

571-272-7822

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG SEMICONDUCTOR, INC., and
SAMSUNG AUSTIN SEMICONDUCTOR LLC,
Petitioner,

v.

HOME SEMICONDUCTOR CORPORATION,
Patent Owner.

IPR2015-00459 (Patent 6,150,244)
IPR2015-00460 (Patent 6,146,997)
IPR2015-00466 and IPR2015-00467 (Patent 6,030,893)

Held: February 25, 2016

BEFORE: JONI Y. CHANG, JON B. TORNQUIST, and
BETH Z. SHAW, Administrative Patent Judges.

The above-entitled matter came on for hearing on Thursday,
February 25, 2016, commencing at 1:00 p.m., at the U.S. Patent
and Trademark Office, 600 Dulany Street, Alexandria, Virginia.

IPR2015-00459 (Patent 6,150,244)
IPR2015-00460 (Patent 6,146,997)
IPR2015-00466 and IPR2015-00467 (Patent 6,030,893)

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1 MR. RENNER: If we could approach the Bench, we
2 have copies of the presentation.

3 JUDGE CHANG: Do you have a copy for the court
4 reporter?

5 MR. RENNER: We have already given it to her.

6 JUDGE CHANG: Thank you so much.

7 MR. RENNER: May it please the Board, I'm Karl
8 Renner, I'm here on behalf of Samsung, as mentioned, with
9 Roberto Devoto and David Holt, and Dan Girdwood has joined us
10 as well. We are going to start today talking about the
11 IPR2015-00460, and that's the '997 patent and the Doshi
12 reference that applies thereto.

13 Slide 2?

14 JUDGE CHANG: May I interrupt?

15 MR. RENNER: Please.

16 JUDGE CHANG: Would you like to reserve rebuttal
17 time?

18 MR. RENNER: Yes, Your Honor, please, 30 minutes.

19 JUDGE CHANG: Thirty minutes, thank you.

20 MR. RENNER: And we are planning to address this
21 patent followed by the Miyazaki and Mak, the '893 patents, and
22 then finally the '244.

23 JUDGE CHANG: Okay.

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1 MR. RENNER: Your Honor, with respect to the '997
2 patent, I will focus really on just two questions or issues. The
3 first deals with the term "spacer," and the second with the term
4 "over." For each, there is two subset of issues, there are
5 construction issues as well as the applicability of Doshi reference,
6 each of which need to be addressed. And in each instance, the
7 institution decision applied Doshi consistent with Samsung's
8 construction, while concluding there was no real need to construe.
9 The decision also maintains the breadth of "spacer" and "over"
10 remains true to the petition and the institution decision, Samsung
11 believes that Doshi applies, even if HSC's narrow constructions
12 are adopted.

13 Now, HSC presents two arguments regarding the spacer
14 limitation. They indicate that Doshi can't apply because Doshi is
15 said to etch away the only structure identified as a spacer by
16 Samsung. This is their argument. And then second argument is,
17 even if Doshi hadn't removed the structure that we've all looked
18 upon, they contend that that structure itself doesn't qualify as a
19 spacer because of the construction they would like you to adopt.

20 Those constructions are going to be easier to discuss if
21 we first look at how Doshi actually operates and how it's
22 related to the '997 patent disclosure. Because the process
23 described by '893, it's exactly the same as the process described
24 by Doshi. The same conformal logic is etched and the same two

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1 manners and it leaves you with the same byproduct, and that
2 byproduct, we'll find, is the structure -- a structure that sits
3 upright next to the gate. That structure does space, as we'll see,
4 consistent with the claim.

5 Next slide, please. So, let's focus on the annotated
6 version of figure 2C of the '997 patent shown in the bottom right
7 of this figure. It shows a relatively minor -- pedestrian
8 semiconductor substrate, and talking from the bottom up, to make
9 sure we're all oriented, 50 is the substrate itself, and it has on it
10 diffusion regions or in its surface diffusion regions 58, shown in
11 the center, and between those, there's hashed sections that are --
12 that surround that diffusion region at -- those are gate electrodes.
13 It's all covered by the conformal region. And then in between
14 you can see there's a red highlighted section of an insulator layer
15 that sits atop of it. And finally, at the very top, there's a mask and
16 the mask window is what exposes or opens up the insulating layer
17 for potential etching.

18 So, ultimately, the red part is the insulator, that's
19 removed, we'll find, as is the flat part of the blue right below it,
20 the conformal layer, and that's also so that you can put a plug in.
21 That plug will connect with, electrically, the gate electrodes and
22 the hashes by using the 58, that diffusion region. So, it's
23 important that that plug contacts the diffusion region eventually,

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1 but it does not contact the gate electrode. Shorts are the enemy of
2 manufacturing.

3 And, so, we need structures, both the '997 discloses this,
4 as well as Doshi. We need structures like the upright blue that's
5 shown here to make sure that the plug that's inserted where the
6 red currently is doesn't contact the gate electrode. This is a
7 fundamental aspect of how we manufacture these chips. Without
8 that, you have shorts and malfunctions.

9 And in this way, as they describe, we'll see in '997, as
10 well as in Doshi, we see the removal of those two layers, the red
11 and then ultimately the blue right below it, you'll see the
12 preservation of the blue along the side of the gate electrode, and
13 through that, the conformal layer, that blue that's upright, it's
14 transformed into what the patent '997 labels as a spacer.

15 We'll see the same process in Doshi used. So, 2C is the
16 first of the two etches that's described with respect to 2C. In that
17 first etched step, it's designed to remove the portion, the
18 insulating layer we talked about, the red layer that's atop the
19 diffusion region of the substrate, that blue that's flat on the
20 bottom, and atop that structure a mask 66 we talked about is used
21 to focus that first etch, as well as the second etch.

22 And you can see the portion of the insulating layer, that
23 red part, it's defined by that width. I want to make sure that's
24 clear that that masked window has a certain width and the

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1 definition of where that etch comes down is defined by that
2 width. So you know what you're clearing using the etches by
3 how wide that is, and that will become important.

4 Slide 8, please. Figure 2D that's shown at the bottom of
5 this figure, this is again the '997, that shows the second of the
6 consecutive etches that are involved in creating the structure. The
7 '997 describes that second etch as anisotropic, and that means that
8 it's directional, etching from the top to the bottom faster than it
9 etches from the side to the side.

10 Now, you apply an anisotropic etch, in applying it, the
11 '997, it etches a hole through, as we talked about, the portion of
12 layer 30 that's in green at the bottom, right above the diffusion
13 region. Again, that's so the plug can insert in and actually make
14 contact with the diffusion region.

15 And it does so, it exposes that diffusion region in that
16 way. This kind of etch also impacts the top surface of the vertical
17 column, as you can see in green on the left and on the right, that
18 top surface is flat, and so a directional etch that's coming down is
19 going to impact that flat surface because it is, after all, in the
20 window that's opened up by the mask.

21 Now, as shown, the depth of the etching of that top part,
22 the green part, that is roughly the same as the thickness of the
23 layer being removed at the top portion of the diffusion region on
24 the bottom. You don't go all the way down, otherwise you would

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1 remove the spacer, and that's one of the fundamental pieces of the
2 '997 that you will see present in Doshi as well.

3 It's also consistent with it being anisotropic that that's
4 the case. In the '997, it shows the vertical face of the column, the
5 vertical face, the part that is literally vertical, that blue section
6 between the greens that is largely unaffected by the second etch.
7 In other words, the etch isn't going this way, that would be
8 isotropic, anisotropic is straight down.

9 So, at the end of this process, the second process, we
10 see the green is removed, we see that you leave behind the
11 diffusion region exposed to an interface with that plug, and while
12 leaving behind that vertical pillar, also the blue pillar is left
13 behind as well. The vertical pillar therefore separates the gate
14 electrode and the conductive plug so you don't have the shorts.

15 Now, slide 8 copies claim 1, and you can see we've used
16 some coloring in claim 1 to describe in (e), element (e), that's the
17 element that's at issue primarily here, we have anisotropic etching
18 in green and we see correspondingly in figure 2D the green is
19 used to show what the anisotropic etch will do. In yellow, we see
20 the claim, it requires the diffusion region to be exposed, and sure
21 enough, the diffusion region we show in yellow, that would have
22 the green removed and be exposed. And in blue, we see in the
23 claim that there's going to be a spacer that results, and sure
24 enough there's a spacer in the '997 patent.

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1 And we see precisely the same disclosed in Doshi. So,
2 let's go to that so you will see, I took the time here so you
3 understand when we see Doshi, we see the same kind of
4 disclosure, we see the same kind of etching process, and we
5 ultimately the same kind of product, the spacer.

6 Slide 12, please. Now, referring to slide 12, just like the
7 '997 patent, Doshi does disclose a two-step process, that's not at
8 issue, there's no debate over that. And it's to do a self-aligned
9 contact hole formation, again, no dispute there.

10 As to the first etch, consistent with '997, we see here in
11 yellow the insulating layer, the BPSG, but that's being removed
12 for the first etch, and it's done so because you have a red
13 conformal layer, it's shown in red in this figure, it overlays just
14 like the blue did in the disclosure we highlighted from '997, that
15 guides where that first etch goes to make sure that it doesn't take
16 out the gate electrode.

17 Slide 16, please. As for the second etch, that's the
18 second etch done by Doshi shown here in slide 16, we look at
19 figure 3g from Doshi, and we've got an annotated version of it
20 here. And we look, also, if you look at the lower left of this slide,
21 at column 10, some text from column 10 that is pretty critical to
22 the case here, is shown. The second highlighting in that column
23 10 text is interesting.

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1 We're going to read that together. It's "the brief nitride
2 etch" is what's being described here. That second etch that's
3 being performed, it's brief. The second quality that it has, as
4 underlined in that text, is that it's "highly anisotropic." So, not
5 only is it anisotropic, it's highly anisotropic. Doshi is very careful
6 to describe exactly what kind of etch it's using, brief, highly
7 anisotropic.

8 Why is that? Because just like you saw in '997, Doshi
9 tells you that it's concerned about shorts. If you look to the first
10 highlighted section here, you can see that the damage to the
11 corners of the gate structures 10 and 11 is substantially -- needs to
12 be substantially minimized. Again, why? Because shorts. We
13 know we don't want that contact plug to interface with the purple,
14 which is -- and this is the purple gate electrode. If you have that,
15 you have a short.

16 So, we've got to make sure we preserve the material in
17 between. And we have a stated objective here in Doshi that you
18 do just that. You substantially minimize the damage to 11, the
19 side wall filament 11, and you use this conformal layer to do that.
20 The second etch that's actually being performed is exactly the
21 same process that's been described in '997. A short that is long
22 enough to expose the diffusion region by eliminating the yellow
23 that's just over top the green, short, anisotropic, highly
24 anisotropic, really a very directed top to bottom etch is used so

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1 that you don't penetrate too deeply these vertical columns, and
2 ultimately you leave that red vertical column, 30, there.

3 So, you transform the conformal layer into the red
4 vertical column, and that's what you're left with. And that
5 vertical column, sure enough, it's a spacer.

6 So, we see in Doshi, this disclosure and its text. I want
7 to be very clear on that. This is part of the text in Doshi. We see,
8 also, corroborating figure, figure 3g, and it's consistent with the
9 objectives, the description and the technology that's described
10 here that you would see these structures persist.

11 Now, HSC has argued that Samsung relies on figure 3g
12 alone. As I've described, you can see that we don't, we rely on
13 the actual description, the detailed description actually that's in
14 the specification.

15 Doshi provides in it clear text, corroborating figures and
16 motivating explanation. And Dr. Rubloff, he notes that one of
17 skill would not perceive figure 3g as inaccurate when showing
18 that this pillar remains after the etching is done. That this is part
19 of what would happen on purpose because you're trying, again,
20 objectively, to not have shorts, you want to have that layer there.

21 And once you appreciate the anisotropic etch of Doshi
22 has to leave the vertical pillar to avoid shorts, things become
23 fairly straightforward. You know, for instance, in the '997, you
24 see that Doshi, it used the anisotropic etch we talked about to do

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1 two things at the same time. Number one, it clears and removes
2 the portion of 30 that covers the diffusion region, but at the same
3 time, that same etch, it restructures, it takes away, if you will, the
4 bottom part and creates the vertical pillar of 30 that's there. And
5 in that way, it transforms 30 into a pillar that separates the gate
6 and plug, a spacer, it forms a spacer.

7 So, simultaneously, that etch achieves the two goals that
8 are stated by the claim. Just as '997 did. The only difference, in
9 fact, between the Doshi and the '997 is Doshi's pillar, it's adjacent
10 to filament 11. You can see that there's a filament 11 right next to
11 it.

12 And so it's important that we look also at the term
13 "spacer." What is a spacer, right? Our contention is that the
14 spacer, each one of those is a spacer, and together they're a
15 spacer. Together, after all, they create space as between the two
16 conductors, the gate electrode and the plug that ultimately goes
17 in.

18 In fact, they're made of similar material, silicon nitride
19 forms most of these layers. So, adding additional silicon nitride
20 or retaining that in layer 30 only makes sense, it's going to be the
21 same kind of structure.

22 Next slide, please, that's 13. So, atop slide 13, we show
23 the construction that we had advocated in the original petition.
24 You know, Your Honors had looked at it and you decided it just

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1 wasn't necessary to actually construe the term "spacer," but we
2 wanted to remind you of the fact that we just put in a structure
3 that spaces between two conductive structures. And we put in a
4 definition that supported that, spacer was one that spaces, it's just
5 something that creates space, right?

6 We're not here to advocate that you need to adopt this
7 construction, that's not our objective. Our objective is, instead, to
8 look through this lens at the construction that you're being offered
9 by HSC to the contrary. And while HSC wants a narrowing
10 construction, you can see that this definition is the only definition
11 that's on the record that supports the word "spacer," and there's no
12 discussion of any kind of disclaimer, no additional or alternative
13 definitions, this is the only definition that exists.

