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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION
Civil Action No. 3:23-cv-05792-RFL
YANGTZE MEMORY TECHNOLOGIES
COMPANY, LTD.,
Plaintiff,
v.
MICRON TECHNOLOGY, INC.,
Defendant.
-----/
MICRON TECHNOLOGY, INC.,
Counterclaim Plaintiff,
v.
YANGTZE MEMORY TECHNOLOGIES
COMPANY, LTD., and YANGTZE
MEMORY TECHNOLOGIES, INC.,
Counterclaim Defendants.

VIDEOCONFERENCE DEPOSITION OF KELIN KUHN
WEDNESDAY, APRIL 2, 2025

Reported by: Monice K. Campbell
CA CCR No. 14171, CRR, RMR
Job No.: 2025-978568

1 VIDEOCONFERENCE DEPOSITION OF KELIN KUHN, held
2 on Wednesday, April 2, 2025, at 9:00 a.m.,
3 before Monice K. Campbell, Certified Court
4 Reporter, in and for the State of California.

5

6 APPEARANCES:

7 On Behalf of YMTC:

8 ROPES & GRAY LLP

9 BY: ALLEN CROSS, ESQ.

10 1121 Avenue of the Americas

11 New York, New York 10036

12 allen.cross@ropesgray.com

13

14 On Behalf Micron Technology, Inc.:

15 ORRICK, HERRINGTON & SUTCLIFFE LLP

16 BY: PATRICK HERMAN, ESQ.

17 51 West 52nd Street

18 New York, New York 10019

19 pherman@orrick.com

20

21

22

23

24

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I N D E X

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NUMBER	DESCRIPTION	PAGE
Exhibit 1001	U.S. Patent Number 10,950,623 B2	14
Exhibit 1004	Prior Art Reference to Park	56
Exhibit 1005	Prior Art for Shibata	70

E X H I B I T S
(Referenced)

NUMBER	DESCRIPTION	PAGE
Exhibit 2002	Applications of AFM in semiconductor R&D and manufacturing at 45 nm technology node and beyond	45
Exhibit 2003	A High Speed Low Power Negative Sensing Architecture for 3D NAND Flash Memory	49
Exhibit 2004	Reset Current Scaling in Phase-Change Memory Cells: Modeling and Experiments	50
Exhibit 2005	Chapter 2 - Limits and Hurdles to Continued CMOS Scaling	53
Exhibit 2006	Novel ESD Protection Transistor including Silicone-Germanium Buried Layer	55
Exhibit 2010	Declaration of Kelin Kuhn, Ph.D.	8

* * * * *

WEDNESDAY, APRIL 2, 2025

9:00 A.M.

* * * * *

Whereupon,

KELIN KUHN,

having been sworn to testify to the truth, the
whole truth, and nothing but the truth, was
examined and testified under oath as follows:

EXAMINATION

BY MR. HERMAN:

Q. Good morning, Dr. Kuhn. Do you
mind stating your name for the record,
please?

A. Sure. My full name is Kelin Jo
Kuhn, K-U-H-N.

Q. And this is Patrick Herman from
Orrick, Herrington & Sutcliffe, and we're
here today in connection with an IPR
proceeding involving Micron Technology and
Yangtze Memory Technologies Company, Ltd,
and the case number is IPR2024-00794.

Would counsel for patent owner
like to introduce themselves?

1 MR. CROSS: Allen Cross from
2 Ropes & Gray on behalf of YMTC.

3 BY MR. HERMAN:

4 Q. Now, Dr. Kuhn, I know you've
5 been deposed before, including by me. Just
6 to make sure things go smoothly today,
7 we're going to go through a few basic
8 ground rules to make sure we're on the same
9 page.

10 The first is that there's a
11 reporter here, so it's important that you
12 respond verbally so that they can record
13 your testimony. Is that okay?

14 A. Yes.

15 Q. It's also important that we try
16 our best not to talk over each other so
17 that there is a clear record. I'll do my
18 best to wait for you to finish answering
19 before asking another question, and I also
20 ask that you wait until I am done with my
21 question before answering. Is that okay?

22 A. I will do my best. In the
23 excitement of the questions, we may screw
24 up, but we will try.

25 Q. Next is you're entitled to a

1 question you understand. So if anything I
2 ask today is unclear, please let me know
3 and I'll try to clarify. Otherwise, I'll
4 assume that we're on the same page. Is
5 that okay?

6 A. Yes. And it may turn out that
7 we start to discuss something and I realize
8 that I misunderstood, and at that point I
9 will also ask for clarification.

10 Q. Next, I ask that you not look at
11 anything during your deposition besides
12 documents that I give you. And if you do
13 look at something, please let me know. Is
14 that okay?

15 A. So let's briefly discuss this as
16 we are remote. I have on my laptop on the
17 desktop with no other drive plugged in, I
18 do have the four relevant documents for
19 this proceeding, namely my declaration, the
20 patents, the prior art Park and the prior
21 art Shibata.

22 Would it be okay to use those
23 documents off my computer, or should I
24 delete those and wait for you to reload the
25 same documents on the clipboard or wherever

1 we are putting them?

2 Q. Are they clean copies of those
3 documents?

4 A. They are clean copies.

5 Q. So you can use those clean
6 copies if you prefer or the versions that
7 I'm going to put in the chat as the
8 deposition proceeds. I leave that up to
9 you. But if you are referring to a
10 document that you have in your computer in
11 answering one of your questions, I ask that
12 you just let me know that you are reading
13 or looking at particular portions of that
14 document. Is that okay?

15 A. That sounds great. That
16 simplifies things if we have trouble with
17 documents loading or whatever, I will have
18 a clean copy.

19 Q. Next, I ask that you not have
20 any side conversations or use technology to
21 chat or otherwise communicate with anyone
22 during the deposition. Is that okay?

23 A. Of course. That's perfectly
24 fine.

25 Q. Now, is there anything that

1 would prevent or interfere with your
2 testimony today?

3 A. There shouldn't be. Should
4 something come up in the course of the
5 deposition, for example, a privileged
6 question or something that conflicts with
7 an NDA agreement, I'll certainly bring that
8 up and we can discuss it.

9 (Exhibit Number 2010, which was
10 previously marked, was referenced.)

11 BY MR. HERMAN:

12 Q. Okay. So I'm going to start by
13 putting in the chat a copy of an exhibit
14 that's been previously marked as
15 Exhibit 2010, which I believe is your
16 declaration, which you may already have a
17 copy of. So please feel free to use either
18 the version I put in the chat or your
19 version of Exhibit 2010.

20 A. What I'll do that's worked in
21 the past depositions this week is I will
22 download the one in the chat and just make
23 sure it's the same document, and then I'll
24 use whichever one turns out to be more
25 convenient electronically.

1 Q. That sounds good.

2 A. I'm downloading it as we speak.
3 And I am confirming it's the same document
4 that I have. It's also unmarked as mine
5 is, so I will continue to refer to my
6 version, recognizing that they appear to be
7 identical.

8 Q. So first, what is Exhibit 2010?

9 A. 2010 is my declaration for the
10 Patent 10,950,623, which I'm going to call
11 the '623 patent, and it was signed on the
12 17th of January, 2025.

13 Q. Is there anything in this
14 declaration that sitting here today you
15 believe to be inaccurate?

16 A. There's nothing I am aware of
17 sitting here today.

18 Q. Now, there are several places in
19 this declaration where you discuss etching;
20 is that right?

21 A. I do recall some places I
22 discussed etching, that's correct.

23 Q. So first, what is a "selective
24 etch"?

25 A. So at a high level, just

1 textbook level, a selective etch is an etch
2 that etches one type of material and does
3 not etch another type of material. As an
4 example, a selective etch might etch a
5 metal but not etch silicon dioxide.

6 Q. Were selective etches known when
7 the '623 patent was filed?

8 A. Yes. Selective etches have been
9 in the art for many years.

10 Q. What is a "timed etch"?

11 A. So when one is etching a
12 structure -- and, again, this is generally
13 speaking of the textbook education level --
14 a timed etch is an etch that is not
15 selective. Someone simply makes a pattern
16 on the wafer, turns the etcher on and
17 allows the etch to run for a certain length
18 of time and turns the etcher off.

19 Q. Were timed etches also known at
20 the time the '623 patent was filed?

21 A. Yes.

22 Q. What is a "wet etch"?

23 A. So, again, high level, kind of
24 textbook level, etches come in two very
25 broad categories. There are etches that

1 use a liquid chemical, a buffered oxide
2 etch, for example. There are also etches
3 that use something other than a liquid
4 chemical, plasma or electron beams or a
5 variety of other things, and they are
6 usually called dry etches.

7 Q. So the one using a liquid
8 chemical you would call a wet etch and the
9 one that does not use a liquid chemical
10 would be a dry etch; is that right?

11 A. In general.

12 Q. Were both of those things -- by
13 "both of those things" I mean wet etches
14 and dry etches -- known when the '623
15 patent was filed?

16 A. Yes. Wet and dry etches have
17 been foundational for many years.

18 Q. Now, if you could turn to
19 paragraph 61 of your declaration, which, if
20 it helps, it is on page 32 of the PDF.

21 A. I'm at paragraph 61.

22 Q. Paragraph 61 falls within the
23 portion of your declaration discussing
24 claim construction for the '623 patent,
25 correct?

