

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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MICRON TECHNOLOGY, INC.,  
Petitioner,

v.

YANGTZE MEMORY TECHNOLOGIES COMPANY, LTD.,  
Patent Owner

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IPR2025-00191  
Patent 11,581,322 B2

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Record of Oral Hearing  
Held: April 27, 2026

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BEFORE: JO-ANNE M. KOKOSKI, KIMBERLY McGRAW, and  
MICHAEL T. CYGAN, Administrative Patent Judges.

APPEARANCES:

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The above-entitled matter came on for hearing on April 27, 2026,  
commencing at 9:00 a.m., via video teleconference.

P R O C E E D I N G S

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JUDGE CYGAN: Good morning. This is Judge Cygan. Judges McGraw, Kokoski are present by video. We will now hear argument in case number IPR2025-00191 concerning US Patent Number 11,581,322 between Petitioner, Micron Technology and Patent Owner, Yangtze Memory Technologies. Counsel for the parties, starting with Petitioner, please introduce yourselves.

MR. LANG: Jason Lang on behalf of Micron. With me is my colleague, Johannes Hsu and we have a representative from Micron, Jan Bissey.

JUDGE CYGAN: And Patent Owner?

MR. VANNETTE: Good morning, Your Honors. Jacob Vannette from Latham & Watkins for the Patent Owner, Yangtze Memory Technologies Company, and with me are my colleagues, Adam Greenfield and Inge Osman.

JUDGE CYGAN: Good morning and welcome to court. Per our hearing order, each party is provided with 60 minutes of oral argument. The parties need not use the entirety of that time. Petitioner will argue first and may reserve time for rebuttal. Patent Owner will respond to Petitioner's argument and may reserve time for surrebuttal. We have the demonstratives from each party. Please identify the number of the demonstrative slide you're referencing as you present your argument. Petitioner, how much time would you like to reserve for rebuttal?

MR. LANG: I would say 10 minutes, but we don't have too much

1 to cover, so it might be 15.

2 JUDGE CYGAN: Okay. So, we'll start you at 45 minutes then.

3 Okay. Petitioner, you may begin when ready.

4 MR. LANG: All right. Good morning, Your Honors. Good to see  
5 you again. For the '322 patent, let me start with the ground. So, there's four  
6 grounds. There's no unique disputes as to Grounds 2 and 4, which is largely  
7 related to a multi-deck. Grounds 1 and 3 --

8 JUDGE CYGAN: Counsel, is your microphone on? We're having  
9 some trouble hearing you.

10 MR. LANG: The green is on here. Is that better?

11 JUDGE CYGAN: Yes, that's better.

12 MR. LANG: Thank you. So, again, with Grounds 2 and 4, there's  
13 no dispute. On Grounds 1 and 3, Patent Owner treats those together, so my  
14 presentation will, as well. So, just to start with the -- some context, turning  
15 to Slide 10 on the '322 patent, some of the issues today you see on the left  
16 -- a dummy channel structure -- that's actually through the connection region  
17 on the left. In the middle, you have a through array contact. On the right,  
18 you have a -- or moving to the right, you have a slit structure, and then some  
19 elements on the right that are not in dispute.

20 Turning to Slide 11, I think it is important to understand what was  
21 the alleged point of novelty. Indeed, in Claim 1, it was merely a through  
22 array contact and a slit structure. Well, those claims have been disclaimed.  
23 There was never any dispute that the prior art disclosed those two.

24 Turning to the right part of the slide, with regards to Claims 10 and  
25 7, and this is one of the disputes today, the examiner found that the prior art

1 did not disclose or thoroughly suggest a TAC with a substantially circular  
2 section. Indeed, the examiner said, none of the prior art of record contains  
3 such a limitation.

4 Well, that's not even in dispute. We've shown five references that  
5 show circular TAC. So, respectfully, this is a case where the examiner made  
6 a mistake. What we're talking about today -- the disputes today -- other than  
7 this inoperability issue, revolve around limitations that were not the point of  
8 novelty, that as the record will demonstrate, were well-known techniques to  
9 address issues, problems.

10 Turning to Slide 13. Just for some background on the state of the  
11 art, to start this notion of circular TAC, that was textbook material. You see  
12 contacts to the staircase on the right, the gray bars. All the way on the right,  
13 that contact down to the yellow substrate, that's a source connection. All of  
14 those, of course, are circular.

15 Turning to Slide 14, back to this notion of a circular TAC, a  
16 through array contact, here's just four examples, and there was never any  
17 dispute that these references disclose circular TACs. So, this notion of a  
18 circular TAC was, in fact, widespread in the prior art.

19 Turning to Slide 15. Once more, the slit structure was textbook  
20 material, too. This is a Nishikawa textbook. You see the purple members,  
21 which is a thin strip of dielectric through the stack. You see three of those  
22 on the right. Now, to turn to the grounds, let me jump forward to Slide 18  
23 and briefly summarize what Petitioner is showing for a circular TAC. The  
24 primary reference in Nishikawa -- and there's a typo in this slide, my  
25 apologies -- discloses a backside contact structure. There's been no dispute

1 that that's the TAC, so through array contact. Indeed, as a result in the face  
2 of that, Patent Owner disclaims numerous claims.

3 Now, the Nishikawa TAC serves as an -- optionally, if they do the  
4 gate replacement process, the hole serves that purpose. Number two, it  
5 functions in the source line contact, meaning, as you see, it's buried into a  
6 substrate. It provides a source voltage to the substrate.

7 Turning to Slide 19, the petition showed that Nishikawa2 also  
8 discloses a backside contact structure, but it discloses that it can be any  
9 suitable shape, including circular. It refers to the opening 79, 79 is later  
10 filled in, and it becomes the backside contact.

11 Turning to Slide 20, the petition further showed that Nishikawa  
12 and Nishikawa2 have the same memory architecture. The architecture is  
13 identical. Indeed, the figures nearly identical, as well. Turning to Slide 29,  
14 once more, it showed that this circular TAC would be suitable and routine to  
15 implement Nishikawa1. Again, circular TACs were well-known. Could you  
16 use a circular TAC for a source line connection? Absolutely. It was in the  
17 art. It was in textbooks.

18 Turning to Slide 22. Well, could you use the hole for this optional  
19 gate line replacement process? Indeed, you could. That was demonstrated  
20 in a prior art, as well. As you noticed there, you have, on the right, lines of  
21 those circular holes that are spread out throughout the array.

22 Turning to Slide 23, the motivations were several supported by the  
23 -- by evidence. One, you can get rid of this big backside trench. You can  
24 spread them out to improve the gate replacement process, and then you can  
25 improve the source connections by spreading them out, as well. Would a

1 POSITA be able to do this? Well, yeah. Nishikawa already etched the  
2 circular holes. These were textbook materials. These were widespread in  
3 the prior art.

4 So, with that, turning to Slide 24, Patent Owner against the primary  
5 claims argues inoperability argument, that Nishikawa would be inoperable if  
6 it had circular TACs. And it really relies on two arguments, in a sense.  
7 One, it says this statement about a circular TAC, that's not applicable to  
8 Nishikawa1. Two, it attacks a straw man.

9 And let me address the first point, turning to Slide 25. While a  
10 little bit ambiguous, I think what's came clear now in their slides and the  
11 surreply is they're arguing that this circular statement only applies to  
12 Nishikawa Figure 14A. It doesn't apply to 17. And let me just back up and  
13 explain why they're making that argument. If that circular TAC argument in  
14 Nishikawa2 on the bottom right, if the circular TAC argument applies to  
15 Nishikawa2, Figure 17, then there's no dispute that Nishikawa would be  
16 operable because that figure is identical to Nishikawa 2. They've never  
17 made an argument that Nishikawa2 is not enabling. It's presumed enabling.  
18 They never made that argument. So, they've conceded that as long as that  
19 circular statement applies to Nishikawa2, it too applies to Nishikawa Figure  
20 16.

21 So, jumping back to Slide 25. So, this argument fails for two  
22 reasons. Turning to Slide 26. One, they said in their Patent Owner response  
23 that the Figure 14 doesn't have cone-shaped word lines, and that's just false.  
24 That separator comes around just like the separator in Figure 17. And so,  
25 what you have is clearly a set of gate and memory cells on the left, and

1 laterally, to the right. It's exactly the same in Figure 17 and Figure 14, and  
2 so if a circular TAC works in Figure 14, it too works in Figure 17. And why  
3 is it that Figure 17 is identical to Figure 14? Well, it makes perfect sense  
4 because Figure 14 through 17, it's the same embodiment.

5           When you look at Figure 14, it's a build. Figure 14 forms the  
6 opening 79. Okay. You move to Figure 15. What does it do? It fills in the  
7 insulating layer, the liner, and then it forms the backside contact. Figure 16 I  
8 don't have on there. You can see Figure 16 simply adds the staircase  
9 contacts. And now that I have a complete structure, Figure 17 provides a top  
10 down view, and it refers back to the spacers that were made in Figure 15 and  
11 the backside contact structures that were made in Figure 15, which of  
12 course, were made by using the hole of Figure 14. They make the argument  
13 in their surreply that, well, Figure 14 already provides a top down view. It's  
14 an incomplete device. It's half built. It's continuing to be built in 15, 16, 17.

15           So, Slide 28, their own expert, Dr. Campbell, would not support  
16 this opinion. We asked him, sitting here today, do you still believe that  
17 Figure 17 is a separate embodiment from Figure 14. No proof one way or  
18 the other. I don't know. And look, he wasn't able to refute it because the  
19 common numerals to the description is patently clear. So, there is no  
20 evidence or argument on the other side that bare attorney argument. And it's  
21 just flatly rejected by any read of Nishikawa2.

22           Turning to Slide 29, the import of this. The import of this is that  
23 we know in Nishikawa2 that a circular TAC applies to that statement Figure  
24 17. If Nishikawa2 implements that Figure 17 with the circular TAC, there  
25 could be no reasonable argument that Figure 16 isn't. And legally, they've

1 never argued against a presumption of enablement in Nishikawa<sup>2</sup>. Never  
2 have. So, we're left with clearly, that statement applies to Figure 17, and  
3 thus, Figure 16 in Nishikawa.

4 Turning to Slide 30, POSITA makes the basis or really, attack on a  
5 straw man. If we look at Slide 31, you see they take the figure on the left,  
6 they remove the horizontal dielectric, and then they conveniently move that  
7 TAC right to the middle. This is how they modify on the right. Why do  
8 they do that? They do that to literally make room for the arrows that they  
9 draw to form a short circuit. So, the manipulation is clear because that  
10 arrow wouldn't obviously be able to draw in there, unless they remove the  
11 dielect, and unless they move the TAC to that position. If either move  
12 wasn't made, there would be no short circuit.

13 Turning to Slide 32, indeed, we ask Dr. Campbell, would one, a  
14 POSITA, modify Nishikawa, such that it causes short circuits. No, a  
15 POSITA would not do this. So, a POSITA would know I'm not going to  
16 position these things in such a way that causes a short circuit.

17 Turning to Slide 33, and it's attacking a straw man disingenuously  
18 because the petition said from the get go, the separator dielectric structures  
19 by themselves divide the array into groups of memory cells, so you have one  
20 on the left, one on the right, by themselves, yet they continue to say, no, the  
21 trench does that, the trench does that.