14 So, we believe that it's actually inconsistent with
15 Federal Circuit precedent to suggest you need to go away from
16 this to a definition that would exclude -- or a construction that
17 would exclude this definition. In 2004, we have *In Re: Bigio* at
18 the Federal Circuit, 381 F.3d 1320 and 1325 say, "The PTO
19 should only limit the claim based on the specification or
20 prosecution history when those sources expressly disclaim the
21 broader definition." Clearly we have a broad definition, and
22 clearly we have no disclaimer, and we believe it would be
23 inappropriate.

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1 Next slide, 14, please. Now, the Patent Owner
2 response, we see that the contention is a spacer would have
3 purposeful design integrated into it. A purposeful design. We
4 looked -- so, even if we look past the lack of a definition or lack
5 of a disclaimer, when we look at what's actually being asked for,
6 we believe it's inappropriate, we believe it's actually inconsistent
7 with the Federal Circuit, it began authority to say that you would
8 read in a state of mind type of a limitation like this.

9 Next slide, please, number 15. And we've cited in the
10 record the *Amazon* case in particular, it's the middle of the first
11 clip here, that speaks to this, as well as a District Court case, but
12 there's a plethora of *juris prudence* on this that state of mind and
13 intent are not appropriate to read into claim limitations,
14 particularly in a construction fashion. We briefed this.

15 Slide 16, please. Now, as we began, Doshi applies to
16 either construction, we believe. We've already -- we show here
17 how it applies to either one, so the first is our construction was a
18 structure that spaces between two conductive structures. Clearly,
19 30, that is what's the spacer we're talking about, is left behind, it's
20 a structure. And surely, it sits between the gate electrode and the
21 conductive plug, so it indeed is a structure that spaces between
22 two conductive structures.

23 HSC's construction we think is equally met. That
24 construction was a structure designed to create physical

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1 separation. Designed to create physical separation. Well, surely,
2 there has been a lot of discussion already today and on the record
3 about how you go about forming this spacer and exactly where it
4 sits. Surely there was a design -- there was baked into that you
5 put this here through a process, carefully constructed, through the
6 etching process, you yield this, and indeed it does space. It
7 separates.

8 So, is it structurally designed to create physical
9 separation? We believe so. That separation being between
10 structures, conducting structures. Well, sure, the gate electrode
11 and the plug. And there's no evidence to the contrary, there's no
12 contrary argument, if you will, with respect to that.

13 Slide 20, please, we'll go to the second position. And
14 this we are dealing with dependent claims 2 and 9. Next slide,
15 21, please. We just reproduced the slides here for Your Honors'
16 review, and we note recollecting that the construction is debated,
17 as well the application of Doshi. The application of Doshi, it's
18 really a heads-I-win/tales-you-lose scenario, though. If the HSC's
19 construction is refused, then Doshi applies, as indicated in the
20 institution decision, and there's not a debate over that in the
21 record.

22 If the construction is adopted, we believe that Doshi still
23 applies and we'll talk about that in just a moment.

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1 So, what are we talking about? Slide 21 shows you
2 claims 2 and 9 as mentioned, and we use highlighting to show
3 how those relate to the features in question to the structures in
4 Doshi's figure 2B. The oxide layer in red, as you can see, is
5 formed over the diffusion region says the claim that's in yellow,
6 and on the side walls of the gate electrode, green.

7 Now, this is a figure from the subject patent itself. So,
8 we're just trying to show you how the claim relates to the
9 structure, and that is there is an oxide that's got to be somehow
10 over the diffusion region, and also along the gate electrode.

11 HSC takes issue with the word "oxide" and the term
12 "over." Next slide, 22, please. Their argument is that "over"
13 must mean "covering." It can't be over -- I mean, it can't be
14 above, it must mean covering. So, if there's a structure that's
15 above, that would be disqualified, says HSC, because over must
16 be covering. Now, we think that's, again, not supportable. We
17 have in our petition offered that forming an oxide layer above the
18 diffusion region would be an appropriate construction of the term,
19 and Your Honors, again, said that there's no real reason to
20 construe the term.

21 And again, we're not debating that with you, we just
22 think that the one thing we shouldn't do is we shouldn't construe it
23 so narrowly as to exclude this. And why is that? Well, for really
24 several reasons, but primarily there's a definition that we've

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1 offered into the record that tells you that "over" can be and should
2 be defined as above, consistent with what we said.

3 Now, in addition, you're going to find there's third party
4 evidence in the record that tells us that the word "over" is used by
5 people in the skill in this field to mean things as not above -- not
6 covering, my apologies.

7 So, next slide, please. So, again, here we offer that the
8 response suggests that covering is necessary by "over," and we
9 don't believe that that's the case. Now, on what basis is this
10 established? Citations to the '997 specification for usage. Not a
11 definition, not a disclaimer, but instead, there's several citations
12 made to the reference itself of the '997 reference to say that this
13 term is used in a certain way in that reference.

14 We would commend to you that when you look at
15 those -- they are both applicable to "over" and "covering." None
16 of them exclude "over" as "above," that is, in the way that would
17 be advocated today.

18 So, we suggest, instead, that "covering" is an
19 appropriate -- next slide, please. And importantly, here you see a
20 reference to the Becker patents. It's the 5,770,498 Becker patent,
21 it's Exhibit 1006, and it speaks -- if you look in the text that's on
22 the upper right, I quote, "forming a gate electrode over a
23 semiconductor substrate." For your reference, we highlighted
24 what is the gate electrode and what is the substrate. The gate

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1 electrode is red, the substrate yellow, and you can see this is how
2 people of skill use this term, "over." It means "above." Is red
3 covering the substrate? We don't see it covering the substrate.
4 So, we believe an appropriate application of that term would be
5 one that encompasses, includes the word "above."

6 So, with that, Your Honor, if there aren't further
7 questions, I'll turn to the '893 patent and talk about the first of the
8 two proceedings involved there, and that is the IPR2015-00466.
9 As my colleague is pulling up the slides, I want to show you
10 really quickly just to kind of get our brains off of the '997 patent
11 and into this. So, we've shown you in figure 8D, an annotation of
12 that on slide 10 of our presentation. I asked him to blow that up
13 here just so we can orient, again, ourselves.

14 What we see in this patent, the subject patent, that is the
15 '893, is the notion of reducing the stress that interferes with
16 manufacturing, that creates bonding problems and other
17 manufacturing issues, by complementing a first high-stressed
18 layer on a semiconductor, and that's the red layer here. You're
19 going to complement that with a second lower-stressed layer, and
20 that's in green. You're going to put that green layer right above it
21 so that the combined stress of the two comes down. And in that
22 way, you don't have manufacturing issues.

23 Now, you need that bottom layer to be high-stressed,
24 because you can see what it's doing is it's filling the contact hole,

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1 and as those holes get smaller and smaller, it's hard to actually fill
2 them without voids, without bubbles, if you will. And when you
3 have those bubbles, you, again, have manufacturing problems.
4 So, it's important to fill them, and it's interesting that Miyazaki
5 speaks of its solution being a solution that's applicable to 0.5
6 micron-sized holes or smaller. This is not greater than 0.5 micron
7 holes. That's the objective that it's trying to seek, it tells you
8 about this in its background. So, its holes are smaller than that.

9 Next slide, please. Now, slide 19, it sets out the full
10 compliment of issues that are disputed in the briefings, and there's
11 three of them that we put in our slides for Your Honors, but time
12 as it is, we're going to look really at the second and the third of
13 those issues. The first issue related to an argument by HSC that
14 Miyazaki had failed to disclose completely filling the contact
15 hole, and that's no longer in their slides, we believe that that is --
16 it's sufficiently briefed and so we're going to focus on B and C
17 here.

18 As to B, the issue concerns disclosure by Miyazaki of
19 separate chambers for depositing -- for depositing the first and the
20 second conductive layers. So, is there one chamber or are there
21 two chambers disclosed by the reference?

22 JUDGE TORNQUIST: Counsel, before we move
23 forward, would you agree that there's no claim construction
24 issues?

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1 MR. RENNER: I would, Your Honor. Yeah.

2 JUDGE TORNQUIST: Okay.

3 MR. RENNER: So, that's right, this case is really -- this
4 particular patent is really about the application of prior art.
5 Thank you for clarifying.

6 Slide 20, please. The sixth Miyazaki embodiment is
7 really the heart of the issue with respect to this particular patent,
8 and the coverage in Miyazaki of it. It discloses overtly, and
9 we've produced a clip at the bottom of the screen, of column 9, 52
10 to 58, where it discloses two separate chambers for depositing the
11 relevant layers. Now, that's consistent with the language you see
12 reproduced in claim 1 here that calls for the same.

13 So, you might ask, what's the issue? Well, HSC
14 contends that Miyazaki's sixth embodiment is devoid of
15 parameters, it doesn't talk about parameters to be used in the
16 depositing the two layers as disclosed. That's the contention.
17 And the disclosure by Miyazaki of the deposition parameters for
18 deposition, which appears in the earlier embodiments for the first
19 and second layers, the third through fifth embodiments, that's
20 suggested to be -- there's hindsight thought to be necessary by
21 HSC to bring that into the sixth embodiment.

22 So, we're going to talk about that sixth embodiment and
23 why we believe there's no need for hindsight to look to the earlier
24 embodiments 3 through 5 and bring in those parameters.

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1 Slide 22, please. Now, intrinsically, we see integration
2 of the third through the fifth embodiments into the sixth
3 embodiment expressly in the patent itself. This is disclosed, it
4 comes out of the sixth embodiment, its description, and you can
5 see reference callbacks to the third embodiment and again to the
6 third and fourth embodiment in the text itself that's describing the
7 sixth embodiment.

8 Additionally, we're going to talk about the integrated
9 nature of the teachings of these embodiments, and the fact that
10 they use the same figures when they're being described.

11 Slide 25, please. So, let's talk about the integrated
12 teaching for a moment. You'll see that in the third through fifth
13 embodiment, disclosure -- fairly detailed disclosure of the
14 different parameters, but each time they describe those
15 parameters, they stop by suggesting that these -- the resulting
16 structure would have a desired thickness as shown in figure 8D.

17 Look at embodiment 4, next slide, slide number 26 and
18 27, each time we highlight for you that there's a calling to this
19 desired thickness. Slide 27. Thank you.

20 That's the third, fourth and fifth embodiment, each one
21 leaves that desired thickness to one of skill. They also leave it to
22 the sixth embodiment.

23 Slide 23, please. In slide 23, we see that the sixth
24 embodiment, it actually discloses how you get to the thickness.

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1 That's one of the primary teachings in the sixth embodiment.
2 And that, of course, informs the third through the fifth
3 embodiment. We have Dr. Rubloff telling us this, when he reads
4 the patent, he sees 3, 4 and 5 disclosed, he sees the sixth as
5 complimentary to their disclosure, and he sees them
6 correspondingly complimentary to the sixth embodiment. After
7 all, the sixth embodiment, it leaves open, it says, hey, we know
8 that the -- we know that the manufacturing design that we've
9 talked about, that it can be used in a dual-chamber embodiment.
10 That's what we saw earlier from the clip.

11 Well, how else would someone read this reference? Of
12 course, they've already seen parameters set forth, they're going to
13 apply those parameters, there's nothing to suggest otherwise.

14 JUDGE TORNQUIST: But you do rely on elements
15 from embodiments 3, 4 and 5 to make up your case, correct?

16 MR. RENNER: Yes, Your Honor. So, embodiment 6
17 is believed -- we believe to encompass those as a consequence of
18 how it was written. So, the reference was written, and when they
19 got to embodiment 6, they said, we've already told you about all
20 the parameters, the particulars of temperature and flow. What
21 we're going to tell you now is about thickness and, you know, this
22 can be used in a multi-chamber embodiment.

23 One of skill, as Dr. Rubloff has said, when he reads that
24 sixth embodiment, he reads it with the third through fifth in his

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1 mind. Just like in a textbook, you wouldn't start at chapter 6 and
2 act as if chapter 3 through 5 weren't present. You would be
3 informed.

4 JUDGE TORNQUIST: But 3, 4 and 5 specifically call
5 out it's a single chamber, correct?

6 MR. RENNER: Correct, yes.

7 JUDGE TORNQUIST: So, why would you move away
8 from that, hey, this is in one chamber and then just assume that
9 you could go to two chambers with the sixth?

10 MR. RENNER: That's an excellent question. For the
11 same reason -- well, there's a variety of answers to that question,
12 one of which is there is an indication by the author, Doshi, that --
13 I'm sorry, Miyazaki, that you could use multichambered scenario.
14 He says this in a way that doesn't leave any doubt. In fact, let's
15 go back to the quote, that it would be implementable.

16 And we have Dr. -- thank you. The different
17 chambers -- the continuous formation, this is a single chamber,
18 continuous formation, he tells you, the reader, that it's not
19 indispensable, right? And he goes on right after that, as you can
20 see, to say, the tungsten film, layer one; tungsten film 16, layer
21 two; they can be formed in different chambers, or in different
22 deposition machines.

23 He's telling the reader, I don't think of this as a
24 difficult-to-deal-with task. Otherwise he might say more about it.

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1 He just tells you, as the reader, what you can do. And what we'll
2 find in the next slides is when we compare the ranges what were
3 given for his layer one and his layer two deposition, to what's
4 actually in the subject patent, we see complete overlap.