1 A. That's correct.

2 Q. And paragraph 61 in particular
3 relates to the claim phrase "dielectric
4 trenches formed in the BSG;" is that right?

5 A. That's correct.

6 Q. In paragraph 61 you state that:
7 "The term 'dielectric trenches
8 formed in the BSG' by its plain meaning
9 does not encompass features that are
10 formed in another structure other than
11 a BSG such as a sacrificial layer."

12 Is that right?

13 A. You've read that correctly.

14 Q. What I just read is a reference
15 to the process for making the dielectric
16 trenches in the BSG, correct?

17 MR. CROSS: Objection. Form.

18 THE WITNESS: So what you just
19 read was the claim phrase "dielectric
20 trenches formed in the BSG" and my opining
21 that that meaning does not encompass
22 features that are formed in a structure
23 other than a BSG.

24 BY MR. HERMAN:

25 Q. So by "formed," you're referring

1 to the process of manufacturing the
2 trenches. And in your view, the trenches
3 need to be manufactured in BSG, not in, for
4 instance, a sacrificial layer, correct?

5 MR. CROSS: Objection. Form.

6 THE WITNESS: So saying this a
7 slightly different way, my interpretation
8 of the term "formed in the BSG," means the
9 trenches are made in the BSG. They are not
10 made in a structure that might not be a
11 BSG. And most specifically, they would not
12 be made in the sacrificial layer that
13 preexists before the formation of the BSG.

14 BY MR. HERMAN:

15 Q. So in your view, it's not enough
16 of the trenches just to be located within
17 the BSG, you need to etch a trench in the
18 BSG itself and then fill that trench with
19 dielectric material for the claim to be
20 satisfied, correct?

21 MR. CROSS: Objection. Form.

22 THE WITNESS: Yeah. The way you
23 asked that seemed a little circular. I'm
24 going to repeat back what I'm trying to say
25 and just see if there is a slight language

1 difference.

2 My opinion is that the phrase
3 "dielectric trenches formed in the BSG,"
4 that is in the bottom select gate, are
5 formed in the bottom select gate. They are
6 not formed in some other structure, and they
7 are not formed, for example, in a mandrel or
8 a sacrificial layer that exists before the
9 BSG is formed.

10 BY MR. HERMAN:

11 Q. And by "formed in," you're
12 referring to the first time that the
13 trenches appear. So the first time that
14 the trenches appear, the BSG has to already
15 be present in your view, correct?

16 MR. CROSS: Objection. Form.

17 THE WITNESS: Help me a little
18 bit with "the first time the trenches
19 appear." Can you maybe describe that a
20 little more fully?

21 (Exhibit Number 1001 was marked.)

22 BY MR. HERMAN:

23 Q. So let's try to do this using
24 examples. So I'm going to put
25 Exhibit 1001, which is the '623 patent,

1 into the chat, and ask that you download
2 that. And, again, if you would prefer to
3 use your copy, you're free to do so.

4 A. I'm going to do the same thing I
5 did the last time. I'm going to download
6 it, just take a look at it.

7 This is the '623 patent. It's a
8 clean copy. Looks just like mine. Just for
9 ease in electronics, I'm going to open my
10 version.

11 I do have this open.

12 Q. So Exhibit 1001 is the '623
13 patent that you reviewed, correct?

14 A. That's correct.

15 Q. And Figure 1a of the patent is
16 meant to provide a cross-sectional view of
17 a 3D-NAND memory device, correct?

18 A. Figure 1a of the patent is a
19 composite view that illustrates key cross
20 sections of the 3D-NAND memory device,
21 that's correct.

22 Q. And that figure includes
23 dielectric trenches that are located in the
24 BSG that are labeled 26 and 28, correct?

25 A. That's correct.

1 Q. Now, there are two ways that
2 those trenches could have been formed: One
3 is the '623 patent calls a gate-first
4 process, and the other is what the '623
5 patent calls a gate-last process, correct?

6 A. There are at least two ways to
7 form those trenches, and let me be more
8 precise. There are at least two ways to
9 form the BSG: One way to form the BSG is
10 using a gate-first process. Another way to
11 form the BSG is through the use of the
12 gate-last or replacement-gate process.

13 Q. And the '623 patent mentions
14 both that gate-first process and gate-last
15 process in its specification, correct?

16 A. Yes. The '623 patent describes
17 both a gate-first and a gate-last process,
18 that's correct.

19 Q. And both of those processes are
20 meant to produce the memory device that's
21 shown in Figure 1a, true?

22 MR. CROSS: Objection. Form.

23 THE WITNESS: So the memory
24 device shown in Figure 1a is an exemplary
25 illustration. The two fabrication

1 processes that are described are two among
2 many, and I think if we are looking at the
3 precise details of the fabrication, we need
4 to look to the claims, not necessarily the
5 specification, as the specification
6 includes a number of differing embodiments.

7 BY MR. HERMAN:

8 Q. So I understand that, but my
9 question is: In the '623 patent, the '623
10 patent contemplates in its specification,
11 at least, putting aside the claims, in its
12 specification, contemplates using either a
13 gate-first or a gate-last process to
14 produce the memory device that's shown in
15 Figure 1a; true?

16 MR. CROSS: Objection. Form.

17 THE WITNESS: So the
18 specification certainly describes both the
19 gate-first and the gate-last process, and
20 it is also clear in the specification that
21 Figure 1a is an exemplary structure of the
22 3D-NAND device.

23 BY MR. HERMAN:

24 Q. So Figure 1a is an exemplary
25 structure of the patent's 3D-NAND device

1 and the structure shown in that figure can
2 be produced using either a gate-first or a
3 gate-last process, correct?

4 MR. CROSS: Objection. Form.

5 THE WITNESS: So I've not opined
6 specifically that that Figure 1a can be
7 done either way. Certainly at the more
8 general level, there are ways to do
9 Figure 1a that potentially could use any of
10 a multiplicity of techniques, but I don't
11 believe I've opined on whether Figure 1a is
12 showing a gate-first or a gate-last
13 process.

14 BY MR. HERMAN:

15 Q. Now, if you turn to Column 20 of
16 the '623 Patent.

17 A. I'm at Column 20.

18 Q. And starting at about line 28,
19 there's a paragraph that begins "After the
20 common source openings are formed."

21 Do you see that?

22 A. It's about 27 or 28, "After the
23 common source openings are formed"? Yes, I
24 see that.

25 Q. This is the continuation of a

1 discussion of manufacturing that begins all
2 the way back in Column 15 and discusses
3 collectively Figures 5a through 11b; is
4 that right?

5 A. Well, certainly this discussion
6 is following a discussion on Figure 11b.
7 It's not immediately clear to me that the
8 phrases here refer to that entire list of
9 figures you just mentioned, but the
10 discussion physically follows 11b.

11 Q. So why don't we turn to
12 Column 15.

13 A. Okay. I'm at Column 15.

14 Q. At Line 18, there's a short
15 paragraph that reads:

16 "Figures 5a through 11d are
17 cross-sectional and top-down views of
18 various intermediate steps of
19 manufacturing a 3D-NAND memory device
20 100 in accordance with exemplary
21 embodiments of the disclosure."

22 Do you see that?

23 A. I see that.

24 Q. So in the '623 patent,
25 Figures 5a through 11d are meant to show

1 various intermediate manufacturing steps
2 meant to produce 3D-NAND memory devices 100
3 like the example that's shown in Figure 1a
4 that we discussed previously, correct?

5 MR. CROSS: Objection. Form.

6 THE WITNESS: So I certainly
7 agree that Column 15 and Figure 5a
8 through 11d show cross-sectional and
9 top-down views of various intermediary
10 steps of manufacturing a 3D-NAND memory
11 device.

12 BY MR. HERMAN:

13 Q. And the point of those
14 manufacturing steps is to produce a memory
15 device 100 like what's shown in Figure 1a
16 of the '623 patent, correct?

17 MR. CROSS: Objection. Form.

18 THE WITNESS: Yes. The precise
19 language is a little different. The
20 precise language is "various intermediary
21 steps of manufacturing a 3D memory device
22 100 in accordance with exemplary
23 embodiments of the disclosure." It does
24 not recite Figure 1a or any other figure
25 there.

1 BY MR. HERMAN:

2 Q. But Figure 1a includes a labeled
3 memory device 100, correct?

4 A. Figure 1a does include a labeled
5 100 in the upper corner of the figure.

6 Q. Now, if you turn back to
7 Column 20 to the paragraph you were
8 reviewing, starting at Line 28.

9 A. I'm back at Line 20. Is it 20
10 or 28?

11 Q. So Column 20, Line 28.

12 A. I'm at Column 20, Line 28.

13 Q. So this is part of the
14 discussion of those collection of
15 manufacturing drawings spanning Figures 5a
16 through 11d, correct?