22 Our read of Nishikawa is that the separators do it by themselves,  
23 but it's neither here nor there because the obviousness combination advanced  
24 that the separator structures could, indeed, divide the array. Why? It's  
25 called a separator. That's its function. It separates. And in the specification

1 of D, it says, it can laterally separate the alternating stacks. So, you have on  
2 the left, one group of cells, one group of gate, and you have on the right,  
3 another group.

4 Turning to Slide 34, what that looks like for a single block  
5 embodiment, it's shown on Slide 34. You have gates 410 on the left, gates  
6 420 on the right. There's no short circuit. Of course, this could be repeated  
7 and have a multi-block embodiment, as well.

8 Turning to 35. So, in addition to that obvious modification does  
9 not cause short circuit, Patent Owner actually admitted one itself. They said,  
10 well, you could position the TAC where the separator is. And why do they  
11 say that, Your Honors? It's because, as I went over before, they  
12 conveniently moved it to the middle to have room for that arrow that they  
13 drew. Obviously, if you didn't move it to the middle, you'd see there'd be no  
14 room to draw those arrows, and so they admit, well yeah, of course you don't  
15 have to move it to the middle, but they say, well this makes the device too  
16 big. And they draw a TAC -- it is literally bigger than any kind of thing that  
17 you're seeing in the actual record.

18 But when we turn to Slide 36, the end of the device -- however you  
19 want to look at the end of the device -- Figure 16 and I have in the slide how  
20 it's described, shows one block. If it's a one block memory, that's the device.  
21 Again, you could repeat the blocks, but all you do is if you position it where  
22 the gate -- where the trench was to where they've drawn it and put it in the  
23 same context of the figure, you don't have a larger footprint. Indeed, you  
24 save all of that space on the left -- on the top and the bottom. That whole  
25 strip of land is safe.

1           And turning to Slide 37, in surreply, Patent Owner argues the  
2 record doesn't identify any device edge, but it shows Figure 16, it says, that's  
3 an exemplary device structure, so that's either a block or the device itself,  
4 and the idea that somehow you would expand it out just doesn't -- it just  
5 contradicts the record. So, again, we have three important facts here. That  
6 statement applies to Nishikawa Figure 17, which is identical to Figure 16.  
7 You have that the separator can merely perform its function. It is a  
8 separator, after all, and then you have the own operable embodiment that  
9 Patent Owner itself proffered.

10           And this is an important point, too, Your Honors. In surreply,  
11 Patent Owner said, well our read of Nishikawa is that the trenches are  
12 optional in that -- their presence. They might not even be there. Well, their  
13 argument falls apart in light of their own admission. If that trench in  
14 Nishikawa2, if it need not even be there, then obviously, there's a separator,  
15 dielectric structure on the top to prevent a short circuit because again, they  
16 never argued Nishikawa2 would be not enabled. That's silly. So, then we  
17 know that you don't even need a trench and Nishikawa2 would still be  
18 operable.

19           JUDGE CYGAN: Counsel, a question on that slide. When you  
20 talk about the separator, you're talking about 45, correct?

21           MR. LANG: Correct.

22           JUDGE CYGAN: The spacer at the top, which is 74 -- the  
23 dielectric spacer -- that's stated in Nishikawa to provide electrical isolation  
24 for the backside contact via structure 76. Is that structure 74 only on the top  
25 or is it also running along both sides of that spacer?

1           MR. LANG: Our read in Nishikawa is that it's on both sides. The  
2 obviousness ground advanced that it would be on both sides, because in our  
3 view, the separator, and certainly, part of the function, performs a function  
4 to separate.

5           JUDGE CYGAN: Now, if I understand your combination  
6 correctly, you're extending 45, but are you removing 74 in your  
7 combination?

8           MR. LANG: Yes. In our view, like in that textbook, you saw that  
9 purple thin strip. In our view, that's still there in Nishikawa. There's also 74  
10 and 76. Their view is that it's not on the top, but the obviousness  
11 combination absolutely advances that the separator would be there. That's  
12 why we said by themselves, they separate the gate sides.

13          JUDGE CYGAN: So, just 45 by itself and not 74 at the top?

14          MR. LANG: Correct. Our view is that we are replacing the  
15 trench, but importantly, that slit structure would still be -- like you just saw  
16 in that textbook, that thin purple strip, that if you get rid of the trench, which  
17 they say Nishikawa2 itself does, then you have to have some type of  
18 dielectric there to prevent a short circuit, unless you move the TAC all the  
19 way to the right where that separator is, as well, in the example they gave.

20          JUDGE CYGAN: Can you show me what you mean by the thin  
21 purple strip?

22          MR. LANG: Yeah. So, these are the slits, the purple there, and  
23 you see how there's one all the way on the -- there's one on the left, one on  
24 the right, one in the middle. And if you look at the middle, it's just like this  
25 thin strip that cuts through. So, in our mind, that's what -- and we've always

1 argued that the separator is a slit, and that's what it is, and so, you would just  
2 have a slit like that on the top.

3 JUDGE CYGAN: And that's something that's not specifically  
4 shown in Figure 16?

5 MR. LANG: Our view of Nishikawa is that it is there, and our  
6 -- the reason that that's our view is because Nishikawa describes the  
7 separator as separating the gates, and we said it does it by themselves. Their  
8 view of Nishikawa is that it's not there, but I would say, Your Honors, it's  
9 irrelevant because the obvious combination puts it there.

10 JUDGE CYGAN: And that would be the case no matter where  
11 you would put the circular TAC in the combination?

12 MR. LANG: Well, no, you don't even need it if you put it  
13 -- instead of putting it in the middle, if you put it where they did, you can put  
14 it there and extend it to the edge of the device, and then you wouldn't need it  
15 at all.

16 JUDGE CYGAN: So, in that modified Figure 16 on the right-hand  
17 side, the slit structures would still be there, correct?

18 MR. LANG: On the -- I'm sorry, what's your question?

19 JUDGE CYGAN: So, we had just went back to take a look at the  
20 thin purple lines and you explained those slit structures weren't specifically  
21 appearing in Figure 16. And my question is, even in this modification,  
22 where we've removed the trench and there's no particular spacer along the  
23 trench, the slit structures would still be there on either side of that -- the  
24 circular TAC?

25 MR. LANG: You could put them there or not. As they said and

1 admitted in their Patent Owner response, if that circular TAC went up to the  
2 edge of the device, then you wouldn't need it. But absolutely, it could still  
3 be there.

4 JUDGE CYGAN: So, in your combination, you're not necessarily  
5 altering the slit structures for this, but they could be altered?

6 MR. LANG: To be very clear, we think that that was a  
7 combination that we advanced in the petition where we said the separator by  
8 themselves through the separation, and yes, so we're putting the separator  
9 there. In this embodiment that they've come back with, we've responded to  
10 their argument and said, yeah, we agree with them that you don't even need  
11 the separator at that point, but that on the -- below it, on the top, but it could  
12 still be there.

13 JUDGE CYGAN: Thank you.

14 MR. LANG: Let me jump to -- I'm going to skip over the missing  
15 limitation. It's replete in the art. There's no missing limitation. Your  
16 Honors are familiar with the law on that. I do want to make one point,  
17 though, that this is really dead onto the Uber case, as well. When a  
18 reference says that it can just be any suitable shape, Uber tells you that that  
19 suggests and means that a POSITA certainly knew how to select between the  
20 options and implement them. So, the Uber case further demonstrates that  
21 this would be operable.

22 Now, I want to turn to the dummy channel issue and I want to start  
23 with Slide 45. The petition demonstrated that with Exhibit 1024, the reason  
24 we cited this, this patent starts with a 5, it was filed in 1998, that for decades,  
25 it's been known, cells located at the edge are subject to process variations.

1 And so, you simply refrain from using them, so they're a channel, but  
2 because you're not using them, they're dummy channels.

3 And again, they say, they abnormally, at the edge of the array, can  
4 cause blow out or shorting issues. That's controlled by adding a dummy  
5 pattern. So, you don't want to use the edge of the array because you are  
6 -- those are going to be defected, deformed, they won't work, and so they  
7 can cause a blow out, they can cause a short out. So, you simply refrain  
8 from using them and they become dummy channels. We advanced a second  
9 motivation that they provide additional support. We agree that Nishikawa  
10 separator provides support. We argue that you would want additional  
11 support.

12 Now, the institution decision preliminarily found that we didn't  
13 show an advantage. The whole record demonstrates clearly that there's this  
14 edge effect. You're going to have yield issues, they're going to be defective,  
15 and so you don't use them and you have, therefore, higher yield. Number  
16 two, this reference that talked about being sacrificed that wasn't about  
17 dummy channels -- I have a slide on this later -- we only cited that to explain  
18 the processing issues on the edge. The record shows, just like Exhibit 1024,  
19 that these memory channels are left there, they're refrained from using, and  
20 they're dummy channels. And then the Board found, well, Nishikawa  
21 already disclosed the supporting structure. The full record demonstrates you  
22 want dummy channels from the edge into the connection region.

23 So, turning to Slide 49, just briefly, what we need to show is that  
24 there was a problem, for example, or an issue, and there was a known  
25 solution for that and it was suitable. And there can be no doubt on this

1 record that the edge effect was real, you had deformed cells over there, you  
2 couldn't use them, they operated differently, and you refrained from using  
3 them. That's how you dealt with that issue.

4 Turning to Slide 50, they came back and said in their POR, well,  
5 these -- your Exhibit 1024 talks about 2D memory. We cited that to show  
6 that this has been a decade-long problem. This was filed at the time of the  
7 '322 patent and it says the conventional 3D memory devices. We're not  
8 talking about one off devices. Defects at the edge. They were so common,  
9 they had a commonly referred to name, array edge effects. Was there a  
10 solution? There wasn't just a solution. It was a conventional solution. You  
11 add an array of pillars at the edge, hoping to set the edge. That's Exhibit  
12 1108.

13 Turning to Slide 51, again, we show that this was replete in the 3D  
14 memory space. There's plenty of examples of that. They can reduce the  
15 undesired array edge effects. So, Dr. Lee explained this. When you have a  
16 consistent pattern, everything is balancing all things the same way. The  
17 amount of edge that's going to get in there is the same, whereas if you're on  
18 the edge, it's a different environment. The reflection is not the same. The  
19 amount of etchant that's going to get in there is not the same, and that's why  
20 for decades, and he explained this with the Wolfe textbook, as well, this  
21 problem is persistent.

22 Turning to Slide 52. And just like Exhibit 1024 said that you leave  
23 them there, you refrain from using them. What that means is that you  
24 simply, for example, don't wire them. And you see that there on the exhibit  
25 on the right, you see on the left, they're on the edge, and they move into the

1 connection of region.

2 JUDGE CYGAN: Counsel, in your petition, you were supporting  
3 the assertion that you would be adding additional dummy channels. In the  
4 petition, can you point me to some place where you have the theory that you  
5 just simply don't use dummy channels?

6 MR. LANG: Yeah. So, on page 59, the last paragraph, it starts  
7 with, it says, it was well-known to include dummy channel structures and  
8 memory stacks for processing reasons. And then we say, we're adding them  
9 to the cell region, and then it thereby results in the dummy channels  
10 surrounding the active region. And so, what we're saying is that you simply  
11 leave the dummy channels on the edge of the array. And we cite Exhibit  
12 1024 on page 60, and I believe in the -- yeah, and this is on 63, where we  
13 say, Nishikawa already discloses forming channel structures and the same  
14 materials are used for dummy. And so, all that's saying is that you make the  
15 dummy channel just the same way as you make the regular channel. And  
16 then Exhibit 1024 is saying, all you do is refrain from using them, which we  
17 cited.