5 So, we see that the contention that's on the floor at the
6 moment is that it's really difficult to get from a single chamber or
7 somehow unpredictable to get to a multiple chamber. These are
8 predictable arts, and you can see that when you actually move
9 toward a multiple chamber, the '893 patent itself applies exactly
10 the parameters that are disclosed here. So, one of skill not only
11 would be led by this teaching to put in a second chamber, they
12 would also know that this author thinks that that's not too difficult
13 and the only thing he's provided for them, the thing necessary,
14 and the thing sufficient, are temperature ranges and flow rates
15 that are, indeed, sufficient.

16 And they're consistent with '893, and the Patent Office
17 has endorsed enablement. If you find that this teaching is
18 insufficient, we would wonder or call into question whether or
19 not the '893 is, indeed, enabled. Those of skill it seems at the
20 time knew that you use those parameters. Let's take a look at
21 those parameters, if we could, please.

22 Let's look at slides -- slide 5 first. So, slide 5, slide 5 --
23 yeah, slide 5, this shows us in the '893 patent itself where you get
24 to parameters of temperature and flow. Temperature is 450 to

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1 490 degrees Celsius, you can see that underlined. And just two
2 lines down below that, you can see that it says that the flow is --
3 oh, that's actually -- I'm sorry, Dave, let's go back one. Slide 4. I
4 want to go to slide 4 first.

5 This is the first deposition, and here you can see that the
6 temperature is 400 to 450 degrees, as underlined. And then 50 to
7 90 sccm, right below it.

8 Now let's go to slide 9 and we'll see what Miyazaki has
9 to say. It tells you 400 to 450 degrees, exactly the same
10 temperature, and it tells you 50 to 100 sccm, the same flow,
11 essentially.

12 Now we look at the same with the second. Let's go to
13 slide 5 now, please. The second flow is the second deposition,
14 again we go back to the subject of the '893 patent and we see that
15 the temperature is 450 to 490 degrees, as we earlier said, and you
16 look down and it's 15 to 60 sccm. Now, correspondingly, if you
17 go back over to Miyazaki, and we see that the temperature is
18 disclosed here, 450 to 500 degrees Celsius, the same range, 450
19 to 490 and 450 to 500, and the flow rate is also the same, 15 to 60
20 is what was in, I'll remind you, the '893, and this is 10 to 50.

21 If it was such a monumental leap to get from a single
22 chamber to multiple chambers, you would expect to see some
23 differentiated treatment in terms of flow and temperature, the
24 primary particles. And, in fact, we see that the ranges being the

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1 same, you don't see any more specific teaching in the subject
2 patent than you see here in this reference.

3 So, with that in mind, we believe that this defies HSC's
4 position that there would have to be some hindsight or other leap
5 to get from the disclosure that's in embodiments 3 through 5 of
6 those terms into how you would apply that into embodiment 6.

7 All right. So, we see that the -- let's go to -- yeah, so a
8 suggestion that Miyazaki fails to enable its multi-chamber
9 embodiment we believe would be contrary to the validity of '893,
10 which I was mentioning a moment ago, and given its disclosure,
11 no more narrow ranges than found in Miyazaki, we don't believe
12 that that patent would stand this test of enablement if, in fact,
13 those ranges weren't sufficient.

14 They are, indeed, disclosed. So, when you review, what
15 you have in this patent is you have a disclosure that says you
16 move to a multi-chamber. That's outright said. You also have
17 disclosure of the ranges. And there's no competing ranges for
18 that multi-chamber. The author has assumed that those ranges
19 would apply.

20 We have Dr. Rubloff on the record telling us that that's
21 natural and appropriate for those of skill and there's an
22 expectation of success. We'll leave the rest.

23 So, the third and final issue on the agenda for this, slide
24 number -- what is this slide number? And I'm going to go right --

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1 thank you -- is that the Jaeger, Wolf and Felix render obvious the
2 ranges of time that's in claims 10 and 23.

3 Let's look at slide 32, please. In slide 32, we've got the
4 time range as 10 to 100 seconds for the CVD process that's set
5 forward in these claims.

6 Slide 9, please. Actually, just stay at slide 9. This was
7 a good slide that they provided in that it summarizes, we thought,
8 the formula, so it was easy to see here. So, we went ahead and
9 used this, if you don't mind, just to set out that the thickness of
10 the layer, it follows from the size of the hole, and it's disclosed at
11 2,000 angstroms in the patent. And 17.5 angstroms per second
12 was a rate that was established in the prior art, it's undisputed that
13 would be applicable. This yields 114 seconds.

14 Now, I'll remind you, the claim said 10 to 100 seconds.
15 This is outside of the claimed range, and we don't dispute that.
16 So, the formula tells you, though, how you figure out how long it
17 takes. You look at the thickness of the layer and you divide it by
18 the rate. Not surprising.

19 Now, the patent, as you can see up top, it tells you that
20 the diameter of 0.5 microns is the thickness, it has a thickness of
21 the layer of 0.2 microns. We also know in the patent that is the
22 Miyazaki patent, that it tells us -- Miyazaki says that we're here to
23 solve problems that are 0. -- for holes that are no greater than 0.5

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1 microns. So, it's clearly applicable to holes that are smaller than
2 0.5 microns.

3 And the question is, how much smaller? So, is it 0.49?
4 Is it 0.48? What is it? Well, I can tell you if you apply this
5 formula, 0.43 will yield the claimed range, 98 seconds. But we
6 didn't want to stop there.

7 Next slide, please. Instead, we went and we looked at
8 Felix, which is -- really didn't give us much on Felix. So, we
9 went to Felix, and Felix tells you about a 0.35-sized hole, okay?
10 It tells you that people that are depositing tungsten in the art at the
11 time was a 0.35 size hole was known. When you apply 0.35 size,
12 and you're trying to, of course, with this invention, fill holes that
13 are of small dimension, right, no greater than 0.5, you decrease
14 the layer. And when you decrease the layer size, you would end
15 up with an 80-second formula. And HSC's slides bear that out.
16 They use the applicable formula, they show that 1,400 angstroms
17 is the thickness, and when it's divided by the rate in question, you
18 get 80 seconds.

19 The point is that the disclosure in Miyazaki is not
20 greater than 0.5 is the problem they're trying to address. When
21 you correspondingly decrease the size that is the thickness of that
22 layer, you end up with the rate being applied well within the
23 claimed range of time.

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1 Further questions? If not, I will have Mr. Devoto come
2 up and talk to you about the other Miyazaki or the other '893
3 patent. Thanks.

4 MR. DEVOTO: Thank you, Your Honors. Can you let
5 me know how much time I have left in the original 60-minute
6 budget?

7 JUDGE CHANG: Twenty-six minutes.

8 MR. DEVOTO: Twenty-six minutes, thank you.
9 Thank you, Karl.

10 I would like to discuss the invention of macrons in
11 rejection of the claims of the '893 patent first. Let's turn to slide
12 16, please. So, for our limited time together, I will focus on three
13 issues. First, I would like to show how Emesh in view of Mak
14 discloses depositing two tungsten layers in two separate chambers
15 at different temperatures. Then I will discuss how Emesh's
16 process renders obvious the WF6 gas flow range recited in claim
17 8, and if time permitting, I will show how Emesh's process can be
18 combined with Miyazaki to render obvious the claimed time
19 range in claim 10.

20 If we can move to slide 14, please. So, there's no
21 dispute that Emesh teaches the primary recited features of
22 depositing two conductive tungsten layers. In fact, as you can see
23 here in figures 2C, 2D and 2E. The only dispute is whether it
24 would have been obvious to a skilled artisan to modify Emesh's

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1 process to form these two conductive layers in two different
2 chambers instead of in a single chamber as disclosed in Emesh.

3 But as we will see in the next few slides, such a
4 modification of Emesh's process would have been obvious in
5 view of the teachings of Mak.

6 Now, let's start first with Emesh, and we'll stay on this
7 slide. You can think of Emesh as disclosing a recipe for creating
8 a semiconductor device. As we can see at the bottom of this
9 slide, slide 14, Mr. Multiel, the HSC's expert, agrees that Emesh
10 teaches a recipe in which a practitioner would perform three
11 steps. First, as shown here in figure 2C, a first conductive layer is
12 deposited in the single chamber of Emesh's deposition tool, which
13 is set to deposit the layer in a way consistent with the claims.
14 Such, for example, at a temperature of 430 degree Celsius.

15 Now, second, Emesh, as shown in figure 2D, this device
16 is then -- this fabricated device is then manually moved from that
17 single chamber, single deposition tool, to an entirely different tool
18 for etch-back, and that tool is used to etch back the first
19 conductive layer, as you can see here.

20 And then, third, as shown in figure 2E, the device is
21 taken out of the etch-back tool and put back into the single
22 chamber of the deposition tool, which is reset to a different set of
23 parameters so as to deposit a second conductive layer in the same

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1 way recited in the claims. In that case, for example, at a higher
2 temperature.

3 Now, unfortunately for Emesh, Emesh only had a single
4 deposition tool available for implementing its process, and it
5 specifies -- it provides the name of that tool as being the variant
6 CVD 5101 tool, and, in fact, Exhibit 2007 shows a lot of details
7 about the nature of that tool.

8 Now, this tool, using this single chamber deposition
9 tool, led to the undesirable requirement in Emesh's process that
10 devices had to be shuttled back and forth between that tool and a
11 separate etch-back tool during the process, and moreover, led to
12 the undesirable consequence that you had to change the settings
13 of that single deposition, single chamber tool, midway in the
14 process between the tungsten depositions.

15 I would like to move to slide 12, please. Now,
16 fortunately, other tools existed at the time of the '893 patent that
17 could be used to both simplify and improve Emesh's process.
18 One such tool is the AMAT 5000 tool which is described by Mak.
19 The AMAT 5000 tool is a cluster tool that has multiple chambers.
20 And as described in Mak, in the implementation of the tool
21 described in Mak, this tool conveniently has two distinct tungsten
22 deposition chambers that are shown here in red, as well as a
23 separate tungsten etch-back chamber that's shown here in green.

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1 All of these chambers are connected to a mainframe
2 chamber that's low contaminant, a mainframe chamber that has a
3 robotic arm that can shuttle wafers or devices between the
4 different chambers.

5 Now, as Dr. Rubloff testified, a skilled artisan would
6 have readily recognized that Mak's tool could be used to improve
7 Emesh's process by reducing contamination of that process and
8 improving the stability and increasing the throughput of that
9 process. HSC never disputed that Mak's tool would offer these
10 benefits to Emesh's process.

11 Now, I want to talk briefly about these benefits in just a
12 little more detail. First, Mak --

13 JUDGE TORNQUIST: Before you move on, I want to
14 make sure I understand the reference.

15 MR. DEVOTO: Please, feel free.

16 JUDGE TORNQUIST: There's a first chamber and
17 there's second chamber. I believe Patent Owner's argument, I'm
18 not sure you actually disputed it, was that those are running in
19 parallel. They're running at --

20 MR. DEVOTO: In Mak's process.

21 JUDGE TORNQUIST: Yes. Is there a disclosure in
22 Mak of actually returning, after you have planarized, to the same
23 chamber, or to a different chamber?

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1 MR. DEVOTO: Well, certainly there is a disclosure in
2 Mak of the capabilities of Mak's tool, and if you look at the
3 description of Mak's tool, what you will see is that it's a tool that's
4 made to allow you to simplify processes, and in allowing you to
5 simplify processes, in fact, there's even expansion chambers to
6 add new processes to the tool. And a skilled artisan recognizing
7 looking at that description, seeing the robotic arm that can move
8 wafers, would have no reason to believe -- in fact, Dr. Rubloff
9 confirms that that robotic arm could, in fact, move wafers
10 between any of these chambers from one to the other, depending
11 on the specifics of the process in which you're going to use that
12 tool.

13 JUDGE TORNQUIST: I guess I want to make sure I
14 understand. Is there an express disclosure in Mak of actually
15 moving the second deposition?

16 MR. DEVOTO: There is a disclosure -- well, it
17 depends on how you interpret "express." There's a disclosure -- if
18 you look at the first couple of paragraphs of Mak, they talk about
19 their tool. They say, hey, here's a tool, it's great because it offers
20 all of these advantages of reducing particle contamination, it can
21 create a lower-cost process because you can do multiple distinct
22 steps in a single process log, and it describes the mechanism by
23 which you can attach new chambers to the tool, and it describes a
24 robotic arm that moves things between the chambers.

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1 So, is there a leaping gun about saying that that robotic
2 arm can move things between the chambers? I think that would
3 be a reasonable leap, and certainly fully corroborated by
4 Dr. Rubloff's statement. And I would argue that if you look at
5 the -- at any material on the AMAT 5000 tool, you're not going to
6 find something that's going to say, oh, and by the way, that tool,
7 our robotic arm, it can't really move this flexibly between the
8 chambers. There's no indication to that effect. In fact, the
9 evidence is to the contrary, both reading Mak as well as based off
10 Dr. Rubloff's testimony.

11 Now, so, returning back to the benefits that can arise
12 specifically to Emesh's process by using Mak's tool, it should be
13 abundantly clear that this tool can be used to avoid the shuttling
14 back and forth of the devices between two different machines,
15 which obviously exposes the devices to contamination. With
16 Mak's tool, now you've got shuttling that actually occurs within
17 the mainframe chamber, which is a much lower, much more
18 contaminant-free chamber and can be used to move the device
19 from the etched -- from the tungsten CVD chamber to -- through
20 the robotic arm to the etch-back chamber and then back to
21 another CVD chamber to finish up the full Emesh process.

22 Now, that would reduce contamination, which, by the
23 way, is particularly important for Emesh's process, as Emesh
24 specifically says that its process is directed to fabrication of

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1 circuits that have high packing density. And as you can imagine,
2 if you're packing a lot of circuits in a small area, hence high
3 packing density, you better be reducing contamination, as even a
4 little bit of contamination could kill the whole circuit.