17 A. Yes. This is after the
18 discussion of Figure 11b.

19 Q. And the paragraph that begins at
20 Line 28 references a gate-first
21 manufacturing flow, correct?

22 A. Well, the paragraph that begins
23 at 28 is a paragraph that is significantly
24 through the process, because the paragraph
25 begins:

1 "After the common source openings
2 are formed, subsequent manufacturing
3 steps to complete the formation of the
4 common source regions can be different
5 between a gate-first manufacturing flow
6 and a gate-last manufacturing flow."

7 Q. But it references in this
8 paragraph, though, the gate-first
9 manufacturing flow and a gate-last
10 manufacturing flow, correct?

11 A. Those words are mentioned,
12 correct.

13 Q. So steps that were part of the
14 gate-first manufacturing flow or the
15 gate-last manufacturing flow may have
16 already occurred before we've gotten to
17 what's shown in Figure 11b, correct?

18 MR. CROSS: Objection. Form.

19 THE WITNESS: So the paragraph
20 on Column 20, Line 28, is relatively late
21 in the process because the common source
22 openings are already present.

23 In these processes, the common
24 source opening formation follows a number of
25 steps, of which the most important for our

1 discussion is the formation of the layers
2 that will eventually end up forming the BSG
3 and the TSG in the process.

4 So, you know, we're
5 three-quarters of the way through the
6 process at this point. Whether one is doing
7 gate-first or gate-last, this paragraph
8 refers to say three-quarters of the way
9 through the flow.

10 BY MR. HERMAN:

11 Q. And the trenches have already
12 been formed at this particular point,
13 correct?

14 MR. CROSS: Objection. Form.

15 THE WITNESS: Which trenches?
16 The TSG or the BSG?

17 BY MR. HERMAN:

18 Q. The BSG trenches.

19 MR. CROSS: Objection. Form.

20 THE WITNESS: So in this
21 particular flow -- and let me double-check
22 what 11b looks like. Give me a second
23 here. 11b indicates the presence of
24 staircases. It indicates the presence of
25 channel structures. The structure is

1 relatively complete at this point, so since
2 11b is following 11A, a significant number
3 of structures are already present by 11b.

4 BY MR. HERMAN:

5 Q. Now if you could turn on to
6 Column 21.

7 A. Column 21. I'm there.

8 Q. Starting at Line 7, the '623
9 patent says:

10 "After the formation of the
11 common source regions, a final memory
12 device 100 is formed which is identical
13 to the memory device 100 illustrated in
14 Figure 1a."

15 Do you see that?

16 A. I see that.

17 Q. So regardless of whether you use
18 a gate-first or a gate-last manufacturing
19 flow, the intent in the '623 patent is to
20 produce a final memory device 100 which is
21 identical to the memory device 100
22 illustrated in Figure 1a, correct?

23 MR. CROSS: Objection. Form.

24 THE WITNESS: So Column 21, Line
25 6, simply states:

1 "After the formation of the common
2 source regions, a final memory device
3 100 is formed which is identical to the
4 memory device 100 illustrated in
5 Figure 1a."

6 BY MR. HERMAN:

7 Q. And the patent does not identify
8 any differences in that memory device 100
9 depending on whether a gate-first or a
10 gate-last process flow is employed, true?

11 MR. CROSS: Objection. Form.

12 THE WITNESS: There are not two
13 figures. For example, a Figure 1a and
14 Figure 1a prime that are associated with a
15 gate-first and a gate-last process. There
16 is a single Figure 1a.

17 BY MR. HERMAN:

18 Q. Associated with both of those
19 processes, correct?

20 MR. CROSS: Objection. Form.

21 THE WITNESS: I think it would
22 be exemplary of an embodiment.

23 BY MR. HERMAN:

24 Q. Now, if you could turn to
25 Claim 1 of the '623 patent.

1 A. I'm there; I have Claim 1.

2 Q. The '623 patent, first of all,
3 includes only a single independent claim,
4 correct?

5 A. That's correct.

6 Q. And that is Claim 1, true?

7 A. That's correct.

8 Q. And the preamble of Claim 1
9 provides that the claim is directed to a
10 memory device, right?

11 A. That's correct. The preamble is
12 memory device comprising.

13 Q. So would it be fair to
14 characterize the claim as an apparatus
15 claim?

16 A. So --

17 MR. CROSS: Objection. Form.

18 THE WITNESS: -- I believe
19 there's some legal distinction here that I
20 may not be aware of. I would characterize
21 this patent, technically, as a structured
22 patent. It's describing a structure more
23 than it is describing a method.

24 BY MR. HERMAN:

25 Q. And so Claim 1 is claiming a

1 structure, not a method, true?

2 MR. CROSS: Objection. Form.

3 THE WITNESS: So this falls in
4 the broad category of structure patents, as
5 more specifically, it does not start out
6 saying, a fabrication process with the
7 following methodology.

8 BY MR. HERMAN:

9 Q. Now, if you could get your
10 declaration handy again. That's
11 Exhibit 2010.

12 A. If it's okay with you, I'm going
13 to place the patent to one side of the
14 screen and the declaration to the other
15 side of the screen.

16 Q. That's fine. It's probably a
17 good idea to keep it accessible.

18 A. So I have my declaration back.

19 Q. And if you could go to
20 paragraph 70 of your declaration, which is
21 on page 38 of the PDF.

22 A. I am at 70.

23 Q. And paragraph 70 spans pages --
24 well, pages 38 and 39 of the PDF.

25 A. No. Paragraph 70 spans 34 and

1 35.

2 Q. Somewhat confusing but there are
3 two separate sets of numbers, but there are
4 page numbers here too as part of the Word
5 document or Word processing document that
6 you used to create the declaration and then
7 there's labels. I'm referring to the
8 labels. So every time I refer to a page
9 number, the numbers in the lower right
10 corner, I'd ask that you look at those.

11 A. I've got it. You want me to
12 look at the Bates number, not my page
13 number. I'm good. So it is indeed 38 and
14 39.

15 Q. So on page 39 you have a color
16 annotated figure.

17 Do you see that?

18 A. Yes.

19 Q. What is that figure meant to
20 show?

21 A. So this is an annotated version
22 of Figure 1b of the '623 patent. The
23 figure has in it, for the base figure,
24 there are two common source regions, 52c
25 and 52b at the top and bottom of the

1 figure.

2 There are -- or there are two
3 first trenches indicated, 26 and 28, and in
4 this patent, we have the BSG and TSG
5 trenches are on top of each other but there
6 is a staircase, so the yellow boxes
7 surrounding BSG and TSG in the middle of the
8 array and only the BSG at the edge of the
9 staircase.

10 Then down the middle is another
11 common source line, which is 52a, which has
12 what's called an H-cut in it.

13 Now, the -- that's just the base
14 image at Figure 1b The highlighting is
15 showing how the original block, which is
16 bounded by 52c and b, has been broken into
17 three subblocks. The first subblock at the
18 top, which is in green, is called Subblock
19 1, and I've written Sub-BSG 1 to the side
20 just to make it clear what the green is.
21 That block is defined by the region between
22 52c and the trenches 26, and similarly, on
23 the bottom, Sub-BSG 3 is defined by the
24 region between 52b and the trench 28.

25 In the middle, what we have is an

1 H-cut through 52a which connects the two
2 sections on each side of 52a, creating a
3 third block which is called Subblock 2,
4 which I have labeled Sub-BSG 2.

5 Q. First you mentioned an H-cut,
6 which I believe is labeled with a very
7 small 72 in the figure; is that right?

8 A. Let me look. I do not recall if
9 it's actually -- yes, you are correct. It
10 is labeled with a 72.

11 Q. And that is meant to
12 electrically connect the two pieces, the
13 two red pieces of what you have labeled
14 Sub-BSG 2; is that right?

15 A. Well, H-cut is a cut through the
16 common source line with the result it will
17 electrically connect the two regions that I
18 have labeled Sub-BSG 2.

19 Q. Now, immediately below the
20 figure, there's a sentence that reads:

21 "And while common source regions
22 52b and 52b are at the edge of sub-BSG
23 and do help define the boundary, they
24 do not separate the BSG into sub-BSGs."

25 Do you see that?

1 A. I do. And I do wish to point
2 out a typo. I believe it is:

3 "While common source regions 52b
4 and 52c are at the edge of sub-BSG and
5 help define the boundary, they do not
6 separate the BSG into sub-BSGs."

7 Q. So what you're referring to
8 there is the common source region 52b
9 that's annotated in purple at the top of
10 Figure 1b and common source region 52c
11 that's also annotated -- maybe I've got
12 those backwards. 52c is at the top of
13 Figure 1b, and 52b is at the bottom of
14 Figure 1b. That's what you're referring
15 to, correct?

16 A. Let me repeat this back to you.
17 There are two common source
18 regions, 52b and 52c on the top -- sorry,
19 now I do it -- on the bottom and top
20 respectively that define this block. Those
21 two common source regions do not define the
22 subblock.

23 Q. And in Figure 1b, you've
24 highlighted those two common source regions
25 52b and 52c in purple, correct?

1 A. That's correct.

2 Q. Now, if you could get
3 Exhibit 1001, the '623 patent handy again.

4 A. I have it.

5 Q. And if you could turn to
6 Column 8 and at Line 65, which is all the
7 way at the bottom of Column 8, there's the
8 beginning of a discussion of Figure 1b.