18 JUDGE CYGAN: But in each of those -- each of the sections you  
19 pointed to, for example, on paragraph 63, I mean, that paragraph does start  
20 with adding dummy channels, then it gives a first and a second, but those  
21 -- the second specifically talks about the additional dummy channels will  
22 reduce processing issues.

23 MR. LANG: Yeah, and the reason you're adding them is because  
24 initially, there's none. And now, you're adding them to the edge of the array.  
25 The way you're adding them, of course, is just not using the regular

1 channels. All of the art, that's what it says, is that you just don't use them, so  
2 you had none to begin with and the way that you add them is just not using  
3 the cells at the edge.

4 JUDGE CYGAN: Can you explain how that works with your  
5 argument on page 59 at the bottom paragraph? So, the bottom paragraph of  
6 page 59, it talks about adding dummy structures to extend the memory cell  
7 pattern. Can you explain that a little bit?

8 MR. LANG: Yeah. If you look at the right, for example, you see  
9 the dummy channels there, kind of that are not filled in, there's a couple that  
10 are pointed at, and that -- it sets the edge, kind of that towards the middle,  
11 and then they include another row of them. And so, what we're saying is  
12 that you don't refrain from -- you refrain from using the ones on the edge  
13 and then yeah, you would actually keep adding them into the connection  
14 region, as well. And that's consistent with Nishikawa -- turning to Slide 55  
15 -- you see there's plenty of room for them on the edges, and then as we also  
16 argue, you would extend them into the separation region.

17 JUDGE CYGAN: So, your argument is that you're really doing  
18 two things. You're taking some dummy -- some cells, which previously  
19 were active cells, and then not connecting them and turning them into  
20 dummy cells. And those would not provide any additional structure support  
21 because it's the same structure?

22 MR. LANG: They do provide extra support. A dummy channel  
23 -- and we cite that in here, they're made exactly the same -- a dummy  
24 channel provides structural support. Absolutely.

25 JUDGE CYGAN: But if you already have the channel in there

1 -- the same structural channel as the active channel, and you just simply  
2 refuse to wire it -- there's -- it's the same structural support, whether you  
3 wire it or not, correct?

4 MR. LANG: Oh, that's correct. Yeah.

5 JUDGE CYGAN: Yes.

6 MR. LANG: Yeah.

7 JUDGE CYGAN: So, the additional structural support argument  
8 you're making is you're also adding dummy channels into which --

9 MR. LANG: Yeah. You keep expanding it into the connection  
10 region.

11 JUDGE CYGAN: Okay. So, you're expanding them in the  
12 connection region, as well. And that is part of your extend memory cell  
13 pattern to include dummy regions on the edges, or where is the argument in  
14 the petition about extending them into the connection region?

15 MR. LANG: That would be in the additional support. The fact  
16 that you're providing additional support. As you said, the ones on the edges,  
17 that they were left as regular memory channels, they would provide the same  
18 support. And so, the additional support is if you add more and extend the  
19 pattern.

20 JUDGE CYGAN: So, in a sense, we -- to understand that  
21 argument, which is made in the reply, we really want to look to what it  
22 means to extend the memory cell pattern. To understand that extending the  
23 memory cell pattern means adding additional structures into the connection  
24 regions?

25 MR. LANG: Yeah.

1 JUDGE CYGAN: Is there anything in the reply that talks about  
2 adding dummy cell structures? It seems to be more focused on using the  
3 existing memory cell structures.

4 MR. LANG: Yeah. We had cited all these figures and showed  
5 that you extend them into the connection region, and that was the point of  
6 this figure -- turning to Slide 55 -- is that we said there's no separator. When  
7 you look at the edge, all the way into the connection regions, there's no  
8 separator. And so, the additional support would be provided into the  
9 connection region.

10 JUDGE CYGAN: So, it would be the sentence on page 17, the  
11 reply that says, it's a conventional option to provide support throughout the  
12 device by including dummy channels from the edge of the array throughout  
13 the contact region.

14 MR. LANG: Yeah.

15 JUDGE CYGAN: Okay. Thank you, Counsel.

16 MR. LANG: Okay. And in the interest of time, they cite this  
17 notion that -- they say, well you want to have a dense memory array, but the  
18 very reference they cite includes dummy channels, and where does it include  
19 dummy channels -- this goes to your last question, Your Honor. If you see  
20 the dummy channel there on the left, that's on the edge of the array, and then  
21 they extend into the connection region. And that's the additional support,  
22 that's extending the pattern that we're referring to.

23 And turning to Slide 60, their own expert said, when we said well,  
24 is the memory density the most important thing -- yes. We said, that's not  
25 true. What about how many bits you can provide? So now, it's about how

1 many bits you can provide. Okay, but you can't fabricate it if it collapses.  
2 Okay, I should've said functional bits because functional bits is the key part  
3 here because he's admitting you have to have functional bits. The ones on  
4 the edge just do not work. Again, the evidence shows it was a conventional  
5 problem that had a commonly referred to name, and there was a  
6 "conventional solution." And so, that alone, you cannot use to form the bits  
7 on the edge. You have to have functional bits. Their own expert admits  
8 that. That, alone, is a well-known problem and the dummy channels was a  
9 well-known "conventional solution."

10 Now, I want to jump forward to Dr. Campbell's testimony briefly.  
11 This edge effect was front and center in the petition. And that exhibit that  
12 says sacrifice, we just cited it to explain the edge effect. It's a fabrication  
13 issue, it's a decade-long problem. It effects at the edge, cells located at the  
14 edge. This was front and center in the petition.

15 Turning to Slide 66. Their expert respectfully just had no clue  
16 what it means. Do you know what edge effects are? Edge effects? No.  
17 Edge effects. Edge effects. I will have to pass on that, no I do not. Their  
18 expert's testimony on this point cannot be given any weight. He simply did  
19 not know what was a conventional problem at the time that had a  
20 conventional solution. He had no clue.

21 I want to jump to the rib cavity issue, and I just want to jump to  
22 Slide 70. And what the petition showed was that Cui discloses the exact  
23 same thing as the '322 patent, and that is that you can have these recesses for  
24 extra, additional space. Now, the institution decision found that we didn't  
25 explain what this additional space was. Okay. Candidly, we thought that

1 the additional space, additional liner, that meant additional isolation, so that  
2 meant additional dielectric isolation, right? And it was well known what  
3 that meant. The institution decision said we didn't explain it enough. The  
4 full trial, that clarification has been given, and there can be no reasonable  
5 dispute that what that extra space does, that providing the extra dielectric  
6 liner, it prevents short circuits. This is from Cui, which is in the petition  
7 itself.

8           As you see, when you put the liner in yellow, and then you have to  
9 etch out the bottom because it's a TAC, whether it's directional or a non-  
10 directional etch, because you have to enter it from the top, it's going to etch  
11 some of the side walls. And as a result, if you don't add that extra liner  
12 shown in yellow on the right figure, then you're going to have a direct  
13 connection from the gate to the TAC, or you're not going to have enough  
14 liner there and you're going to have capacitive coupling. And that's from the  
15 petition. We again demonstrated on Slide 74 the additional isolation, the  
16 additional space. It's desirable to minimize capacitive coupling. We have  
17 another reference -- and it's never been disputed that these references  
18 disclose that.

19           And a couple more points on this. Again, what the Uber case is  
20 telling here -- the Uber case directly applies to this. When a patent like the  
21 '322 patent provides no guidance, it just says, okay, you can have this extra  
22 space -- that tells you what a POSITA thought about that. A POSITA knew  
23 how to implement it, a POSITA knew how to choose between the two  
24 options. The Uber case says that and is completely consistent with the  
25 record. Let me jump forward. When you look at Liu, this just shows -- it's

1 side by side. One without ribs, another with the extra space. And they just  
2 treat them as two options, and that's exactly what the '322 patent does. And  
3 what is this extra space did? The record brought that out and it's never been  
4 disputed that this extra space does exactly what they say here. It reduces  
5 capacitive coupling, it reduces the odds for a short circuit.

6 JUDGE CYGAN: Counsel, on that issue, how do we know that  
7 Liu is talking about something that's common in the art, as opposed to  
8 something which Liu itself came up with?

9 MR. LANG: Because he has just merely both options side by side,  
10 and he doesn't treat them as just kind of here's two options. It doesn't go into  
11 a ton of detail how to do it, it doesn't go into a ton of detail -- he does note  
12 the reasons if you want additional space for additional isolation, but this isn't  
13 part of the inventive aspect of the patent. And you see it in Cui, as well, and  
14 you see it in Lilak, as well. And in the '322 patent itself -- and that's what  
15 the Uber case is about and at issue in that case.

16 Let me jump to a slide. Indeed, you see it in Patent Owner's own  
17 admission, going to Slide 77. They say that the '322 patent teaches  
18 preventing shorting and leakage current. Your Honor, I would ask you to  
19 read the '322 patent and try to find that. The '322 patent simply says that the  
20 spacer can insulate the conductive layer. And what that means is, is that  
21 they're saying they can see, by just saying that you have extra space, you  
22 knew what that meant. It doesn't have to say preventing shortage, leakage  
23 current. You just know that that's what that means. The prior art actually  
24 explains it better than the '322 patent. Cui demonstrates the potential for a  
25 short circuit. Both, Lilak and Liu, describe the extra space to reduce

1 capacitive coupling.

2           So, let me jump forward to the last issue. The last issue is can the  
3 peripheral contacts and the TACs have the same diameter. And what's never  
4 been rebutted is that there was a problem with long over etch times. And  
5 unless you use a specific exotic etch chemistry, the way to solve that  
6 problem was using contact holes of identical dimension. That was in the  
7 petition and this has never been disputed that this is not true. And then we  
8 showed that that's exactly what these references are doing. Their main  
9 argument in their Patent Owner response was that it was impossible to etch a  
10 hole through the stack and etch a hole through the dielectric at the same time  
11 with a common process. That is flat wrong. Tessariol etches all those holes  
12 at the same time. On the left, it's through the stack. On the middle, it's  
13 through the dielectric and the stack. On the right is through almost all the  
14 dielectric. So, their whole argument that you can't use this common process  
15 to make contacts of the same size and a peripheral region in the TAC is  
16 rejected by the record.

17           And briefly, I want to comment on the law that the first thing they  
18 totally ignore -- and I'll jump to Slide 95 -- is that all these references use the  
19 same numerals for the peripheral contact and the TAC, whether it's  
20 Nakajima and C4, whether it's Mushiga with 586, 588. And those have to  
21 refer to the same structure. Never been refuted that these numerals are  
22 wrong. They made this argument that the C4 is wrong in Nakajima and the  
23 papers address that. There's no clear error there. There's no argument  
24 against Mushiga on that.

25           And then aside of that, their reading of Nystrom is just wrong. The

1 dimensions there were a time length of roughly one-half to one inch for a  
2 whiskey barrel. That is specific dimensions. Here is just the same size.  
3 Okay, so that fails for one reason. The second reason it fails is the  
4 specification here is not silent. I mean, our papers go over this, but when  
5 you look, it's the same numerals, it's the same description. Indeed, Nakajima  
6 labels them both C4 and there's one description for C4. So, with that, unless  
7 there's further questions, I'll reserve my time.