5 Now, the second reason why a skilled artisan would use
6 Mak's tool has to do with the fact -- and specifically use two
7 tungsten deposition chambers instead of one, is that that simply
8 introduces stability into the process. There's no need to switch
9 deposition settings of a single chamber midway through the
10 process. Instead, each chamber can be preset ahead of time to
11 both simplify the process and avoid having to wait for the process
12 parameters to settle down and change before you can put the
13 wafer in. It's an increase in thermal stability, yet again, desirable
14 for the type of processing that's envisioned in Emesh.

15 And lastly, use of Mak's tool would certainly increase
16 throughput for Emesh's process. Emesh's process is directed to
17 via sized circuit design. It's well known that in via sized circuit
18 design, you're thinking about, you know, mass production, high
19 throughput, efficiency, these are important criteria in these types
20 of designs of these circuits, so by utilizing two steady-state
21 chambers, which is available in Mak's tool, instead of one
22 chamber in which the settings must be changed midway through
23 the process, the throughput will be necessarily increased both
24 because both chambers can be used in parallel, and because of the

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1 need to not have to wait for the deposition parameters to be
2 adjusted, or for that matter to have to be settled after. The
3 deposition parameters to settle after those adjustments.

4 So, again, all three of these benefits would have been
5 readily apparent to a skilled artisan looking at Emesh,
6 recognizing that there are some deficiencies in the process and in
7 the way the process is implemented in Emesh, and then seeing
8 Mak and saying, hey, this is going to give me benefits by using
9 and implementing Emesh's process in Mak's tool.

10 Now, I would like to turn to slide 17. Now, Emesh is
11 certainly going to focus and, in fact, they did, you can see the
12 bulk of their arguments focus on the fact that Mak describes using
13 the AMAT 5000 tool to perform a different process to build a
14 different device than what is described in Emesh. And HSC will
15 tell you that neither of the unrelated Mak process, nor Emesh's
16 process, explicitly describes using two different chambers for two
17 different tungsten depositions.

18 The problem with this argument is that -- and the reason
19 why we assert in advance to you that it's not credible is because
20 it's treating a skilled artisan as if they were a robot, only capable
21 of adding the explicit teachings of the prior art, but as we well
22 know from the *KSR* decision, a skilled artisan is not an
23 automaton. They are capable of ordinary experimentation and
24 creativity. They are capable of fitting the teachings of various

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1 reference together as if they were a puzzle, using ordinary
2 creativity.

3 And we are submitting to you that that's all that's
4 required here, that the Emesh process clearly has these
5 deficiencies, you've got a tool that clearly addresses these
6 deficiencies, there is no leap of inventiveness to realize that you
7 should implement that process on that tool, which is what we're
8 submitting here. And in doing so, you would, of course, have
9 both tungsten depositions occurring in two distinct chambers and
10 thereby satisfy the claims of the '893 patent.

11 Do you have any questions on that?

12 JUDGE CHANG: No.

13 MR. DEVOTO: So, I would like to turn to the WF6 gas
14 flow range, but I'm a little concerned about how much time I have
15 left. Can you let me know?

16 JUDGE CHANG: Yes, you have 15 minutes.

17 MR. DEVOTO: I have 15 minutes left. So, then, I am
18 going to very briefly talk about claim 8 and the WF6 gas flow
19 range. So, as you can see here, the WF6 gas flow range limits the
20 range, this is a dependent claim that requires that the deposition
21 of the first tungsten layer use a WF6 gas flow of about 50 to 90
22 sccm.

23 Now, it turns out, let's turn to slide 21, that Emesh
24 discloses an example in which the WF6 gas flow can be 40 sccm.

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1 So, clearly, 40 sccm is actually outside the range of the 50 sccm
2 recited in that claim, but Emesh teaches that the important factor
3 for determining the characteristics of the deposited films, the two
4 tungsten deposited films in Emesh, is not the absolute H₂ and
5 WF₆ gas flows, but rather is the H₂ over WF₆ gas flow ratios.

6 Now, Dr. Rubloff declared that there are benefits
7 associated with increasing the WF₆ gas flow and even the H₂ gas
8 flow as well, while maintaining the H₂ over WF₆ gas flow ratio.
9 For example, by increasing the gas flow, as you can see here, the
10 residence time of harmful CVD byproducts, CVD reaction
11 byproducts, such as hydrofluoric acid, is reduced, which can
12 decrease damage to the devices, and moreover, the increased gas
13 flows can be more easily and accurately regulated than, say, gas
14 flows that are much lower.

15 Now, HSC has never asserted that these advantages
16 would not be gained by the proposed modification of Emesh to
17 use a higher WF₆ gas flow. Instead -- I would like to turn to slide
18 22, please.

19 Instead, HSC has again argued that a skilled artisan is
20 basically, again, automaton, a robot that would refuse to deviate
21 from the gas flow ranges explicitly disclosed in Emesh, treating
22 those gas flows as if they were on equal footing and equally
23 important as the H₂ over WF₆ gas flow ratios disclosed in
24 Emesh.

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1 But this is not credible, as Emesh and Mak make it
2 abundantly clear that the H₂ over WF₆ gas flows are more
3 important than the absolute gas flows in controlling the
4 characteristics of the two deposited tungsten films.

5 In particular, the H₂ over WF₆ gas flow ratios are
6 identified in Emesh as producing, for the first tungsten film, the
7 desired increased step coverage for that first tungsten film to
8 allow it to fill in these via holes, and then by using a low ratio of
9 6:8, you get that increased step coverage. And they also -- Emesh
10 also notes that increasing that H₂ over WF₆ gas flow to a range
11 of 20, a much higher range, will actually have benefits for the
12 second tungsten layer deposition, where now you increase the
13 smoothness of that layer, which is very desirable for four and five
14 repeat purposes for that second tungsten layer.

15 And now notice that the actual gas flows themselves are
16 simply relegated to examples in a table. They're relegated, they're
17 diminished to simply being listed in the table. When they talk
18 about the characteristics of these -- of the desired characteristics
19 of the films they're depositing, they focus on these ratios. That's
20 what's important. And this is further emphasized by the fact that
21 Emesh's entire summary and its claim 1 specify the desired H₂
22 over WF₆ gas flow ratios and make absolutely no mention of the
23 actual absolute gas flows at all.

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1 So, a skilled artisan would have certainly had a
2 reasonable expectation of success of enjoying the benefits of a
3 higher WF6 gas flow while still having a first tungsten film with
4 a high step coverage in view of the teachings of Emesh, rendering
5 this feature obvious.

6 JUDGE TORNQUIST: Why switch from the
7 disclosure of Emesh, which they have the ratio, it's within 6:8
8 falls within that broad scope. And it gives very specific gas flow
9 ranges. Why deviate? I mean, I guess, is this a question of --

10 MR. DEVOTO: Why deviate from the ratios or why
11 deviate from what?

12 JUDGE TORNQUIST: Your ratio is within -- I'm
13 looking at column 5. Just tell me --

14 MR. DEVOTO: Why change the gas flows?

15 JUDGE TORNQUIST: Right.

16 MR. DEVOTO: You change the gas flows because of
17 the reasons that Dr. Rubloff testified, which is that when you
18 have increased gas flows, you have some nice advantages that
19 arise from increased gas flows, such as the residence time of
20 these harmful CVD byproducts, such as hydrofluoric acids that
21 pops up when you do these CVD processes and can damage your
22 devices. That residence time is much smaller because the gas
23 flow is moving it in and out much faster.

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1 So, and there's also the advantage of more accurately
2 regulating the gas flows themselves. This was all testified to by
3 Dr. Rubloff, and remains unrebutted on the record.

4 Now, I think -- Judge Chang, could you let me know
5 how much time I have left?

6 JUDGE CHANG: Yes. About 10 minutes.

7 MR. DEVOTO: Okay, 10 minutes. Ten minutes,
8 wonderful, thank you so much.

9 So, I would like, with Your Honor's permission, I would
10 like to move to the '244 patent, if I may.

11 So, let's look at slide 2 of the '244 patent. The scope of
12 inquiry with regard to -- slide 2. Yeah. The scope of inquiry
13 with regard to this patent is quite narrow. HSC has not argued
14 separately for the patentability of any of the dependent claims,
15 nor has HSC argued against the combined ability of the primary
16 reference Nakamura with any of the secondary references.

17 Therefore, the scope of inquiry is really limited to the
18 independent claims. And, now, this table, the table on this slide
19 shows how we have applied the first and third embodiments of
20 Nakamura to the independent claims, and we've actually also
21 applied a modified version of the third embodiment where we
22 modified the third embodiment based on the teachings of the first
23 embodiment to render unpatentable all of these claims.

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1 Now, for HSC, HSC's patent to emerge unscathed from
2 this proceeding, they would actually have to prevail against all
3 three applications of Nakamura.

4 If we can move to slide 3, please. Now, the scope of
5 inquiry is further narrowed in that HSC has offered only two
6 arguments, one against each applied embodiment. In particular,
7 as we show on this slide, HSC has argued that each of the first
8 and third embodiments fails to satisfy one of the limitations
9 recited in the claims, specifically for the first embodiment, they
10 assert that HSC -- HSC's first embodiment does not recite the
11 limitation labeled (a) there, and for the third embodiment, they
12 assert that HSC's third embodiment does not satisfy the limitation
13 labeled (b).

14 If you can move to the next slide, 4. Now, as shown in
15 this slide, I would like to begin with a brief overview of the '244
16 patent, and then, given the very limited amount of time that we
17 have together, I would like to focus our discussion on the
18 application of Nakamura's third embodiment to the claims, and
19 leave the other applications to the briefs, as I simply don't have
20 time to describe or get into the details of them.

21 If we could move to slide 5, please. So, as the Board
22 correctly summarized in their institution decision, the '244 patent
23 is really about a method of fabricating a MOS transistor. And
24 they point to two important aspects of this method. They talk

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1 about the gate electrode being formed prior to the raised source
2 and drain electrodes, which are shown here in green. And
3 moreover, they also point to another critical aspect of their
4 invention, and that's that the definition of the raised source and
5 drains, which are shown in red, does not rely on the use of a
6 single lithographic step.

7 And, in fact, as I suggested, and what I basically just
8 said, as disclosed in column 3, lines 56 to 67 of the '244 patent,
9 the inventors themselves of the '244 patent believe these two
10 aspects to be "critical." They called them "critical aspects" to
11 distinguish their invention from the prior art. And, yet,
12 Nakamura discloses both of these critical aspects. So, it is quite
13 clear that the inventors of the '244 patent simply were not aware
14 of Nakamura.

15 Now, if we can move to slide 7, please. So, let's just
16 turn to the prior art reference Nakamura and see how its third
17 embodiment process compares to the claims of the '244 patent.

18 Slide 8, please. Now, as shown in this slide, just to
19 refresh your memory, embodiment 3 does, indeed, cover all of the
20 independent claims. And, indeed, if you find it applicable to the
21 claims, as we believe you should, properly construed, which
22 should render all of the claims in the '244 patent unpatentable.

23 If we could move to slide 9, please. So, here is a closer
24 look at claim 1. We have shown in red the particular feature or

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1 limitation that HSC has asserted as missing from Nakamura's
2 third embodiment.

3 Let's take a look at the next slide, if we could, 10. And
4 this slide kind of zooms in a little more closely on that one feature
5 that's alleged to be missing from the third embodiment. As you
6 can see, it's the feature that begins with removing said fourth
7 dielectric layer other than said portions masked.

8 Now, it turns out that claim 16, the other independent
9 claim, uses this exact same language. In claim 14, it uses the
10 same language but renames the third dielectric layer to be the first
11 dielectric layer and renames the fourth dielectric layer to be the
12 second dielectric layer, but all of these arguments should equally
13 apply to all of the independent claims.

14 Now, if we could move to the next slide, 18, please. So,
15 what we did with this slide is we tried to use color coding to try to
16 unpack this feature here. It's a big block of text and there's a lot
17 going on there. So, with the color coding, hopefully we can
18 unpack it and make a little more sense out of it.

19 So, first of all, we see only a single positively recited
20 step, and that is the step of removing portions -- sorry, excuse me,
21 removing the fourth dielectric layer, which is shown in purple.
22 We then see a positively recited step that includes a statement of
23 purpose, that's shown in blue here, indicating that the purpose of
24 this step is to form a plurality of trenches.

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1 We then see two wherein clauses. Now, these wherein
2 clauses are important. Now, the first thing I want to note is
3 neither of these wherein clauses explicitly refer back to the
4 positively recited step of removing the fourth dielectric layer.
5 There is no explicit language that refers back to it.

6 The first wherein clause, which is shown in red,
7 requires the claim process to expose portions of the substrate, and
8 the second wherein clause, which is shown in green, requires that
9 the claim process form spacers on the side walls of the gate
10 structures at the same time.

11 Now, the main dispute, and this is the focus of the
12 dispute, the central dispute between HSC and Samsung is over
13 the meaning of the term "at the same time" in the limitation,
14 which you will recall, that term is only in the last wherein clause.
15 Samsung agrees, we agree, with the Board's preliminarily adopted
16 construction that the term "at the same time" simply speaks to the
17 formation of the multiple spacers that are the spacers in that last
18 wherein clause, as you can see here.

19 We believe that that's the correct interpretation,
20 consistent with the plain meaning of the language, and consistent
21 with the patent specification. And if you agree with this
22 construction, and if you agree with the construction which was
23 the preliminarily adopted construction, there really is largely no

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1 dispute that Nakamura's third embodiment satisfies the recited
2 claims.

3 Now, I'm more than happy to go through how that is,
4 how we can walk you through Nakamura's process and show how
5 it satisfies all four of these features. It's actually shown in slides
6 19 and 20, but in the interest of time, unless you want me to, I
7 would leave that to the briefs for you to analyze.