9 Do you see that?

10 A. That's correct.

11 Q. That's the same Figure 1b that
12 appeared in paragraph 70 of your
13 declaration, just not annotated, correct?

14 A. Correct. Correct. Figure 1b on
15 page -- sorry, Figure 1b above or in the
16 middle of paragraph 70 is, indeed, the same
17 Figure 1b except I've added annotations.

18 Q. Now, starting at Line 67 in
19 Column 8 and turning over to Column 9,
20 there's a sentence that states:

21 "The memory device 100 can have
22 three common source regions, 52a to
23 52c."

24 Is that right?

25 A. That's correct.

1 Q. And the next sentence in
2 Column 9, starting at Line 3, states:

3 "The common source regions 52b and
4 52c are disposed at two boundaries of
5 the memory device 100."

6 Right?

7 A. That's correct.

8 Q. And the following sentence
9 reads:

10 "The common source regions 52b and
11 52c can serve as common source regions
12 for the memory device 100 and further
13 isolate memory device from adjacent
14 components."

15 Do you see that?

16 A. (Reading):

17 "And further isolate memory device
18 100 from adjacent components."

19 That's correct.

20 Q. So there, the '623 patent was
21 noting that common source regions 52b and
22 52c serve two functions, right?

23 A. So the sentence, the common
24 source regions 52b and 52c first says,
25 "they can serve as common source regions

1 for the memory device 100," and also says,
2 "and further isolate the memory device 100
3 from adjacent components."

4 Q. So one of the functions
5 performed by the common source regions 52b
6 and 52c is to serve as common source
7 regions for the memory device 100, correct?

8 A. That's correct.

9 Q. And another of the functions of
10 the common source region 52b and 52c is to
11 isolate the memory device 100 from adjacent
12 components, true?

13 A. To further isolate the memory
14 device 100 from adjacent components, that's
15 correct.

16 Q. And in Column 9 at Line 8, the
17 '623 patent states that:

18 "In some embodiments, the memory
19 device 100 is one of memory cell blocks
20 of a 3D-NAND chip not shown."

21 Do you see that?

22 A. Yes, I see that.

23 Q. So what the patent is saying is
24 that a memory can include multiple blocks
25 100 like what is shown in Figure 1b, not

1 just one, correct?

2 MR. CROSS: Objection. Form.

3 THE WITNESS: Certainly, the
4 patent says:

5 "The common source regions 52b and
6 52c accordingly isolate the memory
7 device 100 (or the memory cell block
8 100) from adjacent memory cell blocks
9 of the 3D-NAND chip."

10 BY MR. HERMAN:

11 Q. So those adjacent memory cell
12 blocks will have their own BSGs, correct?

13 A. I don't think I have any idea
14 what they have. If it's replicated
15 identically, then presumably it will be
16 replicated identically, but no information
17 is provided on these adjacent blocks.

18 Q. So the '623 patent says, in
19 Column 9 at Line 8, that:

20 "The memory device 100 is one of
21 memory cell blocks of a 3D-NAND trip
22 chip."

23 You do not take that to mean that
24 the memory device of the '623 patent has
25 multiple identical memory device 100s?

1 MR. CROSS: Objection. Form.

2 THE WITNESS: I have no
3 information on adjacent blocks. Adjacent
4 blocks could be laid out differently. They
5 could have different structures. They
6 could be mirror imaged, inverted, a totally
7 different design. There is no additional
8 information on those blocks. It just says
9 there could be additional blocks.

10 BY MR. HERMAN:

11 Q. So does the '623 patent say
12 anywhere within its specifications that the
13 blocks that are adjacent to memory device
14 100 are any different than memory device
15 100 itself?

16 MR. CROSS: Objection. Form.

17 THE WITNESS: I've not opined on
18 this, but I don't recall anywhere that the
19 patent says they're either the same or
20 different.

21 BY MR. HERMAN:

22 Q. So you do not believe that one
23 of ordinary skill in the art reviewing the
24 '623 patent could draw any conclusions
25 whatsoever regarding what the adjacent

1 memory cell blocks look like?

2 MR. CROSS: Objection. Form.
3 Objection. Mischaracterizes prior
4 testimony.

5 THE WITNESS: I'm going to
6 somewhat summarize my previous position.
7 No information is given other than there
8 may be adjacent memory cell blocks. NAND
9 flash is complicated. It is not at all
10 clear that these memory blocks would be
11 identical or similar.

12 BY MR. HERMAN:

13 Q. So in your view, the '623 patent
14 provides no guidance to one of ordinary
15 skill in the art as to how to implement any
16 memory device besides one that includes a
17 single memory device 100. That's your
18 opinion?

19 MR. CROSS: Objection. Form.
20 Objection. Mischaracterizes prior
21 testimony.

22 THE WITNESS: I disagree. I'm
23 simply saying that no information is
24 provided on the adjacent memory blocks.
25 NAND is complicated. The assumption the

1 blocks would be identical seems excessive
2 based on the complexity that exists in this
3 field.

4 BY MR. HERMAN:

5 Q. So one of ordinary skill in the
6 art would not know how to implement a
7 memory device that includes more than one
8 block 100 because NAND is complicated.
9 That's your opinion?

10 MR. CROSS: Objection. Form.

11 THE WITNESS: The discussion
12 seems to be shifting a bit here. My
13 position is that while memory -- adjacent
14 memory cell blocks are discussed in the
15 abstract, details on these adjacent memory
16 cell blocks are not given. So I can't
17 opine on what's in something that's not
18 discussed and not given.

19 BY MR. HERMAN:

20 Q. So the '623 patent does depict
21 an example of memory device 100 in
22 Figure 1a, correct?

23 A. It depicts an exemplary device
24 in Figure 1a, that's correct.

25 Q. And it states that that

1 exemplary device can be one of many memory
2 cell blocks in a memory, correct?

3 MR. CROSS: Objection. Form.
4 Objection. Mischaracterizes the
5 specification.

6 THE WITNESS: So let me go back
7 to Figure 1a. You said Figure 1a describes
8 many memory blocks in the memory. Can you
9 show me where that description is included?
10 BY MR. HERMAN:

11 Q. Yes. It's in Column 9, starting
12 at Line 8:

13 In some embodiments, the memory
14 device 100 is one of memory cell blocks
15 of the 3D-NAND chip."

16 That's what the '623 patent says.
17 It's not one by itself. It's one of memory
18 cell blocks of a 3D-NAND chip. Those are
19 the words of '623 patent, correct?

20 A. Figure 1a is not in itself a
21 depiction of a block. It's an exemplary
22 drawing.

23 Q. So in arriving at your
24 conclusions with respect to the '623
25 patent, you did not consider and you do not

1 understand the '623 patent to be disclosing
2 an array of memory cell blocks, each of
3 which is substantially identical; is that
4 true?

5 MR. CROSS: Objection. Form.

6 THE WITNESS: So the only place
7 that the character of the array is clearly
8 described is in Column 1, Line 37 or ish.

9 "A related 3D memory device can
10 include a plurality of memory cell
11 blocks or memory cell arrays. Each of
12 the blocks can include a plurality of
13 vertical NAND memory cell strings. A
14 vertical NAND memory cell strings can
15 each have one or more body select
16 transistors," and so on.

17 There is a rather extensive
18 description between Line 37 and Line 60 that
19 is describing the nature of an array. But
20 no where in that description does it say
21 that all the blocks need to be identical.

22 BY MR. HERMAN:

23 Q. So that description does say
24 that each of the blocks includes a bottom
25 select gate BSG, correct?

1 A. (Reading):

2 "The vertical NAND memory strains
3 can each have one or more bottom select
4 transistors, one or more dummy bottom
5 select transistors," and so on.

6 It says that at Line 39.

7 Q. And it also says that each of
8 those blocks can include a BSG or a bottom
9 select gate, true?

10 A. It says each of the blocks can
11 include that, that's correct.

12 Q. So when we turn to Column 9, and
13 Column 9 characterizes memory device 100 as
14 being one of memory cell -- cell blocks of
15 many, but each of those memory cell blocks
16 would include a BSG; true?

17 MR. CROSS: Objection. Form.

18 THE WITNESS: So that particular
19 column does not state that, but the
20 introduction does suggest that all the
21 blocks could have BSGs.

22 BY MR. HERMAN:

23 Q. So in Column 9, each of the
24 adjacent memory cell blocks would have
25 their own BSG; true?

1 A. I believe the language in the
2 patent is may not must. So each could have
3 its associated BSG.

4 Q. And in that circumstance, the
5 common source region 52a -- sorry, the
6 common source regions 52b and 52c,
7 isolating memory device 100 from adjacent
8 memory cell blocks would also isolate those
9 adjacent BSGs from each other, correct?

10 A. So under the circumstance that
11 you would have two adjacent blocks and
12 those two adjacent blocks both have BSGs,
13 and that 52c and b exist in the adjacent
14 block and that 52b and c are common source
15 regions, those two blocks would isolate the
16 BSG from each other.