8 JUDGE CYGAN: Thank you, Counsel. I have you at about nine  
9 minutes left for your rebuttal.

10 MR. LANG: More than I thought.

11 JUDGE CYGAN: And Patent Owner, you can begin whenever  
12 you're ready.

13 MR. VANNETTE: Your Honor, I have some physical copies of  
14 the demonstratives I can pass up, if you'd like them.

15 JUDGE CYGAN: Not necessary. Thank you. And let me know  
16 how much time you'd like to reserve for surrebuttal.

17 MR. VANNETTE: Six to seven minutes.

18 JUDGE CYGAN: Okay.

19 MR. VANNETTE: We'll see where we end up. Hopefully, we  
20 don't need that much. May I proceed, Your Honor?

21 JUDGE CYGAN: Please.

22 MR. VANNETTE: The record shows that Petitioner has not  
23 carried its burden on any ground. For its central argument, these circular  
24 TACs, Petitioner's arguments have been a moving target throughout this  
25 proceeding. What we saw in its reply and what we heard today either would

1 not work or would not be consistent with its stated motivation to combine,  
2 and so there would be no reason to do it. Either way, Petitioner loses.

3 Petitioner's other arguments already failed at the institution stage.  
4 Petitioner has tried to backfill its insufficient showing, changing its  
5 arguments, and supporting them with new evidence, but those new  
6 arguments and new evidence still do not show that the '322 patent would've  
7 been obvious. Petitioner fails to meet its burden of showing invalidity of  
8 any claim in the '322 patent by a preponderance of the evidence. And since  
9 we spent so much time on it just before my friend on the other side  
10 concluded, I'd like to start with dummy channels on Slide 26.

11 And going to Slide 27, the institution decision rightly concluded  
12 that Petitioner did not show that it would've been obvious to add dummy  
13 channels to Nishikawa, and that remains true on the full trial record.  
14 Looking at Slide 28, we see the two bases that the petition identified. What  
15 Petitioner says today, the petition identified for adding dummy channels to  
16 Nishikawa. The first is edge effects and the second is stability problems in  
17 the device.

18 Now, the petition focused almost entirely on this second  
19 justification, this structural support problem, but the reply and Counsel today  
20 pivoted to focus primarily on edge effects, introducing several new  
21 motivations, as well, in the reply, and new evidence, but still, none of this  
22 motivates the modification to Nishikawa that Petitioner urges.

23 The institution decision expressly addressed Petitioner's edge  
24 effects argument, as it was presented in the petition and found that even  
25 though Dr. Lee had said that it was well known and could be used to address

1 processing variations, that did not show an advantage to adding dummy  
2 channels to Nishikawa. Now, Petitioner says in its reply that it didn't have to  
3 show an advantage to justify its modifications to Nishikawa, but this is an  
4 obviousness theory, so it still has to provide some motivation, some reason  
5 to do this, some problem that the modification addresses. It didn't do that  
6 here. In these circumstances, by not showing an advantage, it hasn't shown a  
7 reason to modify Nishikawa.

8           We'll start with edge effects on Slide 30. The problem for  
9 Petitioners is that the petition only cited two exhibits for this edge effects  
10 problem. One of them -- Exhibit 1024 -- had nothing to do with 3D NAND.  
11 It was a 2D memory device, a reference that long pre-dated the '322 patent  
12 and had nothing to do with the state of the art in 3D NAND when the '322  
13 patent was filed. And Petitioner provided no evidence that its disclosure was  
14 relevant to 3D NAND. And the other, Exhibit 1025, says that the dummy  
15 pattern region is later sacrificed in processing, meaning it's not even present  
16 in the final manufactured device and therefore, could not meet the '322  
17 patent's claims. Dr. Lee even quoted that fatal language in his declaration  
18 for -- in support of the petition as we see here on the slide.

19           And so, what we have here is a complete evidentiary failing from  
20 the Petitioner in its petition. It provided no evidence of a problem in 3D  
21 NAND devices that would justify adding dummy channels to the final  
22 manufactured Nishikawa device. And yet, we see here on Slide 31,  
23 Petitioner doubled down on reply and today. It cites again to Exhibits 1024  
24 and 1025 to say that these dummy channels were a typical and suitable  
25 option to address edge effects, but recognizing the evidentiary failings in the

1 petition, Petitioner now also cites Exhibits 1108, 1109, and 1110.

2 Today, we heard that Dr. Lee also relied on Wolfe for edge effects,  
3 which is a textbook that Petitioner included with the petition, but I didn't see  
4 that reliance in Dr. Lee's declaration for edge effects, and I didn't see it in the  
5 papers either. And even if it was, that wouldn't help Petitioner because  
6 Wolfe, which published in 1990, also had nothing to do with 3D NAND and  
7 could not represent the state of the art when the '322 patent was filed.

8 Regardless, none of these new exhibits, 1108 through 1110, were  
9 in the petition, as we see here on Slide 32. They were entirely new in  
10 Petitioner's reply, and Petitioner relies on them to show something -- edge  
11 effects and the use of dummy channels at the edge of the array -- that it  
12 completely failed to support in its petition. Now, this is quintessential  
13 backfilling. It's new evidence to support something that they did not support  
14 in the petition at all, and the consolidated trial practice guide tells us that you  
15 can't do that. If you could've included it in your petition to support an  
16 argument you were making, you had to do it then. It's not properly part of  
17 the proceeding if you don't, but on the merits, they still don't help the  
18 Petitioner.

19 All these references show is that dummy channels existed in the  
20 art. Petitioner is saying nothing more than that they were known. Not that  
21 they addressed any problem with Nishikawa itself. They don't have any  
22 evidence that Nishikawa's device suffered these edge effects problems, that  
23 there were problems on the edge of the memory array in Nishikawa, or that a  
24 POSITA would've been motivated to add them to Nishikawa to accomplish  
25 any particular objective with respect to Nishikawa itself. And the Federal

1 Circuit has told us, as we see here on Slide 33, that the mere fact that  
2 something existed in the art is not sufficient to provide a reason that a skilled  
3 artisan would have done it -- would have added it to an existing reference.

4 And turning to Slide 34, we also don't hear anything from  
5 Petitioners about how a POSITA would've actually modified Nishikawa to  
6 introduce dummy channels. All we know -- I mean, we all know that space  
7 is at a premium in these devices. Memory density is the primary motivator  
8 for designers. This device needs to get smaller while also getting more  
9 dense. And as we can see on Slide 34, there is no room in Nishikawa to add  
10 dummy channels, that any change to Nishikawa, whether that's  
11 disconnecting some of the existing memory cells or adding additional  
12 channels is going to require reducing memory density in Nishikawa, and a  
13 person of skill in the art simply would not be motivated to do that when  
14 there's no evidence of any actual problem with Nishikawa's device.

15 JUDGE CYGAN: Counsel, is that the case if -- as Petitioner is  
16 asserting that the dummy channels would be added to the connection region,  
17 as opposed to the memory region, would that decrease the memory?

18 MR. VANNETTE: Your Honor, I'm not sure if it would decrease  
19 the memory, but it would still have an effect on the structure of the device  
20 because the edge of the -- this is the region 300 that we're talking about and  
21 we see here on Slide 39. That region is already filled with contacts. There's  
22 not any space there either for it. You're going to have to change the  
23 structure of the device and cause some sort of change in the structural of the  
24 device, the shape of the memory array or something, that's going to affect  
25 the way various interconnections are happening between various levels.

1 Maybe that won't reduce memory density, but it will still have some  
2 consequence. We're dealing with very fine tolerances in devices like this,  
3 and we're just not seeing any evidence from Petitioner that a person of skill  
4 in the art would be motivated to take on those challenges, or that it could  
5 even do so with a reasonable expectation of success.

6 JUDGE CYGAN: Could you walk through your next slide, Slide  
7 40, and address any of the dummy channels that are in the connection region  
8 and any of those references?

9 MR. VANNETTE: Of course, Your Honor. First of all, I do want  
10 to point out that this is, again, an instance in which Petitioner is citing new  
11 evidence to cite a new argument that wasn't in the petition. None of these  
12 exhibits were in the petition, as we see on Slide 41, and it's to support an  
13 argument about putting them in the connection region that also wasn't in the  
14 petition. But setting that aside, the fact that there's additional support in the  
15 prior art -- sorry, I'll find the right slide here -- doesn't show that we need it  
16 in Nishikawa.

17 First, Nishikawa already tells us that the separator dielectric  
18 structures, which is what provides the support, and I realize now that I didn't  
19 explicitly say -- in talking about these new exhibits and extending the  
20 dummy channels to the connection region, we're actually moving to  
21 Petitioner's other motivation, which is structural support. They say that the  
22 reason you would put dummy channels out there is because there's no  
23 -- there aren't currently dummy channels there in Nishikawa, and so a person  
24 of skill in the art would be motivated to put them there for additional  
25 support.

1           We already see that Nishikawa provides separator dielectric  
2 structures, which provide support throughout the memory array, and then of  
3 course, this is where the Petitioner points to region 300 and says, well,  
4 there's nothing there, so there must be a need for structural support in that  
5 region. But Petitioner provides no evidence to support that claim. There's  
6 nothing in the record that would allow us to conclude that Nishikawa lacks  
7 structural support in that region or that the existing dielectric structures in  
8 region 100 are not enough to provide support in that region. And the fact  
9 that Nishikawa tells us that the separator dielectric structures provide  
10 structural support for the device indicates that you don't need more in that  
11 extra region.

12           To accept Petitioner's argument and conclude that additional  
13 structural support is needed in region 200, we would have to ignore that  
14 expressed teaching in Nishikawa. And there's certainly no need or at least,  
15 Petitioner gives us no need, or identifies no evidence of a need for structural  
16 support in region 200. It certainly wouldn't be needed during the gate  
17 replacement process because there are no gates in region 200. Your Honor,  
18 did I answer your question?

19           JUDGE CYGAN: Were there any disclosures in any of those  
20 Exhibits 1112, 1113, or 1114, that you wanted to point to as being dissimilar  
21 or as not, themselves, showing a reason why extra support is needed in that  
22 area? Sort of going beyond the argument that Nishikawa -- and Petitioner  
23 hasn't shown a reason why Nishikawa would want something in that, but if  
24 Petitioner is relying on these references to bring some reason for -- to put the  
25 structure there, would you like to either point to something in those

1 references to rebut that or point to some lack of Petitioner showing that any  
2 of the references have that?

3 MR. VANNETTE: Well, certainly, Your Honor, Petitioner did not  
4 show that these references provide any additional disclosure of something  
5 that would motivate a person of skill in the art to then take those -- the  
6 disclosure in those references and add it to Nishikawa. There's no actual  
7 connection drawn in the petition or in the reply that goes from, well these  
8 references use dummy channels in these regions to and here's why you  
9 would do the same thing with Nishikawa. That inference just isn't  
10 supported.

11 JUDGE CYGAN: Do those references talk about providing  
12 additional support in those areas?

13 MR. VANNETTE: I'm not aware of any disclosure of additional  
14 support. And thank you, Your Honor. That was going to be my second  
15 point. With respect to the references themselves, I'm not aware of any  
16 disclosure where there's support in the memory array that is similar to the  
17 separator dielectric structures of Nishikawa where they still provide  
18 additional support in these outer regions. And if it is there and I'm not aware  
19 of it, Petitioner hasn't pointed that out to us. It's not in any of the papers. It's  
20 not an argument that Petitioner has made.