8 Now, I should note that HSC does make one throwaway
9 additional argument that Nakamura fails even under this correct
10 instruction. And but that argument should be readily dismissed
11 by you, as it is based on an improper construction of the claim
12 language as limiting the recited term portions here to really mean
13 all portions, and that language does not say all portions that are
14 masked by this said second resist layer.

15 And if you take a look at what we have stated in the
16 brief, I think you'll find that, indeed, there are portions that were
17 not removed that were masked by the second resist layer, that the
18 removing of the fourth dielectric layer did, indeed, not remove,
19 and, hence, satisfying this limitation.

20 Now, before describing HSC's -- before describing
21 HSC's construction of this limitation, and the term "at the same
22 time," I want to make it abundantly clear that even if you were to
23 reconsider your construction, even if you were to reconsider it
24 and deem their construction, which we, again, believe is

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1 inconsistent with the spec and is overly narrow, but even if you
2 were to entertain using their construction, then Nakamura would
3 still render the claims unpatentable.

4 As it turns out, Nakamura's third embodiment modified
5 based on its first embodiment, if you recall, that was one of our
6 three applications, does, indeed, satisfy this feature under even
7 HSC's own construction.

8 Now, I would like to talk a little more detail about this
9 limitation, as there's a lot going on there, and I want to make sure
10 we're all on the same page as to what's going on with this feature.
11 With that in mind, let's turn to slide 15, please.

12 So, HSC asserts that the term "at the same time" in the
13 context of this limitation requires a single process step -- a single
14 process step of removing the fourth dielectric layer other than the
15 portions masked by the second resist layer that achieves the three
16 distinct results of: One, forming the plurality of trenches; two,
17 exposing portions of the substrate; and three, forming spacers on
18 the side walls of the gate electrode structure.

19 So, this single step, of removing the fourth dielectric
20 layer, has to give you all three of these results. A single process
21 step, as they call it. But HSC's construction simply cannot be
22 right. It cannot be right. First, the recited process step of
23 removing the fourth dielectric layer is clearly completed when the

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1 fourth dielectric layer is removed. After all, this step says
2 nothing more than removing the fourth dielectric layer.

3 So, once that fourth dielectric layer is removed, well
4 that step is done. That's just the plain language of the claim. And
5 as shown in figure 4, which we show here, the problem is that
6 once the fourth dielectric layer is removed, portions of the
7 substrate, which is one of the three results they say has to arise at
8 the end of this "single process step," has not been -- has not been
9 arisen.

10 As you can see here, portions of the substrate have not
11 been exposed at the end, or as the result of the single process step
12 of removing the fourth dielectric layer. And, so, therefore, it is
13 quite clear that this notion that removal of the fourth dielectric
14 layer, the single process step of removing the fourth dielectric
15 layer does not and cannot, in being consistent with the spec,
16 achieve all three of these results.

17 And that is, to reiterate, to be consistent with the spec
18 language and the claim, other subsequent steps, other subsequent
19 steps, in addition to that removal of the fourth dielectric layer
20 step, such as the removal of the third dielectric layer, which as
21 you see here, that's 26. That's layer 26. So, the fourth dielectric
22 layer is 28, you remove that, get into the exposed portions of the
23 substrate. You had to do something else, you had to remove the
24 third dielectric layer, 26. That's an additional step.

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1 And this -- and if we can move to the next page, excuse
2 me, slide 17, and this is purely consistent with the correct and
3 insightful analysis that Your Honors did when you were looking
4 at this term. Keep in mind, the whole point was that we were
5 fighting over what does the term "at the same time" mean, and
6 how broadly can you interpret it.

7 HSC has attempted to take out "at the same time," and
8 honestly, explode it out to say that there must be a single process
9 step that achieves all three of these results. We just showed that
10 that can't be. That can't be. That's inconsistent with the spec.

11 And you yourselves recognized that in your own
12 institution decision where you said, in fact, the claims require the
13 fourth dielectric layer to be deposited on the third dielectric layer,
14 and therefore we observed that the second step exposing portions
15 of the substrate must be performed after this first step of
16 removing portions of the fourth dielectric layer. You recognize
17 it. It doesn't occur at the same time, it occurs after, and this led
18 you to conclude correctly that "at the same time" must speak to
19 the formation of the plurality of spacers.

20 When you see "at the same time," it means that the
21 plurality of spacers are formed at the same time. And certainly,
22 an assertion that somehow it extends beyond that is simply
23 inconsistent with the spec, particularly the assertion that it has to

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1 be a single process step that gets all of these results. That's
2 inconsistent with the spec.

3 Now, I do want to talk about slide 18.

4 JUDGE CHANG: I'm sorry, counsel?

5 MR. DEVOTO: Now that we know that "at the same
6 time," properly construed, is in reference to the spacer formation
7 as we see here --

8 JUDGE CHANG: Counsel, your time is up.

9 MR. DEVOTO: How we deal with the two wherein
10 clauses, because they're still there --

11 JUDGE CHANG: Counsel? Your time is up.

12 MR. DEVOTO: Oh, my time has run out?

13 JUDGE CHANG: Unless you want to use some of your
14 rebuttal time?

15 MR. RENNER: I think we want to use a little bit more
16 of the time, so reduce it by five minutes, if that's okay.

17 JUDGE CHANG: Okay, that's fine.

18 MR. DEVOTO: So, there is still a conundrum here to
19 look at. And take a look at this claim, you do see these two
20 wherein clauses, right? So, the claim process does appear to
21 require that trenches be formed, portions of the substrate be
22 exposed, and spacers be formed. It appears to aggregate these
23 features in this same textural block, but unlike the *Griffin* case,
24 which is the only case identified by the Patent Owner in support

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1 of their position, there is simply no specific reference back to
2 the -- in these wherein clauses back to the positively recited step
3 of removing the fourth dielectric layer. And, therefore, there is
4 no clear tethering of these wherein clauses to that removal of the
5 fourth dielectric layer step.

6 But let's assume solely for the sake of argument that
7 because they're in the same block of text, that somehow that
8 means that these wherein clauses must somehow limit or further
9 modify the removing of the fourth dielectric layer, then, to be
10 consistent with the spec, these wherein clauses at most, at most,
11 indicate that the removal of the fourth dielectric layer is merely a
12 condition precedent to achieving the results, with other
13 unbounded, unspecified additional steps having to occur after the
14 removal of the fourth dielectric layer to achieve the results of
15 forming the trenches, exposing portions of the substrate, and
16 forming the spacers.

17 I mean, we know that. That third dielectric layer would
18 be one of those unbounded, unspecified steps that would have to
19 occur. So, and, of course, so what that means is if you're going to
20 use any -- if you're going to use these wherein clauses simply
21 because they're in the same block of text is somehow modify or
22 limit the removing step, well, it mostly modified by saying, hey,
23 that's one step of a multi-step process that ultimately achieves
24 these results.

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1 And guess what? Our claim doesn't tell you all the
2 extra steps to achieve the results. We didn't say exactly how.
3 What we do say is, well, maybe that removing step has to be a
4 conditioned precedent. It has to be one of the steps. And that
5 would be consistent with the spec, because the spec shows
6 additional steps, like removal of the third dielectric layer to
7 achieve these results.

8 And, of course, Nakamura satisfies this interpretation of
9 this limitation, as it does, indeed, achieve, as we've shown in the
10 briefs, all three of these results. And, indeed, to achieve them, it
11 requires the removal of the fourth dielectric layer as a condition
12 precedent to achieving these results.

13 Thank you.

14 JUDGE CHANG: Thank you.

15 MR. RENNER: Thank you. How much time is
16 remaining at this point?

17 JUDGE CHANG: Twenty-seven minutes.

18 MR. RENNER: Thank you, Your Honor.

19 MR. KAUFMAN: With the panel's indulgence, just so
20 we can change over the presentation.

21 JUDGE CHANG: No problem.

22 MR. KAUFMAN: Good afternoon, Your Honors, I'm
23 Craig Kaufman speaking on behalf of the Patent Owner, Home
24 Semiconductor. Unless the Board would prefer to proceed in a

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1 different order, we're going to go in a slightly different order than
2 Petitioner did. I am going to talk about the '244 and the '997
3 patents, and then my colleague, Mr. Chen, is going to talk about
4 the '893 patents. If that's acceptable to you, that's how we would
5 plan to proceed this afternoon.

6 JUDGE CHANG: As long as the record is clear.

7 MR. KAUFMAN: We will clearly indicate when we're
8 switching patents.

9 JUDGE CHANG: Okay.

10 MR. KAUFMAN: We have a set of extra
11 demonstratives for the panel as well as a set for the court reporter,
12 if you don't mind Mr. Chen approaching, he will distribute those.

13 JUDGE CHANG: Thank you.

14 MR. KAUFMAN: So, I guess it makes sense to start
15 where we ended, and talk about the '244 patent first. So, the '244
16 patent, as we recognized, they're arguing that the patent is
17 obvious in light of two embodiments, embodiment 1 of
18 Nakamura and embodiment 3 of Nakamura. Importantly,
19 embodiment 1 of Nakamura does not apply to claim 16. They
20 acknowledge that on their slide 2. And, so, if for some reason the
21 Board were to find that embodiment 1 of Nakamura would render
22 the claims 1 and 14 obvious, that would leave claim 16 intact.

23 There are claim construction issues, some of which
24 were not addressed by Mr. Devoto. The three claim construction

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1 issues, removal of the top portion in claims 1 and 14, the "at the
2 same time," which was the focus of Mr. Devoto's presentation
3 and which I will spend some time on here, and then the order of
4 the method steps, and again, that applies to claims 1, 14 and 16.

5 So, first, I want to talk about the construction of "the top
6 portion," and Samsung didn't propose a construction of this term
7 in their opening petition. It was a construction which we implied
8 from the way their expert was using the prior art, but this
9 construction that they proposed is too narrow and is inconsistent
10 with the invention that is described and claimed in the '244
11 patent.

12 Their view of "the top portion" is "any small portion of
13 the top." The analogy we used in our brief was if you consider
14 the frosting on the cake, our construction removing the top
15 portion is like taking a knife across the top of the cake and taking
16 a layer of the frosting off all the way across. Their construction
17 is, I can take a candle and I can poke a hole in the frosting here
18 and then I can poke a hole in the frosting there and that is
19 sufficient removal of the top portion of the frosting.

20 If we look at the specification, the specification is clear
21 that the only description of something called "the top portion" is
22 the planarization or removal of this red or pink highlighted area
23 during the process. This is described in column 5, lines 6 through
24 12, and being done by chemical mechanical polishing, it takes a

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1 layer all the way off the top. The limitation requires exposure of
2 the third dielectric layer -- third dielectric layer here, which is
3 done, you can also see that here in figure 4 of the '244 patent,
4 slide 4.

5 Now, Samsung in their reply argues that, well, if you
6 look at the term "portion" and the term "top" separately, that their
7 construction is acceptable and consistent with those words in a
8 disambiguated context, but in the context of the '244 patent,
9 which is how we have to construe the claim, the only use of the
10 term "top portion" is in the context of planarization, and the top
11 portion is removed consistent with Home's construction.

12 Now, this matters, as I'll get to in a minute, because the
13 first embodiment of Nakamura, I was going to call it Doshi there,
14 but Nakamura, does not disclose a planarization step that exposes
15 the third dielectric layer. It planarizes, but it planarizes the fourth
16 dielectric layer at a level that does not expose it. And, so, it does
17 do that step, it just doesn't get to the second part of that step,
18 which is then exposing the third dielectric layer.

19 The second term for construction is the term "at the
20 same time." This was the thrust of Mr. Devoto's argument. And
21 the context here really is do the -- do the three portions of the
22 step, the etching and the two wherein clauses, have to occur as
23 part of the same process or not. And the answer is, yes, they do.

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1 Let's look at the limitation. Mr. Devoto spent a lot of
2 time talking about how the '244 specification didn't teach a
3 process that etched through the fourth dielectric layer, and then
4 down here, etched through the third dielectric layer to expose the
5 substrate and also form the gates.

6 But that's simply not correct. We've reproduced the
7 relevant passage from the specification here, and it specifically
8 says "the etching etches down to remove the portion of the third
9 dielectric layer 26 on top of the gate electrode structure." And it
10 shows in figures 4 and 5 that the anisotropic etching occurs and
11 then it removes those structures. So, we would submit that the
12 specification precisely supports our construction, as well as the
13 language of the claim term itself, which defines these three things
14 as occurring as part of the process.

15 Moreover, when we cross examined Dr. Rubloff on this
16 point and we asked him about the meaning of the claim,
17 Dr. Rubloff said, yes, all these things should be part of an etch
18 step. That's consistent with our construction of the claim.

19 Now, in reply, with their reply, they submitted the
20 declaration, a reply declaration from Dr. Rubloff that says, hang
21 on, wait a second, I was confused -- I didn't realize you were
22 asking about the claim, and I was talking about the preferred
23 embodiment, I wasn't talking about the claim-- but to the extent

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1 that he made that statement three months after his deposition, that
2 statement should be given no credit or weight.

3 Dr. Rubloff's testimony was clear and unambiguous in
4 his original cross examination. On recross, after his reply
5 declaration, he acknowledged that he understood that they were
6 applying the claims, and so to the extent that he tries to explain
7 away what is a difficult issue for Samsung now, through his reply
8 declaration, that reply declaration simply should be given no
9 credit on this issue and the cross examination testimony should
10 control.

11 Finally, we have the order of the method steps. Our
12 position is that the steps of the process are recited in a particular
13 order, they need to be performed in that particular order, and the
14 reality is there are just a couple of steps that Samsung asserts
15 don't need to be part of the order, and that is removing the top
16 portion of the fourth dielectric layer, and then forming the
17 substrate of the patent that exists to mask portions of the fourth
18 dielectric layer.