17 Q. Now, if you could go back to
18 your declaration. That's Exhibit 2010.
19 And if you could turn to paragraph 141.

20 A. I'm at 141.

21 Q. Now, paragraph 141 continues on
22 to the next page of your declaration, and
23 on the next page, there's an annotated
24 figure.

25 Do you see that?

1 A. That's correct. That figure was
2 actually annotated by the petitioner, not
3 by us. I'm simply reproducing an annotated
4 figure.

5 Q. You had added certain things to
6 the annotation, correct?

7 A. Actually, I don't believe I
8 have. I don't have a copy of the petition
9 with me, but my memory is this is taken
10 right out of the petition. I may be wrong.

11 I believe that this is -- you
12 know, my annotation in my notes is this was
13 annotated by the petitioner, not by me, and
14 I may be in error, but given my memory and
15 given what's here, I think that's actually a
16 copy of the petitioner's picture.

17 Q. So this figure is an annotated
18 version of Figure 3 from the Park prior art
19 reference; is that right?

20 A. That's correct.

21 Q. And what is the teal region in
22 the figure meant to show.

23 A. So the teal region shows the
24 area that is sitting between the proposed
25 dielectric trenches and the original Park

1 common source Line 105 that's comprised of
2 103 and 104.

3 Q. Now, in the middle of each of
4 the teal regions, there remains common
5 source region 103, common source region
6 104, and the isolation -- insulation layer
7 111; is that right?

8 A. That's correct. I'm going to
9 amplify a bit on this because this is a top
10 down of a stack. The two dielectric
11 trenches which were proposed by the
12 petitioner are not extending through the
13 length of the stack. The teal region has
14 in it a black line that's segmented by a
15 green box. That is common source line 105
16 that is broken into two pieces, 103 and
17 104. And that common source line extends
18 all the way down to the substrate.

19 The green region is a small cut
20 that's filled with isolation that is in the
21 bottom select gate region but above it are
22 layers of insulation and material. There's
23 no common source line above that.

24 So given that clarification, can
25 you ask your question again?

1 Q. Sure. So in this particular
2 top-down view, within the area that's been
3 highlighted in teal, there are views from
4 the top common source lines 103 and 104,
5 correct?

6 A. That's correct.

7 Q. And during the process of
8 removing Park's sacrificial layers, etches
9 will flow into those common source
10 Lines 103 and 104, correct?

11 A. That's correct.

12 Q. Now, I'm going to put into the
13 chat -- actually I've gotten to a point
14 where maybe it's good idea to take a quick
15 five-minute break.

16 A. I actually was going to propose
17 that myself. I'm a little cold, and I want
18 some tea. Could we do 10 minutes so I can
19 have a little tea?

20 Q. That's fine.

21 A. So 10:05 give or take.

22 Q. That's fine with me.

23 (Recess.)

24 (Exhibit Number 2002, which was
25 previously marked, was referenced.)

1 BY MR. HERMAN:

2 Q. All right. So I'm going to put
3 an exhibit that's been marked 2002 in the
4 chat. I'm not sure if you have that one.
5 You may need to download it.

6 A. I do not. I'll download it.

7 "Answer: Sorry, if we could
8 just pause for a second. Are we back on
9 the record? I'm not seeing the live
10 update.

11 (Recess.)

12 BY MR. HERMAN:

13 Q. Have you had a chance to
14 download Exhibit 2002?

15 A. I have. I downloaded and I
16 saved a local copy in case something went
17 wrong. Just to make sure, it's:

18 "Applications of AFM in semiconductor R&D
19 and manufacturing at 45-nanometer
20 technology and beyond;" is that correct?

21 Q. Yes.

22 A. I have that.

23 Q. So this is an article that
24 relates to various uses for automated
25 atomic force -- an automated atomic force

1 microscope or AFM in semiconductor
2 manufacturing, correct?

3 A. Well, the title certainly is
4 applications of AFM. I'm not sure about
5 the automated part, but it is an article
6 describing AFM in R&D and manufacturing per
7 the title.

8 Q. If you look at the abstract,
9 third sentence in, the abstract refers to
10 "automated atomic force microscope (AFM)."

11 Do you see that?

12 A. There is a sentence that says:
13 "Automated atomic force microscope
14 (AFM) has been used to meet the
15 challenge and characterize narrower
16 lines, trenches, and holes at
17 45-nanometer technology node and
18 beyond."

19 Q. Now, if you could turn to
20 page 6, and by 6, I'm referring to the
21 Bates labels in the lower right corner.

22 A. I am on page 6 for the Bates
23 labels.

24 Q. There's a section that is
25 entitled "3.3, Common Source Line."

1 A. There is a section entitled
2 "3.3, Common Source Line." I see that.

3 Q. And the second sentence in that
4 section reads:

5 "Profile of the CSL needs to be
6 monitored at each process step to
7 assure lines of low resistance which
8 impacts memory speed."

9 Do you see that?

10 A. You read that sentence
11 correctly.

12 Q. So that's referring to using the
13 microscope discussed in the paper to
14 monitor the shape of the common source line
15 to ensure that it is not shaped in a way
16 that increases resistance, true?

17 A. So I have had very little time
18 to look at this paper. I do note that the
19 image in Figure 9(a) is a PlanarFlash
20 device, not a 3D flash device. So I
21 question the applicability of the paper to
22 this patent.

23 Q. And in that section,
24 Section 3.3, there is no discussion of any
25 minimum quantum of common source lines that

1 must be present in a 3D-NAND device, true?

2 A. I don't understand your
3 question. What is a minimum quantum? I'm
4 thinking photons. Can you restate?

5 Q. A minimum number of common
6 source lines. There is no discussion of a
7 minimum number of common source lines that
8 must be present in a NAND device for it to
9 function properly in that section, true?

10 A. The section, which is about a
11 paragraph and two images, does not appear
12 to be describing 3D-NAND in any way.
13 3D-NAND is not mentioned. The image in the
14 section appears to be a conventional planar
15 non-3D flash device. There is no
16 description of 3D, either NAND or other
17 kinds of 3D that I see in this paragraph.

18 (Exhibit Number 2003, which was
19 previously marked, was referenced.)

20 BY MR. HERMAN:

21 Q. I'm going to put another exhibit
22 in the chat. This was previously marked as
23 Exhibit 2003.

24 A. I see that. I am downloading
25 it. I have 2003 up on the screen. The

1 title is, "A High Speed Low Power Negative
2 Sensing Architecture for 3D NAND Flash
3 Memory."

4 Q. So according to the abstract of
5 this paper, it relates to:

6 "A new sensing architecture aimed
7 at negative threshold voltage detection
8 for 3D-NAND flash memory cells."

9 Do you see that?

10 A. The first sentence of the
11 abstract is indeed:

12 "A new sensing architecture aimed
13 at negative threshold voltage detection
14 for 3D-NAND flash memory cells is
15 proposed."

16 Q. So this paper does not relate to
17 any particular design of a common source
18 line, correct?

19 MR. CROSS: Objection. Form.

20 THE WITNESS: I have no idea. I
21 have just seen this paper. I read the
22 first sentence of the abstract. I have not
23 looked through the paper. The paper is not
24 familiar to me.

25 (Exhibit Number 2004, which was

1 previously marked, was referenced.)

2 BY MR. HERMAN:

3 Q. I'm going to put another exhibit
4 into the chat. This one has been
5 previously marked as Exhibit 2004.

6 A. Okay. I have 2004 up on the
7 screen. The title is "Reset Current
8 Scaling in Phase-Change Memory Cells:
9 Modeling and Experiments."

10 Q. So, first of all, what is
11 "phase-change memory"?

12 A. So reading from the paper
13 itself, and I just jumped down into the
14 introduction:

15 "In phase-change memory, data
16 storage is accomplished by means of the
17 (reversible) process of phase change of
18 a chalcogenide material between
19 amorphous and crystalline states which
20 is triggered by material heating and
21 cooling (i.e., melting and quenching)
22 where the amorphous or crystal outcome
23 of the process depends substantially on
24 the chosen cooling procedure."

25 Q. So that's not the type of memory

1 that's discussed in '623 patent, correct?

2 A. I have seen no indication that
3 the '623 patent is referring to
4 phase-change memory.

5 Q. Now, if you could turn to
6 page 6, again, referring to the Bates
7 labels.

8 A. Page 6 of the patent or page 6
9 of 2004?

10 Q. Of 2004.

11 A. I'm on page 6 by the Bates
12 number.

13 Q. There's a section in the
14 rightmost column that starts "B. Reset
15 Current Density."

16 A. I see that section.

17 Q. So that's referring to reset
18 current density in the phase-change memory
19 that this paper is discussing, correct?

20 A. I have not had time to review
21 this paper. It is possible that this is a
22 tutorial discussion that is more generic.
23 It is possible that it is referring to a
24 specific aspect of the physics, which is --
25 applies everywhere. I just don't know

1 whether -- I've not had time to review this
2 paper sufficiently to answer your question.

3 Q. So sitting here today, do you
4 have an understanding of what "reset
5 current density" is?

6 A. I don't know how reset current
7 density is used in this paper. There are
8 many types of reset current densities
9 discussed. There are many types of current
10 densities discussed. I've not read this
11 paper. I can't opine on this without
12 sitting down and thinking about it.