21 So, turning to Slide 42, we see that Petitioner tried to salvage its  
22 redundant support problem by saying for the first time on reply that the  
23 separator dielectric structures in Nishikawa do not preclude adding dummy  
24 channels because Nishikawa 1, 2, 3 has both dummy channels and dielectric  
25 separators. And Petitioner tells us that dummy channels can be used to

1 introduce the etchant and metal -- sorry -- introduce the etchant during the  
2 gate replacement process. This gets Petitioner nowhere.

3 First, this doesn't show that redundant support is suitable in  
4 Nishikawa, because Nishikawa 1, 2, 3 uses these access openings for  
5 introducing the etchant during the gate replacement process. So, these aren't  
6 dummy channels that are providing additional support. And second,  
7 Nishikawa already discloses introducing etchant, either through the memory  
8 hole openings or through the back side via trench. So, this supposed  
9 alternative motivation is also redundant. There already is a way to introduce  
10 the etchant for gate replacement in Nishikawa. There's no reason to add  
11 dummy channels to accomplish that same purpose.

12 Also, very briefly, this is a new argument. As we see here on the  
13 slide, they cite petition page 51 as some sort of support for a dummy channel  
14 argument that relies on Nishikawa 1, 2, 3. The institution decision already  
15 acknowledged that they didn't do that on page 18, footnote 7. The institution  
16 decision explicitly states that Petitioner does not rely on Nishikawa 1, 2, 3  
17 for teaching dummy channels, and we know that's true because page 51 in  
18 the petition relates to the through array contact limitation of Claim 1D,  
19 which is completely different.

20 I'd also like to just briefly address what my friend on the other side  
21 said about Dr. Campbell and his knowledge of edge effects. First of all,  
22 Your Honors don't need to consider Dr. Campbell's testimony on this issue  
23 at all because the evidentiary failings here are entirely Petitioner's.  
24 Petitioner simply did not make a prima facie case, as Your Honor has  
25 already found at the institution stage. But also, Petitioner asked Dr.

1 Campbell these questions before ever really making edge effects an issue in  
2 this proceeding.

3 My friend on the other side said that it was front and center in the  
4 petition, but it was just one brief paragraph. I think the word "edge effect"  
5 appeared once, and then the petition immediately proceeded to spend, I think  
6 two or three pages on structural support. So, it's not exactly correct to say  
7 that this was a front and center argument in the petition. And that deposition  
8 occurred before the Petitioner had ever introduced evidence -- these Exhibits  
9 1108 through 1110, about array edge effects and 3D NAND devices.

10 And so, there's just no reason to conclude that array edge effects  
11 are as ubiquitous as Petitioners are claiming. I mean, it only found two  
12 references that explicitly addressed them and it couldn't find them in time to  
13 include them in its petition. If anything, the fact that Dr. Campbell, who  
14 Petitioner is not contesting his status as a person of skill in the art, the fact  
15 that he didn't know about them, his lack of knowledge is evidence that this  
16 wasn't actually as commonly known and as ubiquitous as Petitioners are  
17 claiming. Unless there are any other questions about dummy channels, I'll  
18 then move on to the ribbed TAC arguments.

19 Turning to Slide 46, the institution decision was also right to  
20 conclude that Petitioner had not shown that it would've been obvious for the  
21 first diameter of the TAC, corresponding to each conducted layer, to be  
22 larger than a second diameter corresponding to the dielectric layers. And  
23 like with dummy channels, that remains true on the full trial record. So,  
24 there are two arguments in the petition about these ribbed TACs. There's the  
25 intentional recesses framing, and the unintentional recesses framing. Since

1 we only talked today about intentional recesses, I'll focus my time on that,  
2 but if Your Honors have any questions about unintentional recesses, I'll be  
3 happy to answer those, as well.

4 Here on Slide 47, we see what the petition said about adding a  
5 ribbed TAC to Nishikawa. All it says is that it was a well-known option.  
6 And on Slide 48, we see the motivation that Petitioner offered, that a ribbed  
7 TAC serves the same purpose as the '322 patent, providing additional area  
8 for the dielectric liner. That's it. That's all it said. The petition didn't  
9 identify any benefit for the additional area or provide any reason why that  
10 additional area was necessary or desirable. And looking at Slide 49, the  
11 institution decision rejected that purported motivation because it was legally  
12 insufficient. The motivation to combine cannot come from the challenged  
13 patent itself, because that is the epitome of hindsight.

14 And so looking at Slide 50, we see that Petitioner had to advance a  
15 new motivation. Short circuits and capacitive coupling of conductive pairs.  
16 Now, we know this is new for a couple of reasons. First, the petition doesn't  
17 say anything about short circuits. It never mentions them. And second, Cui,  
18 which is the only reference that Petitioners relied on for this argument also  
19 doesn't say anything about short circuits. In fact, the petition at page 75  
20 explicitly points out that Cui says that you can put these larger recesses in  
21 either the dielectric layer or the insulating layer. And the petition just says  
22 that because it discloses both, both were equally obvious. Obviously, adding  
23 additional recesses to the dielectric layer can't have anything to do with short  
24 circuits. So, the petition could not have been saying that short circuits -- it  
25 couldn't even have been implying that short circuits is the basis for this

1 change.

2 And another reason that we know this argument is new is because  
3 Petitioner, once again, cites new evidence for it. As we see here on Slide 51  
4 in its reply, Petitioner points to Exhibits 1115 and 1116 as support for the  
5 idea that having a ribbed TAC addresses short circuits and capacitive  
6 coupling concerns. And these, again, are exhibits that were not cited in the  
7 petition to support a claim, an argument, that itself was not in the petition.

8 And looking at Slide 53, at the end of the day, Petitioners are still  
9 using the '322 patent as a road map. The institution decision pointed out that  
10 their original motivation to combine couldn't come from the '322 patent  
11 itself. It was legally insufficient. And after the Board criticized Petitioners  
12 for that, they went out, knowing that they needed to find something to justify  
13 ribbed TACs, and then it was a solution in search of a problem, and so they  
14 went out and they found the problem that they felt they could justify on  
15 reply. But that's still using the '322 patent as a road map. They're still using  
16 the '322 patent as the starting point because they knew that they already had  
17 to justify ribbed through array contacts. And so, they needed to go out and  
18 look for a reason to do that. That is just evidentiary backfilling using the  
19 '322 patent as a guide.

20 Unless Your Honors have any questions about unintentional  
21 recesses, I think I can skip over those slides. So, turning next to the equal  
22 diameter arguments, these also lack merit. Starting with Slide 58 and taking  
23 a step back, there's no dispute that Nishikawa does not teach that the TAC  
24 has the same diameter as the peripheral contact. Of course, it couldn't,  
25 because it doesn't actually disclose a circular through array contact in the

1 first place. In fact, Petitioner doesn't cite a single prior art reference that  
2 explicitly discloses that the through array contact has the same diameter as a  
3 peripheral contact. There's no disclosure of dimensions or relative  
4 dimensions at all.

5           So, what does Petitioner do? Petitioner looks at figures in the prior  
6 art, finds a disclosure in that reference's specification, saying that two  
7 different contacts and two different parts of the array are formed at the same  
8 time. It goes, well, that must mean they're the same size. It does that for  
9 Mushiga. We see it on Slide 59. It does that for Nakajima, as we see on  
10 Slide 60, and it does the same thing for Tessariol.

11           The whole basis of this equal diameter argument is that the  
12 contacts appear to be the same size in figures, and they are formed in the  
13 same processing step, but that isn't enough for obviousness. First, Petitioner  
14 cannot use figures to support that the prior art discloses contacts of the same  
15 size. As we see on Slide 63, the Federal Circuit has been clear. Drawing is  
16 not explicitly made to scale, which is the case for every single prior art  
17 reference that Petitioner relies on are unavailing.

18           Now, we heard from my friend that Nystrom doesn't apply here  
19 because we're not talking about specific dimensions, but even relative  
20 dimensions are still specific. We're still talking about particular sizes, even  
21 in relative terms, and trying to rely on figures that are concededly not drawn  
22 to scale to draw conclusions about what the prior art teaches, and Nystrom  
23 says we can't do that.

24           The other problem for Petitioner, as we see on Slide 64, is that it's  
25 relying on the incorrect premise. The argument that these references must

1 be teaching contacts that have the same diameter, because they're formed in  
2 the same processing step, comes entirely from this Wolfe textbook that I  
3 mentioned earlier. Now, like I said before, Wolfe published in 1990. That's  
4 almost 30 years before the '322 patent was filed. It's over a decade before  
5 3D NAND was even invented, so Wolfe has nothing to do with 3D NAND,  
6 and it certainly cannot represent the state of the art as of the '322 patent's  
7 priority date.

8           And in fact, Wolfe says that there is a way that you can form  
9 contacts at the same time that have different sizes. It proposed a change to  
10 etch chemistry and explicitly teaches that you can maintain uniform etch  
11 rates independent of contact whole size. So, what we are seeing in  
12 Petitioner's own reference, the only thing that it relies on to support this  
13 same processing step, same size argument, shows that a POSITA actually  
14 would've known in 1990 how to form contact holes of different sizes by  
15 varying etch chemistries.

16           JUDGE CYGAN: Counsel, in your discussion of how Wolfe was  
17 from an earlier time and did not address 3D NAND, do you have anything in  
18 the record that shows any distinction between 3D NAND and the  
19 technologies that Wolfe was dealing with? I mean, particularly anything  
20 that relates to the claim that would say, well Wolfe wasn't contemplating  
21 TACs or peripheral contacts?

22           MR. VANNETTE: Well, in terms of the distinction between what  
23 the art would've been around 1990 and what it was when the '332 patent was  
24 filed, I think both parties' papers discuss in the overview of the technology  
25 sort of the evolution from 2D to 3D memory arrays, and I -- and that is going

1 to affect what Wolfe's teachings are for 2D NAND -- or for 2D memory and  
2 3D NAND. I think this is also a question of an evidentiary failing on  
3 Petitioner's part where they rely on something in 1990 about a different  
4 overlapping technology, and they say, well that is the state of the art 30  
5 years later. It's an inferential leap, once again, that simply isn't supported by  
6 anything in the record.

7 And for this one in particular, I would emphasize that, once again,  
8 that Wolfe actually does teach the solution to -- let's call it a problem that  
9 Petitioner identifies. That there is an -- that it's difficult to etch contact holes  
10 at different sizes at the same time, but Wolfe in 1990 is already teaching a  
11 solution to that problem, and we don't have anything in the record  
12 suggesting that that was hard to do 30 years later. It's sort of implying that  
13 persons of skill in the art hadn't developed additional solutions to the same  
14 problem that Wolfe was already starting to propose.

15 JUDGE CYGAN: So, with Wolfe, is part of your argument how  
16 Wolfe is approaching this? That Wolfe is not saying that you want contact  
17 holes of identical dimension, but Wolfe is just telling you how to address it  
18 through etching, whether or not you want identical holes.

19 MR. VANNETTE: Well, so, Your Honor, I think that the way  
20 we're approaching this is just understanding what Petitioner is saying and  
21 what the basis for Petitioner's obviousness ground is. And I understand  
22 Petitioner's argument to be that if you look at these prior art references, you  
23 look at their figures and their disclosure of that is the same processing step.  
24 What Petitioner is saying is that these prior art references must be disclosing  
25 contact holes of the same size, and that's why it's obvious. It's not a question

1 of motivation, other than to do it in the same processing step, and I'm sure  
2 that my friend will stand up here and tell me if I'm misreading their  
3 argument or if I'm misunderstanding anything, but that's how I read the  
4 petition.