19 So, we can stop for a moment, and the record from both
20 Mr. Maltiel and Professor Rubloff is clear that in general, in
21 semiconductor processing, the order of steps is important. You
22 typically don't want to go messing around with the steps because
23 changing the steps has consequences. Samsung cites *Interactive*
24 *Gift Express* in that the Board in its initiation decision adopts

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1 *Interactive Gift Express*, which is the Federal Circuit's
2 commentary, one of the Federal Circuit commentaries on
3 ordering of steps in claims.

4 And the general rule, I guess, as could be said to be the
5 claim steps order doesn't matter except when they do. And you
6 look at the spec and the claim language to determine when they
7 do. And in *Interactive Gift Express*, unlike here, the preferred
8 embodiment of describing the specification did not match the
9 order of the steps that the Patent Owner was trying to assert. The
10 Patent Owner was saying, follow the order of the steps as written,
11 but if you looked at the preferred embodiment, it did step three,
12 then step four, then step two. It jumped around, so there was
13 clear evidence in the specification in that case that showed that
14 order was not important.

15 In this case, the specification describes the process
16 being performed in a specific order, the specific order that
17 matches Home's proposed construction, i.e. that different steps
18 should be performed in a particular -- in the claimed order
19 because they need to be done that way.

20 Moreover, Mr. Maltiel explained why that is so. You
21 have to planarize, or remove the top portion and make it even
22 before you put on the mask. And there are a couple of reasons for
23 that. The first reason that Mr. Maltiel talked about is that a flatter

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1 surface gives you a better photoresist mask that exists down the
2 further processing, which is more accurate.

3 The second, and, of course, this logically follows, if you
4 form the mask first, and then you planarize or remove the top
5 portion by planarizing, one of two things is going to happen:
6 Either you're not going to be able to planarize, because the mask
7 is going to interfere with the polishing, and the removal; or,
8 you're going to remove the mask, which then is problematic
9 because the next steps require you to etch the areas that are
10 covered by the mask, and if the mask has been removed before
11 the etching occurs, you cannot create the additional structures that
12 are required by the etching process.

13 We asked Dr. Rubloff about it in his cross examination,
14 you can see that the -- that there were these problems, and that he
15 would need to, you know, invent a new way effectively if he was
16 going to try to do chemical/mechanical polishing while
17 preserving the photoresist intact.

18 One last issue before we go to the merits. An additional
19 reason for rejecting Samsung's construction is that Dr. Rubloff
20 testified that he came up with the idea for this construction from
21 the prior art, that is instead of following the normal canons of
22 claim construction, which is that we look at the claims themselves
23 and then we look at the specification and the intrinsic record and
24 decide what the claim means, that he went to the prior art and

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1 looked at the prior art and said, well, the prior art does it
2 differently, so I can change things around, and that turns normal
3 motions of claim construction on its head.

4 All right. Turning now to the first embodiment of
5 Nakamura, we didn't spend a lot of time with this in Mr. Devoto's
6 presentation, I won't spend a lot of time on it now, apparently
7 Samsung doesn't consider it that important, but here is -- here is
8 the issue, and if you adopt our claim construction on this, then
9 there is no -- there is no issue, because they don't propose a
10 theory of invalidity under our claim construction. Their only
11 proposed theory of invalidity is under their own claim
12 construction. So, to the extent that you adopt our construction of
13 "removing" for claims 1 and 14, that ends the issue and the first
14 embodiment is no longer in play.

15 But what Nakamura does when it removes the top
16 portion of the first -- of the fourth dielectric layer is it does, in
17 fact, perform the planarizing process, but as we see here in figure
18 1C from Nakamura on slide 20, there is layer 26, which is the
19 fourth dielectric layer, there's still a -- there's still a pretty good
20 chunk of it on top of the third dielectric layer, which is supposed
21 to be exposed. And because it is not exposed, there is no -- you
22 know, that limitation is not met, and the claim is not rendered
23 obvious.

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1 What Samsung argues is that the further etching
2 process, the poking of the holes, as you will, is actually the
3 process by which this is met. And this requires, first as a
4 condition precedent, adoption of their claim construction for 1
5 and 14. But even if you get that, and we explain this in the
6 record, it still does not expose the third -- the portion of the third
7 dielectric layer that's over the gate. And, so, we would argue that
8 even if the Board adopts this, which it should not, there is no
9 obviousness and there is no teaching of this particular limitation.

10 Their response, in their reply, was that, well, Nakamura
11 now has embodiment 2, embodiment 2 teaches that you can make
12 bigger holes, but there are all sorts of problems with making
13 bigger holes, chief among them it creates difficulty in patterning,
14 and that would teach away from this post-op solution that they
15 advocate in their reply.

16 Now let's turn to the third embodiment, because that
17 was the core focus of Samsung's argument, and again, if you
18 adopt our construction that all things have to be done at the same
19 time, we would submit that that ends the inquiry. If the three
20 steps are part of -- for embodiment 3 as written, if the three steps
21 are required to be part of the same process, it's undisputed that
22 that's not taught by Nakamura.

23 First, Nakamura teaches a three-step process. In the
24 first step, the mask here, 28, is shown. So, the unmasked portions

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1 of 26 are removed by etching. So, but that leaves the third
2 dielectric here, covering the substrate, and the spacers have not
3 yet been formed.

4 So, if we look at the claim limitation, they're omitting
5 the portions of the substrate are exposed, they're omitting the
6 spacers that form the side walls at the same time. Then what
7 happens is the photoresist is removed. So you have to take it out
8 of the chamber, you have to process it to remove the photoresist.
9 So, at that point, then, you're taking away 28 to then expose the
10 remainder of the fourth layer. They then put it back in, kind of
11 like doing the hokey-pokey, and they remove -- they do a second
12 etch and they remove the portion of the third layer over the
13 substrate and they also form the spacers.

14 And, so, it's a wholly different process, and in so doing,
15 they're also at that point then removing the portions of the
16 remaining portions of the fourth dielectric layer, and the reason
17 they're doing that is to achieve a general planarity, and Nakamura
18 talks about that you want to do this in order to improve the depth
19 of focus over the wafer for further patterning.

20 So, under either our construction or even we would say
21 under their construction, under any reasonable construction, the
22 three-step process where you remove the photoresist midstream is
23 not a single process that removes only the fourth -- the portions of

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1 the fourth dielectric layer that are not under the photoresist,
2 removes the portion over the substrate, and forms the spacers.

3 Now, to get around that, Samsung's answer is, well, we
4 could use the etching process of embodiment 1, in embodiment 3,
5 and just leave the spacers on top. But that's problematic because
6 if you leave the spacers on top, you are destroying the planarity
7 that the third embodiment is designed to create. The whole point
8 of the third embodiment and the whole point of the etch process
9 in that third embodiment is to give you a result that shows -- that
10 has planarity and improved depth of focus. And when you are
11 intentionally leaving things on to destroy that planarity, that's not
12 a proper combination. The internal teachings of Nakamura aren't
13 simply consistent and that combination would not be made.

14 Now, in his reply, Dr. Rubloff acknowledges this. In
15 his reply declaration, Dr. Rubloff comes up with a whole set of
16 new arguments regarding a formula $X+T$ and various
17 relationships between X and T . None of that is disclosed in
18 Nakamura, or any of the other secondary references that Samsung
19 relies on. And, so, this belated argument that we can do math to
20 somehow justify a depth of focus modification because we can
21 look at things and analyze them in a way that's not disclosed by
22 Nakamura is classic hindsight and should be disregarded by the
23 Board.

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1 And with that, unless there are questions, I'm going to
2 turn to the '997 patent.

3 JUDGE CHANG: Go ahead.

4 MR. KAUFMAN: Now, proceeding to the '997 patent,
5 the issue here is only whether the claims at issue are anticipated
6 by Doshi, and when we get down to it, there's really only one
7 limitation that's in dispute, and that is whether Doshi teaches a
8 process where the etching occurs and simultaneously forms the
9 spacer. If it does, then it discloses it, but our -- if it doesn't, then
10 the claims anticipate it.

11 The problem, of course, for Samsung, is that it does not,
12 and the only reference -- the only evidence that they have to rely
13 upon is Figure 3g that their own expert admits is riddled with
14 errors. And when you examine the specification in contrast, the
15 specification clearly discloses the removal of the entire nitride
16 layer 30. The specification also is important in that when Doshi
17 wants to really remove something, Doshi -- or to leave
18 something, Doshi says, we're going to leave something, then
19 Doshi says, hey, we're leaving some stuff, and that's true, not only
20 for intended structures, but when there is byproducts or silicon
21 nitride layers that may remain after an etching has taken place.

22 We can talk about claim construction for "spacer," but
23 the reality of it is that as presently framed, both sides are arguing
24 that the spacer is intentionally there. And, so, there is not really a

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1 dispute for the Board to resolve I think at this point in terms of
2 "spacer."

3 We can proceed to "over." The term "over," on the
4 other hand, there is a dispute, and the dispute remains. And
5 really, and this is not going to look good on the transcript, but at
6 least you're all here watching me, so hopefully you will remember
7 this, I think the dispute on "over" comes down to this: Does --
8 you know, right now, my hand is over the podium. We would
9 agree my hand is over the podium, they would agree my hand is
10 over the podium. It's sitting on and in contact with the podium.

11 My hand is still over the podium, I think that
12 Mr. Renner would agree that my hand is over the podium, and I
13 would agree that my hand is over the podium. We are not saying
14 that to be over the diffusion layer it has to be physically in
15 contact.

16 Here's where we disagree and here's where the parties
17 diverge: When my hand is over here, it is no longer over the
18 podium. It is elevated -- if you consider the plane in which the
19 podium lies, it is elevated above that plane, but it is not in any
20 reasonable construction of the term "over" over the podium. And,
21 so, that's really -- that's the fundamental dispute.

22 JUDGE CHANG: Counsel, in the context of
23 semiconductor, "over" could be like -- since in your example,
24 your hand is smaller than the podium, but in most semiconductor

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1 devices, the layer is I guess spread over to a smaller feature. So,
2 would that be over? Because what we're talking about is a layer
3 over a smaller --

4 MR. KAUFMAN: So, maybe -- I have two pieces of
5 paper, if I put them on top, you know, this piece of paper is over
6 my pad of paper, they're the same size, they're a smaller feature,
7 they're the same, if I understand your question. This next piece of
8 paper, if I put it on top of it, would also be over that feature.

9 JUDGE CHANG: Right. If you have a pencil, let's say.

10 MR. KAUFMAN: If I have a pencil and I put the
11 pencil over here.

12 JUDGE CHANG: Put the pencil down and then put the
13 paper on top of that. Yeah. So, now, is that paper over the
14 pencil?

15 MR. KAUFMAN: So, the paper is over the pencil
16 because there is a part of the paper that covers the pencil. If we
17 placed it like this, I would not say the paper is over the pencil,
18 but -- and when we get to --

19 JUDGE CHANG: So, you're saying that the whole
20 layer would be over the pencil now?

21 MR. KAUFMAN: Right. Well, no, I would say that
22 the portion of the -- the portion of the layer that is --

23 JUDGE CHANG: Because I think -- I think the
24 difference is the claim construction is you want it to -- only the

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1 portion that is, I guess, vertically on top of the pencil. That's
2 where you say "over?"

3 MR. KAUFMAN: Right.

4 JUDGE CHANG: And, so, like a lot of times, people in
5 this art will say, you know, when you have a pencil and you have
6 a layer on top of the pencil, that whole layer is over the pencil.

7 MR. KAUFMAN: Right. And I think part of the issue
8 here is the claim language, which is the oxide layer over the
9 diffusion region. So, the diffusion region is a particular structure.

10 JUDGE CHANG: It's a smaller, like the pencil,
11 smaller. It's the pencil, right. And the oxide layer is the whole
12 paper.

13 MR. KAUFMAN: Well, but the oxide layer in this
14 context is not the whole paper, and that's the issue here, is the
15 formation of the oxide -- if your analogy would be correct if the
16 formation of the oxide layer --

17 JUDGE CHANG: Was continuous.

18 MR. KAUFMAN: -- was continuous across the whole
19 structure, but the formation of the oxide layer really is described
20 by Doshi, is not wholly across the sides. It's really just an
21 oxidation of the side walls of layer 22 in the gate because at the
22 time the oxidation is performed, the diffusion region already has
23 an oxide layer on it. So, there's nothing -- there is an oxide layer
24 already in place, and so there's not -- the claim language requires

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1 forming an oxide layer over the diffusion region, you know, at a
2 particular time in the process, and the corresponding process in
3 Doshi does not form an oxide layer over the diffusion layer
4 because at an earlier time in Doshi's process, your broad-based
5 oxide layer was formed across the wafer.

6 And, so, at the time that we're talking about in Doshi's
7 process, the oxide -- the oxidation that's occurring is in the side
8 walls of the gate. And, so, that's why there's a bit of a difference
9 here and that's why the parties are spending so much time arguing
10 over a term that otherwise you wouldn't expect to draw much
11 attention.

12 Your Honors have the slides, these are just examples of
13 "over" and I don't need to -- it just shows consistent usage
14 throughout the specification. So, let's proceed then to the slide 38
15 and the simultaneous formation, which is the heart, at least for the
16 independent claims, of the issue here. And the question really is,
17 does a flawed figure win or does the disclosure of the
18 specification win? Because Figure 3g shows part of nitride layer
19 30 remaining that looks a lot like the pictures of the structure in
20 the '997 patent. And if it's accurate and correct, that's a problem
21 for us, but the problem is -- the problem for Samsung is that their
22 witnesses testified that it has errors. Our witness agrees that it
23 has errors. And the description of the process in the specification
24 suggests that it has errors.