13 Q. Now, I'm going to put up yet
14 another exhibit. This one has been marked
15 Exhibit 2005.

16 (Exhibit Number 2005, which was
17 previously marked, was referenced.)

18 THE WITNESS: And this is
19 entitled, "Chapter 2 - Limits and Hurdles
20 to Continued CMOS Scaling."

21 BY MR. HERMAN:

22 Q. That's right.

23 A. Hang on a second. I'm actually
24 going to save a local copy in case
25 something crashes. I'm now on the local

1 copy.

2 Q. If you turn to page 2, there's a
3 paragraph at the top of the page that
4 reads:

5 "In the interconnect region."

6 Do you see that?

7 A. No. Hang on. Oh, I see. Yes,
8 page 2 is kind of oddly formatted. I do
9 see at the top:

10 "In the interconnect region,
11 limits arise from increasing current
12 density as the cross-section of the
13 current carrying copper lines decreases
14 and the power and signal density
15 increases."

16 Q. So that interconnect region with
17 the current carrying copper lines, that's
18 referring to, for instance, interconnect
19 layers that are located over top of a
20 typical memory array, correct?

21 A. Again, I have not read this
22 paper in detail. It's not really a paper.
23 I've not read this document in detail. The
24 sentence in the interconnect region limits
25 arise from increasing current density as

1 the cross section of the current containing
2 copper lines decreases and the power in
3 single density increases, that appears to
4 be discussing a somewhat general concept
5 regarding the cross-section of copper
6 lines.

7 Q. The paragraph does not mention
8 common source regions, correct?

9 A. The paragraph does not mention
10 common source regions, that's correct.

11 Q. Now, I'm going to put one more
12 exhibit in the chat. That's Exhibit 2006.

13 (Exhibit Number 2006, which was
14 previously marked, was referenced.)

15 THE WITNESS: I have this on the
16 screen.

17 BY MR. HERMAN:

18 Q. So this is an article entitled,
19 "Novel ESD Protection Transistor," and then
20 it goes on.

21 Do you see that?

22 A. I do see that.

23 Q. So not a paper about the design
24 of a common source region, correct?

25 MR. CROSS: Objection. Form.

1 THE WITNESS: The paper's
2 entitled "Novel ESD Protection Transistor
3 including Silicone-Germanium Buried Layer,"
4 and it's discussing the -- the title
5 suggests it's discussing local temperature
6 overheating.

7 BY MR. HERMAN:

8 Q. And temperature overheating
9 caused, in particular, by ESD, which is
10 electrostatic discharge, correct?

11 A. ESD is indeed electrostatic
12 discharge, that's correct.

13 Q. So that's what this paper is
14 trying to address, the effects of
15 electrostatic discharge, true?

16 A. This is a paper that is, in
17 fact, talking about electrostatic discharge
18 in silicone-germanium buried layer.

19 Q. Now, you can put that aside.
20 And I'd like to turn your attention to
21 Exhibit 1004, which is the prior art
22 reference to Park.

23 (Exhibit Number 1004 was marked.)

24 BY MR. HERMAN:

25 Q. I'm going to put it in the chat,

1 but if you have it, you're free to use that
2 prior art.

3 A. I do have that. I am in Park.

4 Q. So Exhibit 1004 is the Park
5 prior art reference that you reviewed,
6 correct?

7 A. That's correct.

8 Q. Now, if you could turn to
9 Figure 3 of Park.

10 A. Okay. I'm in Figure 3 of Park.

11 Q. Figure 3 of Park depicts a
12 memory device 100, correct?

13 A. Yes.

14 Q. And as shown in Figure 3, that
15 memory device 100 is divided into eight
16 unit areas, which Park labels UA1 through
17 UA8, correct?

18 A. Figure 3 does indeed show eight
19 unit areas. They're actually divided into
20 two blocks which are labeled in the figure
21 Block 1 and Block 2. UA1, 2, 3, and 4 are
22 under the Block 1 indication, and UA5, 6,
23 7, and 8 are under the Block 2 indication.

24 Q. The figure also depicts a number
25 of common source lines 102 and 105; is that

1 right?

2 A. Yes. There is a common source
3 line 102 at the top, in the center, at the
4 bottom, and as we've discussed before, Park
5 has common source lines 105 that are broken
6 into a 103 and a 104 piece with a gap in
7 between.

8 Q. Now, counting in Figure
9 Number 3, there appear to be depicted nine
10 such common source lines, 102 and 105; is
11 that right?

12 A. There are three common source
13 lines in each block that are the 105 type.
14 There is a center common source line of the
15 102 type and two surrounding common source
16 lines also of the 102 type.

17 Q. So that would be three total
18 common source lines of the 102 type and six
19 total common source lines of the 105 type,
20 for a total of nine; is that true?

21 A. As depicted in Figure 3, that's
22 correct.

23 Q. Now, in Column 12 of Park,
24 starting at line 10 --

25 A. Hang on. I'm in the

1 illustrations here. Column 12 of Park,
2 line 10. I'm there.

3 Q. There Park states that:
4 "Figures 16 and 17 are plan views
5 of memory devices 200 and 200A
6 according to other examples of the
7 present inventive concept."

8 Do you see that?

9 A. I see that.

10 Q. So Figure 3 is also a plan view,
11 right?

12 A. Let me remind myself what
13 Figure 3 looks like. Yes, Figure 3 is also
14 a plan view.

15 Q. Figures 16 and 17 are plan views
16 of other embodiments in Park, correct?

17 A. Let me check my declaration on
18 this. I recall that Park has some
19 confusion over which embodiments go with
20 which figures. So hang on a second here.

21 I'm looking in my declaration.
22 This will take a few minutes. I remember
23 this was a -- okay. So why don't you ask
24 the question again because I do think we
25 have a discrepancy on what the embodiments

1 are.

2 Q. So in Column 12 at Line 10, Park
3 characterizes:

4 "Figures 16 and 17 as plan views
5 of memory devices according to other
6 examples of the present inventive
7 concept."

8 Correct?

9 A. That's what the sentence says.
10 That's correct.

11 Q. So identified by Park as
12 examples of its present inventive concept,
13 true?

14 MR. CROSS: Objection. Form.

15 THE WITNESS: So Column 12,
16 Line 10, definitely says:

17 "Figure 16 and 17 are plan views
18 of memory devices 200 and 200A,
19 according to other examples of the
20 present inventive concept."

21 BY MR. HERMAN:

22 Q. And the present inventive
23 concept that's being referred to there is
24 Park, correct?

25 A. It's not clear to me it's Park

1 as a whole or simply an earlier figure.

2 Q. Now, if you could turn to
3 Figure 16 and 17. Why don't we start with
4 Figure 16.

5 A. Okay. Let me do that.

6 I have Figure 16.

7 Q. So Park said this is a plan
8 view, and by "plan view," it means a view
9 essentially from above, correct?

10 A. The general understanding of
11 plan view is a top-down review from above,
12 and Figure 16 appears to be a plan view.

13 Q. Now, in this figure, the common
14 source lines are labeled 202 and 205; is
15 that right?

16 A. Let me double-check that. Going
17 down a couple of lines, it confirms that 16
18 is a common source line, it's 205, and
19 let's go see if we can find 206.

20 I am not seeing 206 identified
21 expressly as a common source line. If you
22 are aware of a place it's identified as a
23 common source line, feel free to point that
24 out.

25 Q. I believe 202 may be the other

1 common source line.

2 A. Okay. Why don't you reask the
3 question because I've confirmed that 205 is
4 one of the split common source lines that
5 is formed of 203 and 204. Is it 202 that
6 is the other common source line you asked
7 about?

8 Q. Yes.

9 A. That's my problem.

10 There it is. The first common
11 source line is 202 and the second common
12 source line is 205. I confirmed that from
13 Column 12, Lines 34 and 35.

14 Q. Now, Figure 16 depicts three of
15 the common source lines of the Type 202 and
16 two of the common source lines of the
17 Type 205, for a total of five common source
18 lines, correct?

19 A. That's correct.

20 Q. So in this example, there are
21 five common source lines, which is less
22 than the nine common source lines shown in
23 Figure 3, true?

24 A. There are two common source
25 lines of the 205 type and three of the 202

1 type within the figure. That doesn't talk
2 about things outside the figure. And five
3 is indeed less than nine.

4 Q. And Figure 17 also includes five
5 common source lines, correct?

6 A. Figure 17 is very similar to
7 Figure 16. There are two lines of the
8 203/204 type, three lines that are depicted
9 of 202 type, in a very similar way to the
10 previous figure with regards to the common
11 source lines.

12 Q. So Park includes examples that
13 have as many as nine common source lines
14 but also includes examples that employ
15 fewer common source lines; true?

16 A. So the examples we've moved
17 through, Figure 17 illustrates five common
18 source lines of various types, Figure 16
19 illustrates five common source lines of
20 various types. And in some of the earlier
21 figures we discussed, I believe it was
22 Figure 3 that we've discussed at some
23 length, Figure 3 has three common source
24 lines of the 102 type and six of the 105
25 type.