5           And what we see from Wolfe is that -- even if you want to etch  
6 these contact holes in the same processing step, that doesn't mean that you  
7 have to make them the same size. You can make them different sizes by  
8 varying etch chemistries. And we already have a solution in 1990 allowing  
9 you -- I mean, Wolfe calls this a problem and says that you have to use  
10 identical dimensions if this problem isn't solved, and then it says, here is the  
11 solution to that problem. And so, I'm not aware of any other evidence in the  
12 record suggesting that a person of skill in the art would want to make them  
13 the same size. Petitioner only tells us that a person of skill in the art would  
14 have to make them the same size to do them in the same processing step, but  
15 Wolfe already shows that's not true.

16           JUDGE CYGAN: And if we were just to look at Wolfe itself and  
17 not the other references, and not like take a look at that argument you just  
18 went through -- if we were just to take a look at your Slide 64 and Wolfe's  
19 statement that one common text -- the representation by Petitioner that the  
20 common textbook approach was to make contacts the same size, can you  
21 explain a little bit about what Wolfe is actually teaching and if Wolfe is  
22 saying it's known in the art to make contacts the same size, and that could,  
23 by itself, be a statement that one of ordinary skill in the art would look to the  
24 knowledge in the art when they're trying to make contact sizes? Why  
25 wouldn't that be a reasonable way to look at this statement of Wolfe?

1           MR. VANNETTE: Well, I think there's two answers to that  
2 question, Your Honor. I think the first is that Wolfe is saying, if this  
3 problem was not solved. So, Wolfe is already acknowledging that maybe it's  
4 not desirable -- that is a problem that you need to, at these sizes, have  
5 identical sized contact holes if you want to etch them in the same processing  
6 step. And then it says, well here's a solution to that problem. So, if a person  
7 of skill in the art is looking to Wolfe for anything, it's because it knows that  
8 it's a problem that you have to etch contact holes the same size if you want  
9 to want to do it in the same processing step, and Wolfe is teaching a solution  
10 and it's finding a way to do it differently, to etch it at the same time,  
11 independent of contact hole size.

12           And the second point, Your Honor, is that this is a reference from  
13 1990. I'm not aware of any reason why a person of skill in the art -- and  
14 Petitioners have given no reason why a person of skill in the art -- when  
15 designing a 3D NAND device in 2018 or 2017 would look to a textbook that  
16 published almost 30 years earlier.

17           JUDGE CYGAN: So, is it fair to say your argument is that Wolfe  
18 is talking about etching conditions that existed at the time of Wolfe, that  
19 don't necessarily exist at the time that we should be looking at. And what  
20 Wolfe is talking about really is not an advantage to contact size, but different  
21 ways of etching and how they relate to contact sizes.

22           MR. VANNETTE: That's correct, Your Honor. That is how I  
23 would characterize it. Wolfe is disclosing a problem about needing to etch  
24 independent -- or sorry, identical contact hole sizes if you want to do the  
25 same processing step, and it's saying, well here's a way that you can do it

1 differently so that you don't have to do that.

2 JUDGE CYGAN: Thank you.

3 MR. VANNETTE: Unless Your Honors have any other questions  
4 about this section, I'll then turn to circular TACs. Let's go to Slide 9, please.  
5 So, for circular through array contacts, Petitioner's starting point is  
6 Nishikawa's backside via structure, and that's specifically as we see here on  
7 Slide 9, elements 74 and 76 in this Figure 16. We know that 74 and 76  
8 together are Petitioner's TAC, at least in the petition, because that's what Dr.  
9 Lee told us in his declaration at paragraph 108. And as we see here, and as  
10 the petition acknowledges, Nishikawa's backside via structure is a trench,  
11 not a circle.

12 So, Petitioner had to show that a person of ordinary skill in the art  
13 would've been motivated to modify Nishikawa to replace this trench with a  
14 circular TAC. And we heard from Petitioner this morning that the reason a  
15 person of ordinary skill in the art would have been motivated to make that  
16 change is you can replace the trench, reduce the footprint, and increase  
17 memory cell density. There's also a discussion of putting the TAC at  
18 different -- spreading it throughout the array, as well. But as we will see, a  
19 person of skill in the art could not have done that with Nishikawa's  
20 architecture because the trench, or at least the 74 element, 74 part of the  
21 trench, works in concert with the separator dielectric, structures 45, to isolate  
22 word lines on each level, and replacing the trench with a smaller circular  
23 through array contact would break isolation and short circuit the device. So,  
24 a person of skill in the art could not do it that way. And a person of skill in  
25 the art would not be motivated to do it in a way that might work. For

1 example, placing a circular TAC at the end of dielectric separators 45  
2 because there would be no benefit or reason to do that.

3 Now, taking a step back and looking at Slide 10, to understand  
4 why circular through array contacts either wouldn't work or would bring no  
5 benefit to Nishikawa's architecture, we need to look at what Nishikawa  
6 actually discloses. As we see here, Nishikawa is directed to a vertical  
7 memory device having dual memory cells, and those dual memory cells  
8 extend through every level of the memory stack. And looking at Figure 11C  
9 here on the right, Nishikawa says that these dual memory cells have  
10 dielectric separator structures, which are elements 45. And Petitioner maps  
11 these onto the slit elements of the '322 patent's claims.

12 Now, thanks to these separator dielectric structures 45, the dual  
13 memory cells can electrically connect to the control gate electrodes, which  
14 are 46 in Figure 11C on each side, without those control gate electrodes also  
15 connecting to each other.

16 Slide 11 gives us a closer look at Nishikawa's dual memory cell  
17 architecture, and you can see here how each side of the ellipses is a different  
18 memory cell, and the middle of the ellipses where the separator dielectric  
19 structure 45 contacts this structure, that's isolated, so each of these memory  
20 cells are separated from each other.

21 And on Slide 12, we see how that translates to the overhead view  
22 of Nishikawa in Figure 16 that Petitioner relies on so heavily throughout its  
23 arguments. Each side of the dual memory cell is associated with a different  
24 word line, here identified with element numbers 410 and 412 on each side.  
25 The separator dielectric structure 45 runs through the whole region between

1 backside via contact, on the top -- 74 and 76 on the top, and the one on the  
2 bottom, to keep these word lines separate from each other.

3           This isolation, as we see on Slide 13, allows Nishikawa's device to  
4 have two word lines on every level, and we see that in green and red in this  
5 slide on the right. And that isolation is not just the result of dielectric  
6 separators 45. It is those 45s working in concept -- in concert, sorry -- with  
7 separator 74 -- spacer 74. I think spacer is the word that Petitioner uses.

8           And so now, on Slide 14, we can see what happens if one takes  
9 away Nishikawa's trench and replaces it with a circular TAC, as Petitioner  
10 proposes. There's no longer any horizontal dielectric separating word lines  
11 410 and 420, meaning we now have a short circuit path between those word  
12 lines, which completely destroys Nishikawa's dual cell purpose. It means  
13 that it would no longer work as designed.

14           Now, we heard from Petitioner today that a person of skill in the  
15 art wouldn't do it this way, that this is just something that no one would do.  
16 They tell us Dr. Campbell admitted at his deposition that a POSITA  
17 wouldn't do this, but that's the whole point. The whole point is that the  
18 Petitioner proposed a modification in which Nishikawa's backside via trench  
19 would be replaced with the circular TAC, and this is an illustration based on  
20 what the Petitioner said in the petition, saying that the via contact 76 and  
21 spacer 74 together correspond to the TAC of the '322 patent's claims, and  
22 that a person of skill in the art -- or that it would be obvious to make that a  
23 circle, and that's what we see here in this image. This is what Petitioner was  
24 describing, and so when Dr. Campbell says, yeah, a POSITA wouldn't do  
25 that, that's the point, because the Petitioner didn't show that a person of skill

1 in the art would or could do this.

2 And so on reply and today, Petitioner got wise to the problems in  
3 its petition and it tell us now that this is what it always meant. We heard  
4 today that this is their obviousness argument, maintaining these horizontal  
5 dielectrics at the top and the bottom of the device. Petitioner was  
6 unambiguous today. This is their obviousness combination. This wasn't in  
7 the petition, first of all. There was no explanation in which horizontal  
8 dielectric separators, which again, that's 74 in Nishikawa, and we were told  
9 that 74 corresponds to the through array contact and that would be circular.

10 So, now having a horizontal dielectric separator, which my  
11 understanding from the argument this morning was that that's sort of  
12 changing 45 to now add this horizontal separator at the bottom, that's  
13 nowhere to be found in the petition. But setting that aside, this proposed  
14 modification has several issues and we see the first one on Slide 16. You  
15 know, my friend on the other side told us that this memory block  
16 architecture repeats itself, which means that you're going to have this  
17 separator dielectric on each side of the circles that you see on the screen.  
18 And what that means is that you're keeping a trench. There's still going to  
19 be a trench in Petitioner's obviousness combination.

20 So, that's not even consistent with their motivation to combine,  
21 which we see here from these excerpts in page 51 of the petition, which told  
22 us that the motivation to do this is to replace the trench and reduce its  
23 footprint, but there is no reduction of footprint here. There's no replacing of  
24 the trench here. This is keeping the trench, and the reason we're told that  
25 you want these horizontal separators is to maintain isolation, which just

1 takes us back to the original point. Petitioner is essentially conceding that  
2 what the Patent Owner put in the Patent Owner response is, in fact, not right  
3 and not something that a person of skill in the art would do. And so, they've  
4 come back on the reply and showed us this version that is completely  
5 inconsistent with their original arguments, does not maintain their original  
6 motivation to combine, and doesn't even accomplish the goals that they set  
7 forth in the petition for reducing the footprint.

8           The second issue with this proposal we see on Slide17, and Dr.  
9 Campbell explained that having multiple circular contacts like we saw, and  
10 I'll go back to that, there's multiple via contacts in the separator dielectric  
11 structure. Having densely packed through array contacts like this wouldn't  
12 function well, if at all. Dr. Campbell explained that this pattern pushes the  
13 limits of manufacturing tolerances and can lead to defects like short circuits.  
14 It can cause mechanical stress because of etching variations cracking the  
15 TAC. There are limits to the resolution of lithography equipment, and this  
16 can ultimately just result in parasitic capacitates. This testimony is not  
17 rebutted. Dr. Lee does not address this testimony at all in his reply  
18 declaration, and Petitioner didn't talk about it at all either. There's no  
19 explanation for how these closely spaced through array contacts, looking  
20 again at Slide 16, would work, but Dr. Campbell says that they wouldn't.

21           There's a third problem with this, too, as we see on Slide 18.  
22 Because we're maintaining these horizontal separator dielectrics on the top  
23 and the bottom, which when you're repeating this, necessarily is going to  
24 appear on either side of these via contacts in the middle, that just doesn't  
25 meet the claims language. The claims require that the through array contact

1 extend through conductor dielectric pairs, but in Petitioner's obviousness  
2 combination, it's only going through dielectric. It's only going through that  
3 spacer. So, even if a person of skill in the art would have been motivated to  
4 do this, and even if a person of skill in the art could figure out how to make  
5 it work, that still doesn't get you the invention of the '322 patent.

6           So then Petitioner falls back on another proposed implementation  
7 of a circular TAC, and this is one that Patent Owner actually originally  
8 suggested or mentioned, and the reason Patent Owner did that is to say that  
9 this would not be suitable with Nishikawa's architecture because the circular  
10 TAC would have to be large enough to contact the side of the device in order  
11 to maintain isolation, and we heard Petitioner today say, and we saw in its  
12 reply, that that's true. They agree that for this implementation, the through  
13 array contact would have to contact the side of the device.

