: 18 19 REASON: 20 21 ____ CHANGE: 22 REASON:

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