1 Q. So they're examples in Park of
2 using both more and fewer common source
3 lines, correct?

4 MR. CROSS: Objection. Form.

5 THE WITNESS: Well, all the
6 examples in Park use the same number of
7 completed common source lines. They all
8 seem to have three. They have different
9 numbers of the segmented common source
10 lines depending on which particular
11 embodiment we're looking at.

12 BY MR. HERMAN:

13 Q. So in Figure 3, there are six of
14 the segmented common source lines, right?

15 A. In Figure 3, there are three
16 conventional -- I don't want to say that
17 word -- there are three of the 102 type
18 common source lines and six of the 105
19 type, whereas in the later figures, there
20 are still three of the -- three of the 206
21 type, for example, and two of the 205 type.

22 Q. So in the later figures, you're
23 referring to Figures 16 and 17?

24 A. Figures 16 and 17, that's
25 correct.

1 Q. So in Figures 16 and 17, I think
2 what you were trying to say is that
3 compared to Figure 3, some of the divided
4 common source lines have been eliminated,
5 correct?

6 MR. CROSS: Objection. Form.
7 Objection. Mischaracterizes prior
8 testimony.

9 THE WITNESS: Yes. All I was
10 attempting to say is that there are two
11 types of common source types in our
12 discussion: There is a continuous type
13 represented by, for example, 206, and
14 there's a segmented type represented, for
15 example, by 205, and all of the figures
16 appear to have three of the 206 type but
17 varying numbers of the 205 type, and we've
18 discussed both 2 and 6 as some of the
19 options.

20 BY MR. HERMAN:

21 Q. And looking at Figure 16,
22 Figure 16 also has an element that's
23 labeled 211.

24 Do you see that?

25 A. I do see an Element 211.

1 Q. Now, Element 211 is Figure 16's
2 isolation insulation region, correct?

3 A. Let me double-check that against
4 the patent. I'm not seeing that clearly in
5 the patent. If you are aware of where
6 that's clearly specified and could point
7 that out, that could be helpful.

8 So hearing no response, I do not
9 see 211 described in the patent.

10 Q. Sure. So if you look at
11 Column 6, Column 6, Line 12, refers to an
12 isolation insulation layers 111.

13 A. 206. Sorry, Column 6, Line 12,
14 it does indeed refer to isolation
15 insulating layers 111.

16 Q. So in Figure 3, the common
17 source lines are 102 and 105, right?

18 A. That's correct.

19 Q. And the isolation insulation
20 layers are 111, correct?

21 A. That's correct.

22 Q. Now, in Figure 16, the common
23 source lines are given the numbers 202 and
24 205, correct?

25 A. That's correct.

1 Q. And there's an element that's
2 labeled 211, correct?

3 A. That's correct.

4 Q. Is it your understanding that
5 that is that figure's isolation insulation
6 layer?

7 MR. CROSS: Objection. Form.

8 THE WITNESS: So 211, as
9 illustrated in Figure 16, is consistent
10 with nomenclature elsewhere in the patent
11 for 111 and 311, but I do point out it is
12 not described anywhere in the patent. So
13 this is an assumption based on the other
14 two figures.

15 BY MR. HERMAN:

16 Q. Reviewing those figures, is that
17 what you would assume 211 to be, the
18 figure's isolation insulation region?

19 A. I have not reviewed this in
20 detail. It is not obvious that it's
21 identical to me. I do acknowledge the
22 similarity in the numbers. I acknowledge
23 the similarity in the location, but I have
24 not looked through this figure to the level
25 of detail to absolutely confirm that 211 is

1 identical in nature to 111 and 311.

2 Q. Now, if you were to compare
3 isolation insulation layer 111 in Figure 3
4 with what's labeled as 211 in Figure 16,
5 the Element 211 in Figure 16 has a greater
6 dimension or greater length in the X
7 direction than the element in 111 in
8 Figure 3, correct?

9 MR. CROSS: Objection. Form.

10 THE WITNESS: So first -- none
11 of these figures have dimensions on them.
12 So are you simply asking me to compare the
13 size of the structure as it appears on the
14 screen between the two figures?

15 BY MR. HERMAN:

16 Q. So two things: Number 1, do you
17 think one of ordinary skill in the art can
18 extract information about dimensions from
19 Park's figures?

20 A. So it is not typically assumed
21 that dimensional information can be taken
22 from figures in a patent. Typically,
23 figures in a patent are representative,
24 especially in semiconductor patents where
25 the dimensions are very small. So I don't

1 believe that a POSITA would assume any
2 dimension for an object, particularly in
3 comparison between two different figures.

4 Q. So you would not conclude just
5 because Figures 3 and Figures 16 show those
6 Elements 111 and 211 as differently sized,
7 that they are, in fact, differently sized;
8 is that correct?

9 A. Let me make sure I have the two
10 figures on the screen. Figure 16 is one of
11 them, and what was the other one?

12 Q. Figure 3.

13 A. Figure 3. Sorry.

14 If a POSITA was looking at
15 Figure 16 and Figure 3 side by side, I don't
16 believe a POSITA would make any conclusion
17 on the length of -- the absolute length of
18 the 111 or 211 lines simply based on these
19 two figures.

20 Q. And the same would apply to
21 Park's other figures showing 111, 211, and
22 311; is that true?

23 A. There are two separate questions
24 here, and I think we need to be a little
25 bit cautious. Are you asking the question

1 about simply the dimension as depicted in
2 the two figures? In other words, are you
3 asking a question about scaling the
4 dimension off the figure?

5 Q. Yes.

6 A. So I would say, in general, it
7 is -- a POSITA would simply not scale a
8 dimension off of a figure, although a
9 POSITA might look to the relationships
10 between that dimension and other elements
11 in the figure.

12 (Exhibit Number 1005 was marked.)

13 BY MR. HERMAN:

14 Q. Now I'm going to put one more
15 exhibit in the chat. You probably also
16 have a copy of this one. This is
17 Exhibit 1005, which is the prior art
18 reference to Shibata.

19 A. Okay. I'm downloading that. I
20 do have a copy of this one. I'm just
21 double-checking it's the same. This looks
22 like an unmarked copy of Shibata. It
23 matches my copy. So I will use my local
24 copy as they appear to be identical.

25 Q. Now, Shibata is one of the prior

1 art references that you reviewed, correct?

2 A. That's correct.

3 Q. If you could turn to Figure 16
4 of Shibata for me, which is on page 17 of
5 the PDF.

6 A. I have Figure 16 of Shibata on
7 the screen. Hang on a second. I'm going
8 to rotate it.

9 I have Figure 16 on the screen.

10 Q. There are a number of lines that
11 are labeled on the left side of the figure.

12 Do you see that?

13 A. The lines labeled word line,
14 word line, word line, excuse me, "WL, WL,
15 WL."

16 Q. Yes.

17 A. I see those.

18 Q. And those are the word lines,
19 correct, the ones labeled "WL"?

20 A. That's my assumption.

21 Q. And there are nine of those?

22 A. There are indeed.

23 Q. And the figure shows that there
24 is one top select gate that's labeled SGD0,
25 correct?

1 A. Correct.

2 Q. And there are three bottom
3 select gates labeled SGS0A, SGS1A and SGSB,
4 correct?

5 A. That's correct.

6 Q. Now, I recognize in your
7 declaration you address whether it would
8 have been obvious to replace those three
9 bottom select gates with just one bottom
10 select gate. That's an issue you
11 addressed, correct?

12 A. That's correct. I point out
13 that the Shibata reference has very key to
14 its disclosure that multiple select gates
15 are used to access the various blocks.

16 Q. Now, assume for me that you did
17 replace those three bottom select gates
18 with just one bottom select gate that's
19 divided in the way described in the
20 petition. Can you make that assumption for
21 me?

22 A. So let me understand what we're
23 trying to do here. Give me a second here
24 to catch up with my declaration because I
25 believe this was -- this configuration was

1 already discussed by the opposition, by the
2 petitioner.

3 So are you referring to the
4 configuration that I show at the bottom of
5 my page 92, Bates Number 96, where the
6 bottom gates are replaced by a single SGS0?

7 Q. That's right, yes.

8 A. Okay. Yes, I understand the
9 proposed modification as illustrated by the
10 petitioner on page 96 and 97 of the -- of
11 my declaration.

12 Q. So in Figure 16, if you counted
13 up all of the select gate word line -- the
14 top select gate word line and the bottom
15 select gate layers, there is a total of 13,
16 correct?

17 A. 14 actually. Maybe I
18 miscounted.

19 Q. I think you may have counted the
20 SL line. So if you included the SL line,
21 it would be 14.

22 A. I did include the SL line.

23 Q. So Figure 16 depicts, including
24 the SL line, 14 layers, correct?

25 A. That's correct.

1 Q. And that figure that's on
2 page 92 of your declaration -- or maybe I
3 should refer to page 96, which is the Bates
4 number in the bottom corner, as 12 layers,
5 including the SL layer?

6 A. That's correct. The bottom two
7 layers have been omitted by the petitioner
8 in that figure.

9 Q. And 12 layers is less than 14,
10 correct?

11 A. 12 is certainly less than 14,
12 that's correct.

13 Q. And if you included two
14 additional word line layers of what's shown
15 on 96, the device shown on page 96 would
16 still only be 14 layers, correct?