14           And so, on this slide, what we have is this is taking what was in  
15 Petitioner's reply at pages 6 and 7 and adding back in the original trench of  
16 Nishikawa, and even just using that overlay illustration, the circle is bigger  
17 than the trench. Looking at Slide 20, in conceding that the through array  
18 contact would have to contact the edge of the device, the Petitioner's  
19 response to that is, well, that's fine because that doesn't mean that you're  
20 increasing the footprint.

21           It says, all while not increasing the footprint. And that is its only  
22 response to this implementation, that they say it wouldn't increase the  
23 footprint so that it's still a viable option. But even if we take that at face  
24 value, and Petitioner has provided no evidence against supporting this  
25 assertion, that means that a circular TAC is, at minimum, the same size as

1 the trench, the same width as the trench, and so there's no actual reduction of  
2 footprint. It doesn't actually accomplish the proposed objective that  
3 Petitioner gave us in the petition, which is reducing the footprint.

4           So, we're once again seeing a situation from Petitioner where it's  
5 providing more information, more evidence on reply, continuing its evolving  
6 position, and still giving us something that doesn't -- that isn't consistent  
7 with the motivation to combine and the objectives that it included in its  
8 petition. Their motivation said that you would reduce the footprint and that  
9 would be the reason for it, but the best they can say about this  
10 implementation on reply is that it wouldn't increase it, which is not the same  
11 thing.

12           And we have testimony from Dr. Campbell, as we see here on  
13 Slide 21, that at the end of the day, a circular TAC in that position would  
14 increase the device footprint. Neither Petitioner, nor Dr. Lee really rebut  
15 this. They just sort of wave their hands. They use the figures, as we saw  
16 earlier, and say, well it would be at least the same size, but they don't have  
17 any evidentiary support for this. And we've also heard Petitioner say that,  
18 well, we don't know where the edge of the device is. We don't actually  
19 know whether these -- if these red lines are drawn correctly, if that's the edge  
20 of the device. We don't know where it is, and that's true. It could be further  
21 away than Petitioner drew it.

22           And if that were the case, that would require an even larger  
23 through array contact and increase the footprint even more. Nishikawa is  
24 silent on that question, and there's no evidence of it in the record, but  
25 Petitioner is the one with the burden of proof here and Petitioner is the one

1 who said that the motivation to implement a circular through array contact is  
2 to reduce the footprint. So, it is not enough for Petitioner to say that making  
3 Nishikawa's TAC circular like this would not increase the footprint.  
4 Petitioner has to show that it is more likely than not to reduce it because  
5 that's the motivation Petitioner gave us in its petition, without any evidence  
6 of showing where the edge of the device is, Petitioner has not made that  
7 showing.

8 Now, Petitioner spends a lot of time relying on Nishikawa 1, 2, 3.  
9 In its disclosure, it's one sentence in a, I think, 28 column specification,  
10 saying that through array contacts can be any suitable shape, and it lists  
11 circular there in the general statement. But Nishikawa 1, 2, 3 -- Nishikawa2  
12 does not address any of the problems that we've been discussing today about  
13 through array contacts. It doesn't address the issues we've talked about with  
14 the obviousness combination that Petitioner put forward today, with the  
15 horizontal dielectric separators. It doesn't address the issues with needing to  
16 increase the footprint of the device, if putting the circular through array  
17 contact at the end of separator dielectric structures 45.

18 All that Nishikawa 1, 2, 3 says is that those openings can be any  
19 suitable shape. It doesn't give a reason why you would do that. It doesn't  
20 give a POSITA any motivation to implement that, and it goes on to  
21 explicitly describe an embodiment that doesn't do that, and provide a bunch  
22 of details about an embodiment that does not have a circular through array  
23 contact.

24 So, nothing in Nishikawa 1, 2, 3 addresses the evidentiary  
25 shortcomings and failings in Petitioner's obviousness showing, which

1 requires a motivation to replace Nishikawa's trench with a circular TAC, and  
2 show that a person of skill in the art would have done that with a reasonable  
3 expectation of success.

4 JUDGE CYGAN: So, if a person of ordinary skill in the art is  
5 reading Nishikawa 1, 2, 3, and Nishikawa 1, 2, 3 says, you can make this  
6 TAC circular instead of a trench, why doesn't a person of ordinary skill in  
7 the art think that that's something that they can do?

8 MR. VANNETTE: Your Honor, it's not that the person of  
9 ordinary skill in the art wouldn't think it's something they could do, it's that  
10 the person of ordinary skill in the art wouldn't, even after reading Nishikawa  
11 1, 2, 3.

12 JUDGE CYGAN: So, they don't think that Nishikawa 1, 2, 3 is  
13 teaching something which is inoperable by itself. So, a person reading  
14 Nishikawa 1, 2, 3 would think that they could look at the trench  
15 embodiments and convert those to circular trench embodiments without a  
16 problem, correct? Because that's what -- Nishikawa just says sort of  
17 offhand, you can do it in a circle. It doesn't go into detail and say, you can  
18 only do it in these situations. It says, as a general matter, you could change  
19 the rectangular trench shape into a circular, so why wouldn't a person of  
20 ordinary skill in the art, when looking at Nishikawa, make that same leap?

21 MR. VANNETTE: So, Your Honor, I think first of all, Nishikawa  
22 1, 2, 3 says -- mentions the circular opening in a more general context than  
23 specifically about the figures. Nishikawa 1, 2, 3 is very clear that each of  
24 those shapes is a different embodiment, and the depicted embodiment is the  
25 trench shape. But setting that part aside, a person of skill in the art reading

1 Nishikawa, even if that person comes away from reading Nishikawa 1, 2, 3  
2 thinking, oh, I could do this, we already know from the Federal Circuit that  
3 that's not enough for obviousness.

4           So, just because you could do something or just because something  
5 is in the prior art doesn't mean that a person of ordinary skill in the art would  
6 do it, and we've walked through all the reasons already today why a person  
7 of skill in the art wouldn't do it or in certain circumstances, couldn't do it.  
8 Even Intel, which is a case that Petitioner cites says that something is  
9 obvious if it's a suitable option to solve a known problem, and Nishikawa 1,  
10 2, 3, at best, gets to the suitability part, but it doesn't address a known  
11 problem. There's no explanation of a problem in the art in Nishikawa 1, 2, 3  
12 that would suggest that a circular through array contact would solve it.

13           The problem that we hear comes from Petitioner, completely  
14 separate from Nishikawa 1, 2, 3, which is the trench takes up a bunch of  
15 space and you would want to reduce the footprint of that trench, and so you  
16 would do, or you would use a through array contact, but even their  
17 obviousness combination that we saw today doesn't accomplish that  
18 objective, and they haven't shown us an implementation of a circular through  
19 array contact that would accomplish that. And so, it's just a failing of  
20 showing a prima facie obviousness case using Nishikawa 1, 2, 3 from  
21 Petitioner.

22           JUDGE CYGAN: So, your argument on the law here, it would be  
23 like saying, if a reference teaches you could use gold or platinum, it wouldn't  
24 be enough for a person of ordinary skill in the art to look at that and say, I  
25 can use gold or platinum. There would also have to be a reason why they

1 would choose gold or why they would choose platinum. Is that your  
2 contention?

3 MR. VANNETTE: I think that's right, Your Honor. I think that is  
4 an accurate statement of what we've heard from the Federal Circuit on  
5 obviousness, that there needs to be a motivation to either modify what's in  
6 the prior art or to change what's in the prior art, and this is an instance, in  
7 this case, of a modification to an existing reference. They're not relying on  
8 just Nishikawa 1, 2, 3. This isn't an anticipation ground. This is an  
9 obviousness ground where they have to show a reason to modify Nishikawa  
10 to replace its backside via trench with a circular through array contact. They  
11 gave us a bunch of reasons why one would do that, but they haven't shown  
12 that their implementation would accomplish that, and Nishikawa 1, 2, 3  
13 doesn't fix that for them.

14 JUDGE CYGAN: So, in your understanding of the Federal Circuit  
15 law, there has to be an explicit reason somewhere?

16 MR. VANNETTE: It's not that it has to be an explicit reason in  
17 the art. Just to be clear, I'm not saying that the art has to provide the  
18 motivation to combine. The Federal Circuit has been clear that that's not  
19 true either. The point is that there has to be a reason, and Petitioner has to  
20 give us a reason why a person of ordinary skill in the art would be motivated  
21 to do this.

22 JUDGE CYGAN: Okay. You're coming up to the end of your  
23 main argument time --

24 MR. VANNETTE: Yeah, and I can --

25 JUDGE CYGAN: -- just to let you know.

1           MR. VANNETTE: -- stop there, unless Your Honors have any  
2 other questions.

3           JUDGE CYGAN: Okay. Petitioner, you'll have nine minutes for  
4 surrebuttal, and Patent Owner, you'll also -- sorry, Petitioner, you'll have  
5 nine minutes for rebuttal, and Patent Owner, you'll also have nine minutes  
6 for surrebuttal. And Petitioner, you may begin whenever you're ready.

7           MR. LANG: All right. Let me get hooked up here. Sorry about  
8 that, Your Honors. I couldn't get that to work, but I'll go ahead and proceed.  
9 So, to address -- I mean, I guess I have a new friend -- but to address  
10 Counsel's -- a few of his comments. I'll start on the law point, Your Honor.  
11 On the Intel/PACT case. Counsel just got the law wrong. If there's two  
12 known techniques -- oh, start the timer.

13           JUDGE CYGAN: Thank you.

14           MR. LANG: If there's two known techniques to address the  
15 problem -- address the function, however you want to say it. If both of those  
16 were known and suitable, they're obvious. What's the issue here is the  
17 through array contact. You have to provide a contact through the array, and  
18 what does it do in Nishikawa? It provides a source connection, for example.

19           So, if there's two known suitable ways to provide that source  
20 connection, then it's obvious, and we -- and counsel brought it up because  
21 we raise that twice in the petition on pages 43 and 50. And so absolutely,  
22 Nishikawa2 by saying it can be circular, shows that the TAC is a suitable  
23 option for being circular. And again, you didn't hear from Counsel say that  
24 Nishikawa2 is -- or 1, 2, 3 is inoperable, because there's no argument that  
25 can be made to that effect. Your Honor, they -- Counsel said we cite nothing

1 for the idea of saving space. Nishikawa2 says it. We cite that in the petition  
2 at 51. And even in their own figures, when they put the TAC up there, you  
3 see all that room and regardless, if you put the TACs with the horizontal  
4 separator, there's still additional room there, as well.

5 They had some slides on the idea that we're maintaining the trench.  
6 It makes no sense. We said we're replacing the trench, and how could you  
7 etch a hole in a trench. They're saying there's still the trench there, but a  
8 through array contact, you have to etch a hole. It makes no sense to say that  
9 you're etching a hole in a trench. That's on the --

10 JUDGE CYGAN: So, Counsel, to the extent that your figures in  
11 the reply are unclear, they were not meant to show that the trench is being  
12 maintained in the reply?