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1 So, if we look at the specification when it describes the
2 brief nitride etch, it uses phrases like, "clear the nitride layer 30,"
3 or "remove the nitride layer 30." These are statements of
4 removal. These are not statements of "etched some but not all" or
5 "etched only the portion over the diffusion layer." There is no
6 clear explanation in discussing these etched processes that says
7 remove, you know, the portion over the diffusion layer and keep
8 some to bolster the spacer. And that makes sense because Doshi's
9 structure already has a spacer in filament 11. Doshi doesn't need
10 the etch process to form a spacer because the spacer already
11 exists.

12 Moreover, when Doshi forms spacers and when the
13 processes leave residual materials, Doshi is clear about that fact.
14 Doshi discusses in column 7, lines 57 to 65, that not only does it
15 form side wall filaments and leave them behind after the etch
16 process, but as noted above, silicon nitride residue 26 may remain
17 along the sides of the oxide structure. So, when Doshi wants
18 something left there, Doshi is clear and unambiguous about that
19 fact. But when Doshi discusses the etching of nitride layer 30,
20 Doshi doesn't say some nitride may remain, Doshi doesn't say
21 etch it a little bit so that the diffusion region is exposed, but that
22 the gate electrodes are manufactured. Doshi says, remove and
23 clear.

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1 And if you look at figure 3k, which is the same process,
2 figure 3k does show, in fact, removal of the -- removal of the
3 process -- of the nitride layer and complete removal of the nitride
4 layer.

5 JUDGE CHANG: But the counsel for the Petitioner
6 mentions specifically that Doshi is a highly anisotropic etch,
7 right? Or am I getting it wrong?

8 MR. KAUFMAN: No, that is correct, Doshi does --
9 both patents refer to these as anisotropic etching.

10 JUDGE CHANG: Yeah.

11 MR. KAUFMAN: And, you know, the anisotropic
12 etching is what it is, but both Mr. Maltiel -- Mr. Maltiel suggests
13 that some overetching would occur to remove it and you would
14 need to adjust the time to remove it. It's not that anisotropic
15 etching would not remove layer 30, it would just be that you
16 would take -- it would need additional time, a longer etch than if
17 you were only removing the flat layer where it goes --

18 JUDGE CHANG: There could be a lot of overetching
19 required, because it's pretty -- you know, when you have the side
20 walls, it's a lot thicker than the bottom portion. Isn't it?

21 MR. KAUFMAN: Right, and Mr. Maltiel addressed
22 that and indicated that, you know, some of the silicon nitride
23 would be removed as a consequence of the BPSG etch that occurs
24 before the pertinent silicon nitride etch that we're talking about

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1 here, and that the remainder would be handled by overetching.

2 And, you know, we have Mr. Maltiel saying yes, we have

3 Professor Rubloff saying no, at the end of the day, you know,

4 we've got to look at what's disclosed, and what's disclosed is

5 removal. You know, there's nothing -- there's nothing in Doshi

6 that says, you know, keep some portion of the silicon nitride

7 layer.

8 JUDGE SHAW: Except for Figure 3g.

9 MR. KAUFMAN: Except for Figure 3g.

10 JUDGE SHAW: That's a figure that we have to look at,

11 though. So, you're asking us to read several different

12 interpretations of Figure 3g to basically remove the entire portion

13 of 30. Is that correct?

14 MR. KAUFMAN: Yes. Yeah. What I am saying is

15 that -- and when it comes down to it, what I'm saying is that

16 Figure 3g should be, you know, given little or no weight, because

17 Dr. Rubloff, Samsung's expert, acknowledges that there's an error

18 in Figure 3g, and having defined it as erroneous, you know, it

19 can't be okay for him when it suits him and not okay when it

20 doesn't suit him. Having defined Figure 3g as erroneous, we need

21 to look at the specification and see what the specification says.

22 The specification says remove or clear the nitride layer.

23 And, so, I would submit that given the admitted errors,

24 given the issues here, that the simple picture should be given

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1 basically no material weight. And we pointed to Figure 3k,
2 which I put up here on slide 45, because Figure 3k, which is the
3 bit-line contact etch, shows removal of layer 30 above the
4 diffusion region and no formation of the surface, no residual.
5 And this is the same process that was -- this is described by the
6 Doshi reference as following the same process.

7 Now, in the reply, you can see this on the next slide,
8 slide 46, the second step is substantially identical to that
9 performed in the two-step etch of the plug contact location. So,
10 there are two points in Doshi where this etch is performed,
11 Figures 3k and 3g. Figure 3k shows removing, Figure 3g does
12 not. Figure 3g is admitted by their expert to have errors, and so
13 our position is that Figure 3k and the disclosure and the
14 specification should control.

15 Now, in the reply, Dr. Rubloff said, well, hang on,
16 nobody -- Figure 3k is an error. You know, and I saw this the first
17 time I looked at the patent and, oh, my goodness, it's in error and
18 it's completely wrong. Well, he didn't mention that in his original
19 declaration. And when we asked him, originally if he saw any
20 errors in his initial cross examination, the answer was, "No. It's
21 possible, but I don't know of any. I mean, we could argue -- I
22 think it's difficult."

23 So, this argument presented in the reply that Figure 3k
24 is somehow erroneous is, again, an example of Dr. Rubloff in his

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1 reply attempting to backfill in ways that are inconsistent with his
2 initial cross examination, and we should -- we would submit that
3 the reply statements that are contradicted by his earlier -- as with
4 the '244, the reply statements that are in contradiction with his
5 earlier declaration, or his earlier oral testimony should be
6 disregarded.

7 JUDGE SHAW: What about the portion of the
8 specification that the Petitioner's counsel pointed to that column
9 10, where Doshi talks about the beneficial highly anisotropic
10 edge where there's damage to the corner of the gate structure and
11 it's substantially minimized. What about avoiding this damage,
12 which I think Judge Chang started to ask you about, but I wanted
13 to hone in on that.

14 MR. KAUFMAN: Right, and we address that in part of
15 that -- so, part of this is handled, this problem is handled by the
16 selectivity of the edge which is selected for silicon nitride. So, to
17 the extent that they say it's going to damage the diffusion layer or
18 otherwise, it's selected for silicon nitride and so it's going to etch
19 silicon nitride much more effectively than the -- than it's going to
20 etch the silicon layer.

21 With respect to the corners or other part, those sections
22 are buried under the additional -- the filament, which is what
23 they're talking about protecting, is buried under an additional
24 layer of silicon nitride, which is nitride layer 30, and that -- that

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1 layer is curved and Dr. Rubloff was not entirely clear and
2 somewhat evasive in his testimony about what happens when the
3 silicon nitride layer is curved in terms of the effectiveness of the
4 anisotropic etching. But we would submit that the layer 30 can
5 be removed and layer 11 is still there. That's the point.

6 All right. Now turning to dependent claims 2 and 9, we
7 have methods for forming self-aligned contact holes, and this is
8 where we're talking about -- this is where "over" comes into play.
9 And do we form the thermal -- do we form the oxide layer over
10 the diffusion region and on the side walls of the gate by thermal
11 oxidation.

12 So, here's Doshi Figure 3a, and Doshi talks about first
13 oxidizing the side walls of 22 and then applying a silicon nitride
14 layer to form the -- the filament 11. And the location of the
15 nitride -- the location of the oxidized layer upon the side wall of
16 layer 22 is -- if we blow it up, it's here and it's not over the
17 diffusion region there. And, so, that's why -- this is why when I
18 was talking -- you know, when I was waving my hands over the
19 podium and trying to address Judge Chang's hypothetical, it is --
20 it is above but it is not over. Filament 11 is over, but the oxidized
21 side of region 22 is not.

22 But Samsung also argues, and they claim we don't rebut
23 it, but we clearly did, that thermal oxide must be formed over the
24 source drain regions because source drain regions are uncovered

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1 doped silicon, which is susceptible to thermal oxidation. If true,
2 that would be correct. Unfortunately, it's not true because in
3 Doshi, the diffusion region is not uncovered doped silicon during
4 the oxidation step. That area is -- has previously been covered by
5 gate oxide 8. So, they're not forming an oxidation layer over the
6 diffusion region because the oxide layer is already there. They're
7 just -- they're treating it and they're creating an oxide side wall on
8 the side of layer 22, and that side wall does not cover, is not over
9 the diffusion region, and that's why we submit that claims 2 and 9
10 are not anticipatory -- or the additional reasons why claims 2 and
11 9 -- obviously if you find the independent claims are not
12 anticipated, you don't need to go any further, because the
13 dependent claims as a matter of law will not be anticipated. But
14 if you -- should you do so, independent grounds exist for 2 and 9.

15 And with that, unless there are questions, I will pass the
16 remote control to my colleague, Mr. Chen, and he will address
17 the '893 issues.

18 JUDGE CHANG: Thank you.

19 MR. CHEN: Good afternoon, members of the Board.
20 Earlier today, you heard Samsung's attorneys argue that the '893
21 patent is obvious in view of the Miyazaki reference for the 466
22 IPR, and the Emesh reference for the 467 IPR. I'm going to now
23 explain to you why we believe that Samsung's arguments are
24 wrong. I want to start with the 466.

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1 Now, the central issue here is whether the Miyazaki
2 reference discloses the dual chamber tungsten CVD process of
3 the '893. As you know, the core invention of the '893 patent is a
4 specific method for forming the tungsten contact and tungsten
5 interconnect layer using dual chambers. The first tungsten layer
6 is deposited under conditions so that you can completely fill the
7 contact hole, and then the wafer is moved to a second chamber,
8 where the second tungsten layer is deposited under different
9 parameters, under different conditions, in a second chamber so
10 that you can form an interconnect layer with low stress.

11 This concept is captured in the independent claims of
12 the '893, exemplary claim 1 shown here, and as you can see in the
13 last element, it requires the formation of the second conductive
14 layer or the second tungsten layer, on the first conductive layer in
15 a second chamber where the temperature of the second chamber
16 is different from the temperature of the first chamber.

17 And this element is precisely what's missing from
18 Miyazaki. Miyazaki doesn't disclose a two-chamber process or
19 the two-chamber process claimed in the '893. The processes
20 described in Miyazaki are all explicitly single-chamber processes.
21 There's a total of six embodiments. One and 2 deposit only a
22 single layer of tungsten and they're not relevant to this inquiry.
23 Embodiments 3, 4 and 5 deposit two layers of tungsten, one for
24 the contact and one for the interconnect layer; however, Miyazaki

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1 expressly emphasizes that those are all single-chamber
2 continuous deposition processes.

3 If we look at the excerpts from the Miyazaki
4 specification, it makes very clear for embodiments 3, 4 and 5 that
5 the second tungsten layer is deposited in the same deposition
6 chamber in a continuous formation. So, what about embodiment
7 6? Well, embodiment 6 doesn't teach any process at all. It's
8 focused on managing film stress by adjusting the ratio of the
9 thicknesses of the two tungsten films.

10 JUDGE TORNQUIST: Counsel, is there any
11 suggestion in Miyazaki that in the same deposition chamber in
12 these three embodiments is critical or important to that process?

13 MR. CHEN: Yes, when Miyazaki -- if I understand
14 your question, when Miyazaki is actually -- I'm sorry, could you
15 restate?

16 JUDGE TORNQUIST: Well, they're specifically
17 calling out it's in the same chamber.

18 MR. CHEN: Right.

19 JUDGE TORNQUIST: Do they mention or explain that
20 that's important or is that just simply --

21 MR. CHEN: I think it's implied when it's explaining the
22 process because it emphasizes that it's a continuous deposition.
23 And then if you look at the -- I think Figure 11 in Miyazaki, let
24 me make sure I get it right -- yeah, Figure 11, it shows the

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1 process itself, unfortunately I don't have it -- well, let me see if I
2 can find it.

3 JUDGE CHANG: We have it.

4 JUDGE TORNQUIST: We have it.

5 MR. CHEN: Got it? It shows what's happening to the
6 wafer when it's in the chamber -- the chamber in the continuous
7 deposition, and it specifically shows the transition time that
8 occurs when it goes from the lower temperature to the higher
9 temperature. So, it emphasizes the fact that the wafer is subject
10 to this transition time. Both the increase in temperature and the
11 decrease in temperature.

12 JUDGE CHANG: But is it within one of ordinary skill
13 in the art basically to use one chamber or multiple chambers?
14 Isn't it like a design choice in a fab lab or fabrication line that
15 having one or two to do specific -- because actually it's two
16 distinct steps is because this seems like you have two different
17 parameters and two different type of gas it could be. So, I'm just
18 wondering why would one of ordinary skill in the art would not
19 be doing it in two different chambers when Miyazaki did talk
20 about having two different -- could be multiple chambers?

21 MR. CHEN: Okay. Well, there's qualitative
22 differences between a single-chamber deposition and a
23 dual-chamber deposition. One of the differences is, of course, the
24 single chamber is subject -- a single-chamber continuous

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1 deposition is subject to temperature transitions that wouldn't
2 necessarily occur in a dual-chamber process.

3 So, the parameters themselves for these two different
4 types of processes would have to be different. You would have to
5 take into account the fact that you would have these temperature
6 transitions.

7 Another issue which our expert, Home's expert,
8 Mr. Maltiel addressed in his declaration is the fact that when
9 you're designing these processes, you would need to calibrate
10 them. So, in a single-chamber process, you're calibrating your
11 two temperatures for a single machine, whereas when you're
12 using multiple chambers, you're actually subjected to a different
13 calibration protocol.

14 I think, you know, in addition to those other differences,
15 there is other, you know, benefits and costs that are associated
16 with using a single chamber as opposed to a dual-chamber
17 process. Samsung's counsel has mentioned some of the benefits
18 of, you know, the multi-chamber, plus there are tools like the
19 contamination, or the throughput benefits, and I think there's also
20 some certain consequences as well, right? And those -- what
21 we're saying is those would be beyond the skill of a person of
22 ordinary skill in the art for this field.