17 A. If I added -- if I take away two
18 layers of the SGS0A and SGS1A, and I put in
19 two word line layers, it would have the
20 same number of layers as Figure 16, that's
21 correct.

22 Q. Now, that device that you just
23 referred to would have the same number of
24 layers as Figure 16, but would have more
25 memory cells, correct?

1 MR. CROSS: Objection. Form.

2 THE WITNESS: It has more word
3 line layers, that's correct.

4 BY MR. HERMAN:

5 Q. And each word line layer has
6 along it a number of memory cells, correct?

7 A. That's the typical arrangement.
8 I do note that there are questions of dummy
9 word line letters.

10 MR. HERMAN: I don't have any
11 further questions.

12 THE WITNESS: You don't have any
13 further questions period?

14 MR. HERMAN: Yes.

15 THE WITNESS: Or do you mean
16 before lunch?

17 MR. HERMAN: No, just period.

18 MR. CROSS: Why don't we take a
19 15-minute break.

20 (Recess.)

21

22 EXAMINATION

23 BY MR. CROSS:

24 Q. Dr. Kuhn, can you open up your
25 expert declaration, please?

1 A. I have it open.

2 Q. Can you go to PDF page 11? And
3 if you can read paragraph 25?

4 A. Paragraph 25:

5 "In the course of conducting my
6 analysis and forming my opinions, I
7 have reviewed the references and
8 materials cited in the petition,
9 preliminary response, and herein,
10 including those listed below

11 Q. And that list goes on from
12 page 11 to page 12, correct?

13 A. That's correct.

14 Q. Do you see listed in there
15 Exhibits 2002, 2003, 2004, 2005, and 2006?

16 A. I do indeed.

17 Q. Did you consider these materials
18 when forming your opinions in your report?

19 A. I did. I considered them quite
20 some time ago in forming my opinions with
21 regards to the -- with regards to the
22 source region.

23 Q. And did you read the materials
24 at that time?

25 A. Yes, I did. And my opinions

1 around paragraph 144, which are regarding
2 that if you reduce the number of common
3 source lines, you are going to dramatically
4 degrade the memory device, and my exact
5 wording is "reducing the number of common
6 source lines would have several adverse
7 effects on the memory device," and I list
8 several well-understood effects, higher
9 resistance, increased heat generation,
10 increased electrical stress, significant
11 voltage drops, and crosstalk. And those
12 references were references associated with
13 those effects.

14 Q. And so you found those
15 references relevant to those effects?

16 A. I did. The section was
17 formulated quite some time ago, and I had
18 forgotten the references I've used, but
19 these are all fundamental physics effects.
20 They are not necessarily specific to
21 3D-NAND flash. They are applying or
22 applicable to all semiconductor devices.

23 And these four or five
24 references, as I actually mentioned in part
25 of my testimony, were discussing fundamental

1 physics issues that would be shared across
2 many types of devices.

3 MR. CROSS: Thank you. No
4 further questions.

5 MR. HERMAN: I don't have any
6 additional questions. With that, I think
7 we're done. Thank you for your time,
8 Dr. Kuhn.

9 THE WITNESS: Thank you as well,
10 Patrick. That was fun. Brief and fun
11 which was good. And I also want to thank
12 Monice. Your help makes all these things
13 possible, and I really appreciate that. If
14 you have any questions about bizarre words
15 I used, I'm sure there's some way we can
16 follow up and get clarity.

17 MR. HERMAN: We can go off the
18 record now.

19 (Whereupon, the proceedings
20 concluded at 12:10 p.m.)
21
22
23
24
25

CERTIFICATE OF REPORTER

STATE OF CALIFORNIA)
) SS:
COUNTY OF LOS ANGELES)

I, Monice K. Campbell, a duly
commissioned and licensed court reporter,
Los Angeles County, State of California, do
hereby certify: That I reported the taking
of the deposition of the witness,
Kelin Kuhn, Ph.D., commencing on Wednesday,
April 2, 2025, at 9:00 a.m.;

That prior to being examined,
the witness was, by me, duly sworn to
testify to the truth. That I thereafter
transcribed my said shorthand notes into
typewriting and that the typewritten
transcript of said deposition is a complete,
true, and accurate transcription of said
shorthand notes.

I further certify that I am in no way
related to any of the parties, nor am I in any
way interested in the outcome thereof.

(x) Review and signature was not
requested.

1 IN WITNESS THEREOF, I have hereunto set my
2 hand in my office in the County of Los Angeles,
3 State of California, this 7th day of April,
4 2025.

A handwritten signature in black ink, appearing to read 'Monice K. Campbell', written over a horizontal line.

5
6
7
8 Monice K. Campbell,
 CCR No. 14171

1 1 25:25 26:1,6,8,25 29:19 40:8 57:21, 22 68:16 10 45:18 58:24 59:2 60:2,16 10,950,623 9:10 100 19:20 20:2,15,22 21:3,5 24:12, 13,20,21 25:3,4,8 32:21 33:5,12,18 34:1,2,7,11,14,19,25 35:7,8,20 36:14, 15 37:17 38:8,21 39:14 41:13 42:7 57:12,15 1001 14:21,25 15:12 32:3 1004 56:21,23 57:4 1005 70:12,17 100s 35:25 102 57:25 58:3,10,15,16,18 63:24 64:17 66:17 103 44:2,5,16 45:4,10 58:6 104 44:2,6,17 45:4,10 58:6 105 44:1,15 57:25 58:5,10,13,19 63:24 64:18 66:17 10:05 45:21 111 44:7 66:12,15,20 67:11 68:1,3,7 69:6,18,21 11A 24:2 11b 19:3,6,10 21:18 22:17 23:22 24:2,3 11d 19:16,25 20:8 21:16 12 58:23 59:1 60:2,15 62:13 66:11,13 74:4,9,11 13 73:15 14 73:17,21,24 74:9,11,16 141 42:19,20,21 15 19:2,12,13 20:7 15-minute 75:19 16 59:4,15 60:4,17 61:3,4,6,12,17 62:14 63:7,18 64:23,24 65:1,21,22 66:22 67:9 68:4,5 69:5,10,15 71:3,6,9 73:12,23 74:20,24 16's 66:1 17 59:4,15 60:4,17 61:3 63:4,6,17 64:23,24 65:1 71:4 17th 9:12	18 19:14 1a 15:15,18 16:21,24 17:15,21,24 18:6,9,11 20:3,15,24 21:2,4 24:14,22 25:5,13,14,16 38:22,24 39:7,20 1b 28:22 29:14 31:10,13,14,23 32:8, 11,14,15,17 34:25 2 2 4:2 30:3,4,14,18 53:19 54:2,8 57:21, 23 65:18 20 18:15,17 21:7,9,11,12 22:20 200 59:5 60:18 2002 45:24 46:3,14 2003 49:18,23,25 2004 50:25 51:5,6 52:9,10 2005 53:15,16 2006 55:12,13 200A 59:5 60:18 2010 8:9,15,19 9:8,9 27:11 42:18 202 61:14,25 62:5,11,15,25 63:9 66:23 2025 4:2 9:12 203 62:5 203/204 63:8 204 62:5 205 61:14,18 62:3,12,17,25 64:21 65:15,17 66:24 206 61:19,20 64:20 65:13,16 66:13 21 24:6,7,24 211 65:23,25 66:1,9 67:2,8,17,25 68:4,5 69:6,18,21 26 15:24 29:3,22 27 18:22 28 15:24 18:18,22 21:8,10,11,12,20, 23 22:20 29:3,24 3 3 29:23 33:2 43:18 57:9,10,11,14,18, 21 58:9,21 59:10,13 62:23 63:22,23 64:13,15 65:3 66:16 68:3,8 69:5,12, 13,15	3.3 47:25 48:2,24 311 67:11 68:1 69:22 32 11:20 34 27:25 62:13 35 28:1 62:13 37 40:8,18 38 27:21,24 28:13 39 27:24 28:14,15 41:6 3D 20:21 40:9 48:20 49:16,17 50:2 3D-NAND 15:17,20 17:22,25 19:19 20:2,10 34:20 35:9,21 39:15,18 49:1, 12,13 50:8,14 4 4 57:21 45-nanometer 46:19 47:17 5 52a 29:11 30:1,2 32:22 42:5 52b 28:25 29:24 30:22 31:3,8,13,18, 25 33:3,10,21,24 34:5,10 35:5 42:6, 14 52c 28:24 29:16,22 31:4,10,12,18,25 32:23 33:4,11,22,24 34:6,10 35:6 42:6,13 5a 19:3,16,25 20:7 21:15 6 6 24:25 47:20,22 52:6,8,11 57:22 65:18 66:11,13 60 40:18 61 11:19,21,22 12:2,6 623 9:11 10:7,20 11:14,24 14:25 15:7,12 16:3,4,13,16 17:9 18:16 19:24 20:16 24:8,19 25:25 26:2 28:22 32:3 33:20 34:17 35:18,24 36:11,24 37:13 38:20 39:16,19,24 40:1 52:1,3 65 32:6 67 32:18
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