13 MR. LANG: Correct, Your Honor.

14 JUDGE CYGAN: Okay.

15 MR. LANG: And on Slide 17, Counsel put up there a slide from  
16 Dr. Campbell's testimony that said, Dr. Campbell said you can't have these  
17 TACs like that. They misrepresented his testimony. Your Honors, I'd ask  
18 you to look at that testimony. That testimony, he was saying if you make the  
19 TACs all touching each other, and their slide completely misrepresents that  
20 testimony.

21 Briefly on the issue of the ribbed cavities, it's interesting. They say  
22 that we're making a new argument on Slide 31, but they left out the part, did  
23 not highlight, where the reply says, what -- it says the extra space does. The  
24 extra space has been front and center from the very beginning. We have  
25 clarified, Your Honor -- I will admit that -- we have clarified what that extra

1 space does, but if you look at the line of cases in the two examples that you  
2 all know, is the Axionics case is, I think it is, and Ariosa. Ariosa says you  
3 can't advance a new obviousness theory. There, basically, they were trying  
4 to combine it with something that didn't work and then they pointed to  
5 something else and made a new combination, but Axionics says that you can  
6 rebut and you can clarify and you can elaborate. The extra space was always  
7 what we said. We did clarify what that extra space means, but it's  
8 disingenuous for them to say that they didn't know what the extra space was  
9 because they point to the slide -- to one of their slides. They say, the '322  
10 patent discloses reducing short circuits and reducing capacitive coupling. It  
11 doesn't say that anywhere. The point is, is that when you say extra space for  
12 liner, extra space for insulation, you're extra insulating something. What  
13 does extra insulation do? We did clarify and explain that what the extra  
14 space does is extra insulation -- what does insulation do? It insulates two  
15 things. That prevents the capacitive coupling. They say that we had to go  
16 out and look for something. Not so. Cui, that was in the petition. We didn't  
17 go out and look at anything. Cui was right there in the petition and it said  
18 extra space, we cited that, and then we -- it did cite and explain that yeah, of  
19 course, here's what the extra space does, but that was right there in the  
20 petition.

21 JUDGE CYGAN: Counsel, when your petition says extra space  
22 for the liner, do you want us to read that as saying extra liner?

23 MR. LANG: Yeah, and as we showed, it's because when you etch  
24 and you recess it back, then more liner goes into it. So, what we meant by  
25 that is it's more space for the liner. So, more liner.

1 JUDGE CYGAN: And that the extra space would be filled with  
2 liner?

3 MR. LANG: Yes. Yes, sir.

4 JUDGE CYGAN: Okay.

5 MR. LANG: Turning to the last issue. Oh, I want to hit the  
6 dummy channels real quick. And just one point on the contacts. You had  
7 asked, does Wolfe say, well maybe you've accomplished this and now you're  
8 only going to do this new contact technique, this new etchant. Wolfe says  
9 nevertheless, despite the solution, it's common to do same contact sizes.  
10 And all the references that we showed with the same numerals is consistent  
11 with that.

12 On the last issue on dummy channels, it's in our petition at 59. The  
13 very first reason we say is because of defective bits on the edge. So, this  
14 idea that this is new or tucked away somewhere, it's the very first reason,  
15 regardless of whether the gate process is used. It was well known to include  
16 dummies on the edges. We cite the evidence for that. This idea that Dr.  
17 Wolfe didn't cite Wolfe, he did in his reply declaration at page 22. But what  
18 cannot get lost is this -- whether you look at -- I mean, if you look at the  
19 evidence here, 1998, Exhibit 2024 -- 1024 cited in the petition. Then we cite  
20 Exhibit 1108, and that is from the day that the '322 patent was filed. And  
21 they both say the same thing. It was conventional to not use the channels at  
22 the edge because they are defective. So, for literally 30 years, this was a  
23 conventional problem, there is a conventional solution. And Your Honor,  
24 you had asked early on where we had said that you would refrain from using  
25 them. In the petition at 63 in the end of the first full paragraph, we talked

1 about dummy channels can be made by the process and at the same time as  
2 the active channels. Then we say, the dummy channels do not require  
3 connections due to upper level devices, thereby not consuming space. And  
4 Dr. Lee explains all that at paragraph 147, and that is what we were saying,  
5 we're on the edge. You make the dummy channels exactly the same, and all  
6 that you do is you refrain from using them at the edge, like Exhibit 1024  
7 says, and we said that you don't have to wire them at the top. And if that  
8 needed any clarification, we put an exhibit in the reply that shows exactly  
9 what that looks like.

10 JUDGE CYGAN: So, Counsel, we should understand that third  
11 reason -- sorry, the third reason for using dummy channels when applying a  
12 gate replacement process, described on page 63 as being connected to the  
13 discussion on page 59, that the dummy channel structures extend the  
14 memory cell pattern to the dummy region on the edges. That's how we're  
15 weaving these together?

16 MR. LANG: I wouldn't say weaving them together. It's a point  
17 that we made that -- the second point is that they can be made with the same  
18 process. The third point is that they don't require wiring. Granted it's in the  
19 context of the second limitation, but I think it's consistent with Exhibit 1024  
20 that you refrain from using them.

21 Lastly, this idea that there's no evidence for them being in the  
22 connection region, the Patent Owner response at page 43 admits that that's  
23 what the petition shows with several references. That's on page 43 of the  
24 Patent Owner response, for example. And that was what we meant by  
25 additional support from the edge through there. They admit that we showed

1 references that show that and indeed, we further demonstrate that in the  
2 reply with Masamori 632. So, with that, Your Honor, if no further  
3 questions.

4 JUDGE CYGAN: None. Thank you very much.

5 MR. LANG: Thank you, Your Honors.

6 JUDGE CYGAN: And Patent Owner, I believe I have you at  
7 seven minutes for your surrebuttal.

8 MR. VANNETTE: I believe that's right, Your Honor, and I  
9 shouldn't need all seven of them, hopefully. I just have a few points. It's  
10 always fun to debate Federal Circuit law because it's such a model of clarity,  
11 but Petitioner said that it's obvious that both -- if there are two solutions,  
12 both are obvious if they're known and suitable. What Petitioner left out is  
13 that they have to be known and suitable to address the same problem, and  
14 here, we don't have any evidence that a circular through array contact in a  
15 backside via trench are both known suitable to address the same problem,  
16 because that's not Petitioner's argument. Petitioner's argument is to replace  
17 one of those with the other, and it gives a bunch of reasons why a person of  
18 skill in the art would do that, and it doesn't support those here.

19 JUDGE CYGAN: So, Counsel, why isn't the statement in  
20 Nishikawa 1, 2, 3 that the openings can have the circular shape or the  
21 rectangular shape, why isn't that addressing the same problem?

22 MR. VANNETTE: It's not addressing a problem at all, Your  
23 Honor. It's simply a general statement about shapes for through array  
24 contacts. There's no description of a problem in Nishikawa 1, 2, 3, and the  
25 problem that Petitioner says that a circular through array contact would solve

1 is with the via trench already, so the only problem that we know about is  
2 footprint, and Petitioner is saying the circular through array contact would  
3 solve that problem. We don't know of any problem that both a trench and a  
4 circular through array contact would solve.

5 JUDGE CYGAN: Why aren't they both solving the problem of  
6 providing an opening?

7 MR. VANNETTE: Well, it's not a problem of providing an  
8 opening, Your Honor. An opening is necessary for a through array contact,  
9 and as a general matter, maybe they can both be the same size. Or sorry --

10 JUDGE CYGAN: Okay.

11 MR. VANNETTE: -- both be -- or be different shapes.

12 JUDGE CYGAN: So, there are two options for providing a  
13 necessary structure, but they are not solving the problem that a necessary  
14 structure needs to be provided?

15 MR. VANNETTE: Well, we don't know what problem these  
16 structures would be solving because that's not what Petitioner's argument is.  
17 The petition says that you would replace the trench with a circle, and it  
18 identifies a problem for that, it identifies a motivation, but it doesn't support  
19 that a circular through array contact would actually meet that or solve that.

20 JUDGE CYGAN: So, when you look for a statement of a  
21 problem, you want the reference to say, we're addressing this issue, which  
22 has been covered in the art and we provide a solution to this. You don't  
23 want the reference to say, we need to provide a structure at element 79 and  
24 here are three different options for that structure. You want a more tangible  
25 statement in the reference which says, this is a problem?

1           MR. VANNETTE: Your Honor, I don't think it's a demand of a  
2 more tangible statement of a problem in the reference. It's a demand for a  
3 statement of the problem in the record. So, Petitioner needs to provide  
4 something to support some argument about obviousness. It's their burden,  
5 it's always been their burden, and so all I have to go on is what's in their  
6 petition.

7           JUDGE CYGAN: But if they pointed to Nishikawa, I'm trying to  
8 understand why that sentence is not sufficient to say, here's something that's  
9 needed, here are the three ways of meeting that need.

10          MR. VANNETTE: The reason it's not sufficient, Your Honor is  
11 because all it does is say that a person of skill in the art could do this. It's  
12 not taking that next step that the Federal Circuit demands of us for an  
13 obviousness case, which is that a person of skill in the art would do it.  
14 That's what Petitioner is trying to do in its petition and failing to do.

15          JUDGE CYGAN: Okay.

16          MR. VANNETTE: With respect to this idea that Petitioner isn't  
17 maintaining the trench with their proposed obviousness ground, I'm  
18 struggling to understand -- looking at the pictures that they had given us, that  
19 they put in their reply, that maintains a horizontal dielectric separator of  
20 both, above and below the circles -- how that doesn't result in a trench. If  
21 they're saying that you would have this separator here, this separator here,  
22 and then you would etch holes between those, I mean, that's additional  
23 processing steps that you have to etch two different, I guess, trenches, and  
24 then etch a contact hole through the middle of those. Functionally, I don't  
25 see how that's different from a trench, and if anything, what I'm hearing

1 today is that you're adding processing steps, so there's still no reason to do  
2 that.

3 With respect to the ribbed through array contacts and the  
4 motivation for doing that, if this idea of short circuits and capacitive  
5 coupling wasn't new on reply, then they wouldn't have needed new evidence  
6 to support it. And lastly, just briefly on this point about Dr. Lee citing  
7 Wolfe in his reply declaration for dummy channels, thank you, you're right.  
8 He does, he cites a different volume of Wolfe, which is also a new piece of  
9 evidence cited for the first time on reply. Unless there are any other  
10 questions --

11 JUDGE CYGAN: And when you're talking about the new issue  
12 -- the issue of new evidence being brought up that wasn't in the petition --

13 MR. VANNETTE: Um-hum.

14 JUDGE CYGAN: -- you're also saying that there wasn't anything  
15 in the Patent Owner's response, that they're responding to, that they need that  
16 new evidence for?

17 MR. VANNETTE: That's correct, Your Honor.

18 JUDGE CYGAN: Okay.

19 MR. VANNETTE: The issue is the institution decision identifies  
20 an evidentiary failing in the petition. And what this new evidence is being  
21 used for is to fill in those evidentiary gaps, and that's what the rules don't  
22 allow.

23 JUDGE CYGAN: Thank you.

24 MR. VANNETTE: Thank you.

25 JUDGE CYGAN: I'd like to thank Counsel for both parties today,

1 for your attendance and your presentations. We appreciate the level of  
2 preparedness of Counsel today, and your good command of the record which  
3 is very helpful for the Board. We'd like to compliment your colleagues.  
4 You did a fine job with the demonstrative exhibits, which were useful for us  
5 in following the arguments. A final decision will be issued in due course,  
6 and we're now off the record.

7 (Whereupon the above-entitled matter went off the record at 11:08  
8 a.m.)

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