23 Do you have any more questions?

24 JUDGE CHANG: No, not right now, thank you.

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1 MR. CHEN: All right. So, I think I was talking about
2 embodiment 6, and how embodiment 6 doesn't actually disclose
3 any process at all, it's focused on the effect of managing film
4 stress by adjusting the thicknesses or the ratio of the thicknesses
5 of the two film layers. That's what's described --

6 JUDGE CHANG: I'm sorry, opposing counsel
7 mentioned that there's a certain text that is incorporating
8 embodiment 3 and 5. So --

9 MR. CHEN: Okay. So, yes. Why don't I address that.

10 JUDGE CHANG: Okay, yeah, because I don't want to
11 just look at embodiment 6 in isolation.

12 MR. CHEN: Sure. Sure. So, Samsung's argument is
13 essentially that, you know, even if Miyazaki doesn't disclose --
14 explicitly describe a dual-chamber process, Miyazaki mentions
15 dual chambers in that blurb that they had shown earlier, and that
16 because of that, a person of ordinary skill in the art would have
17 been able to implement the dual-chamber process.

18 So, if we look at that blurb, and this is at column 9, lines
19 52 to 58 of Miyazaki. What that says is, is that it says in the
20 above -- in the above-mentioned embodiment, and when it says
21 that, it's referring to embodiment 6, "the tungsten film 15 and
22 tungsten film 16 are continuously formed in the same chamber.
23 However, the continuous formation is not indispensable. The
24 tungsten film 15 and tungsten film 16 can be formed in different

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1 chambers or in different deposition machines or in chemical
2 vapor deposition and the sputtering respectively."

3 So, first of all, that blurb there is referring to
4 embodiment 6, and what it's saying is that the teachings -- for the
5 teachings of embodiment 6, which relate to managing film stress
6 by adjusting the film thickness ratios, the manner in which the
7 films are formed is not critical. The teachings would still apply.
8 That's what that blurb is talking about.

9 It's not suggesting the conversion of the Miyazaki
10 single-chamber process is the dual chambers. Any more than it's
11 suggesting the conversion of those processes to sputtering, which
12 is PVD, it's a completely different process, right? It mentions all
13 of those potential variables in the same sentence, but it's not
14 really telling a person of ordinary skill in the art that you should
15 then convert the explicit processes that are taught by Miyazaki to
16 these different techniques.

17 So, what we're saying is that that blurb, even if it is a
18 suggestion, it still doesn't teach a dual-chamber process, because
19 all of the processes that are in Miyazaki are explicitly
20 single-chamber. All the specific parameters that are described are
21 explicitly for use in a single-chamber process, and those
22 parameters aren't designed for a dual-chamber system.

23 Now, if you wanted to do that, if you wanted to convert
24 those processes to a dual-chamber system, you would have to

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1 make changes to the process, okay? And Miyazaki doesn't
2 provide any guidance on how to make those changes. Miyazaki
3 doesn't discuss the benefits of dual chambers, Miyazaki doesn't
4 discuss the benefits of dual chambers -- it doesn't describe the
5 consequences, it doesn't say what changes would be required, and
6 Samsung hasn't cited any other reference that would describe
7 what those changes are or how they would be made.

8 JUDGE TORNQUIST: For embodiment 6, I
9 understand it's talking about ratios.

10 MR. CHEN: Yes. Um-hmm.

11 JUDGE TORNQUIST: But those have to be applied in
12 some way.

13 MR. CHEN: Sure.

14 JUDGE TORNQUIST: And specifically flow rates and
15 tungsten and the like.

16 MR. CHEN: Right.

17 JUDGE TORNQUIST: Why wouldn't someone of skill
18 in the art look to the previous embodiments to figure out how to
19 apply these layers?

20 MR. CHEN: They could. A person of -- and as
21 Samsung's counsel had pointed to, there's portions of embodiment
22 6 which does refer to, you know, the layer formation of the
23 previous embodiments. I think, for example, it says that you
24 would form some of the earlier steps in the process, similar to

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1 embodiment 3, and then it mentions one of the tungsten layers, at
2 least the contact -- the first tungsten layer being similar to
3 embodiment 4, but even if you apply the processes from 3, 4 and
4 5 to embodiment 6, you're still applying single-chamber
5 processes.

6 So, no matter how you slice it, you're still talking --
7 Miyazaki is still disclosing only a single-chamber process. It's
8 never actually described a dual-chamber process with the
9 parameters for a dual-chamber process. And what we're saying is
10 a person of ordinary skill in the art, and what we're saying is that
11 there's no guidance for that in there. There's no guidance on how
12 to do that conversion, and if a person of ordinary skill in the art
13 would want to do that, they would have to change the process,
14 and they wouldn't know how, right?

15 Without the guidance, a person of ordinary skill in the
16 art wouldn't be able to modify Miyazaki, the Miyazaki
17 single-chamber processes, those specific processes, to a
18 dual-chamber system. And part of the reason for this is because
19 those of ordinary skill are trained to follow the process -- the
20 recipes and parameters that they're given.

21 This is what Samsung's expert, Dr. Rubloff said about
22 this. In the field of semiconductor manufacturing, if you're a
23 process engineer and there is a recipe provided, that's what you
24 should follow. Playing the parameters, he said, is verging on the

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1 irresponsible. And now, if you did want to make adjustments, if
2 you did want to make changes to the process to try to improve it,
3 he said you have to think very clearly and then you have to design
4 a set of experiments to be able to determine whether your changes
5 would even be -- would even work.

6 And I think one of the things here is that these recipes,
7 these are sophisticated recipes. And we may not be giving them,
8 I guess, enough credit, because they're designed and developed
9 through pretty extensive processes. There are very complex
10 chemical and physical interactions that go on here.

11 And, so, when Samsung suggests that they're
12 predictable, we would say that they're not, right? You actually
13 have to do a lot of experiments to figure out what's going on
14 when you change some of these parameters.

15 JUDGE TORNQUIST: Counsel, what is the level of
16 ordinary skill in the art?

17 MR. CHEN: Here it's been defined as somebody with a
18 bachelor's degree and around three to four years in the relevant
19 field.

20 JUDGE TORNQUIST: Okay.

21 MR. CHEN: Effectively, I mean, I think if you would
22 equate it to -- and this was covered in some of the deposition
23 testimony, but it is not really that much -- not a disputed issue
24 between the parties, but I think it's, you know, that person might

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1 be a process -- you know, a process engineer, somebody with
2 some process integration experience would be useful as well.

3 Okay. So, you know, Dr. Rubloff said you would need
4 to do these experiments to determine whether your changes
5 would even work. We have seen no evidence of any such
6 experiments, or any evidence of any of the developmental work
7 that would be required to change this single-chamber process to a
8 dual-chamber process.

9 So, what evidence do we actually have here? We have
10 Miyazaki, which specifically teaches a single-chamber process.
11 We have no suggestion to move to two chambers. We have no
12 discussion of the benefits of such a change. We have no guidance
13 on how to make such a change, and even if we knew what the
14 changes in the parameters were, we don't have any evidence
15 showing that there would be a reasonable expectation of success.

16 So, we submit that the evidence in the record simply
17 doesn't support Samsung's claim that Miyazaki discloses the
18 dual-chamber process claimed by the '893, or that a person of
19 ordinary skill in the art could modify Miyazaki to implement such
20 a process.

21 So, I'm going to move on to one of the dependent claims
22 now.

23 JUDGE CHANG: Go ahead.

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1 MR. CHEN: So, Samsung also argues that Miyazaki
2 combined with Jaeger, Wolf and Felix render obvious claims 10
3 and 23, and these relate to the deposition time of the first tungsten
4 deposition.

5 JUDGE CHANG: Would you please read the slide
6 number for the record whenever you change slide.

7 MR. CHEN: Oh, okay. Yes, I'm on slide 63.

8 JUDGE CHANG: Thank you.

9 MR. CHEN: So, these claims require deposition of the
10 first layer to occur between 10 and 100 seconds. Miyazaki
11 doesn't actually disclose the deposition time, but it does disclose
12 the thickness for the first tungsten layer of being 2,000
13 angstroms. You know, what Miyazaki says is 2,000 angstroms or
14 more, but let's just use 2,000 angstroms. And Samsung uses the
15 deposition rate drawn from the Wolf reference to calculate what
16 the time would be, and they come up with a time of the minimum
17 114 seconds.

18 So, this is outside the range. So, what does Samsung
19 do? Samsung reconstructs the reference. And this is something
20 that we will see time and time again. It says that the Miyazaki
21 process is designed for 0.5 micron hole. And so if you were to
22 apply the same process to a smaller hole, Samsung states that,
23 well then you would just proportionally reduce the thickness of
24 the deposit layer, and if you proportionally reduce the thickness

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1 of that layer, then your time is reduced, and you're now within the
2 claimed range.

3 This is effectively what they've done. Now, this is pure
4 hindsight reconstruction. They've used the claim as a target, and
5 they just modified the reference to try to get within the claimed
6 range. Miyazaki doesn't teach a tungsten layer of 1,400
7 angstroms. It teaches a tungsten layer of 2,000 angstroms, or
8 more. And there's nothing to say that the process described in
9 Miyazaki could be applied to a smaller hole simply by
10 proportionally reducing the layer thickness.

11 JUDGE TORNQUIST: Is there any evidence of record
12 to suggest that it couldn't, or it wouldn't?

13 MR. CHEN: There is some discussion in the -- in the
14 cross examination testimony which talks about what happens
15 when you reduce the size of the hole, and what happens is not
16 simply reducing the size, what you're actually doing is
17 dramatically increasing the aspect ratio of the contact hole. And
18 when you do that, especially at these sizes, filling the hole
19 becomes a lot more difficult.

20 And one of the requirements of these claims is, of
21 course, to fill the hole completely without voids. So, it's not
22 really a linear relationship, because now that you have a higher --
23 there's testimony about how when you have a higher aspect ratio,
24 you -- it's harder and harder to fill the hole, which would then

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1 lead you to potentially require changes to the parameters, but also
2 potentially require you to deposit a thicker layer to make sure
3 that -- because the layer thickness is measured at the surface, and
4 not within the hole, you need -- may need to deposit more or
5 longer to make sure your hole gets completely filled, because
6 you've reduced the size of the opening.

7 And, so, we're saying that there's nothing in the process
8 that would say that you could apply the same process to a smaller
9 hole, and simply by proportionally changing the layer of
10 thickness. We don't know how the layer of thickness may or may
11 not change, and we don't know what adjustments would be made.

12 JUDGE CHANG: But, counsel, isn't that one of
13 ordinary skill in the art, when you're reading Miyazaki, that it is a
14 result effective variable that they will be able to optimize it?

15 MR. CHEN: Optimize the process for a smaller hole?

16 JUDGE CHANG: Yeah. Or, you know, basically it
17 was recognized as a parameter in the art that you optimize, right?

18 MR. CHEN: If we accept that as being true, and we
19 accept that a person of ordinary skill could make certain
20 optimizations to the process disclosed in Miyazaki, how do we
21 know that this proportional reduction --

22 JUDGE CHANG: But the claim is just asking for time,
23 right?

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1 MR. CHEN: Sure, but how do we know that the
2 proportional reduction in thickness that Samsung has proposed is
3 the optimization that would occur? How do we know that all you
4 have to do is to just, you know, oh, well, my hole is 30 percent
5 smaller, so I will now reduce my layer thickness by 30 percent
6 and then my deposition time by 30 percent.

7 Is my time up?

8 So, I'm saying that even if they would make the
9 adjustments, and this goes to a lot of what is occurring here in
10 what Samsung is arguing. Even if you make the adjustments,
11 what they're doing is they're applying the parameters that are for
12 one set, right? They say, okay, well maybe you need to make
13 adjustments, but then we don't have what those -- what you
14 should be comparing is the adjusted set of parameters to the
15 claims, but we don't know what those are.

16 It's true for the dual chamber as well. Even if a person
17 of ordinary skill could adjust those processes for dual chambers
18 and you would modify maybe the temperatures or whatever, that's
19 what you would need to be comparing to the claims, not the
20 process parameters for single chamber, right? Because you're
21 taking bits and pieces from different processes and then
22 comparing them to the claim which covers one dual-chamber
23 process. And I think that's true for this situation here as well, if
24 that addresses your question.

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1 JUDGE CHANG: Now, does that pose a problem for
2 you since you don't have --

3 MR. CHEN: I think if you have my slides, it should be
4 fairly easy to follow along. While it's rebooting, I don't have any
5 more slides on this particular area, so in summation, what we're
6 basically saying that Samsung is doing is basically hindsight
7 construction. We don't all these details, we don't know whether
8 the adjustments they made would be effective, or would work.
9 Dr. Rubloff testified that he didn't do any experiments to
10 determine whether these adjustments wouldn't work or still
11 achieve intended purpose.

12 So, what do we have? We just have Miyazaki with a
13 specific teaching that falls outside the claimed range. We have
14 no teaching of how that process would be changed for a smaller
15 hole, and we have no evidence showing that simply
16 proportionally reducing the layer of thickness would achieve the
17 same objectives, or have a reasonable expectation of success.
18 We're saying no person of ordinary skill would modify the
19 teachings in that way. What Samsung has done is classic
20 hindsight and you can't form the basis of an obviousness
21 determination.

22 And if you don't mind, I want to move on to the 467
23 IPR.

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1 JUDGE TORNQUIST: I have just a couple of
2 questions.

3 MR. CHEN: Sure.

4 JUDGE TORNQUIST: One I asked, I think your
5 briefing is pretty clear on this, but I want to make sure there are
6 no claim construction issues.

7 MR. CHEN: Yeah. That's true.

8 JUDGE TORNQUIST: Okay. Okay.

9 MR. CHEN: Okay.

10 JUDGE TORNQUIST: Well, there's one more
11 question, I'm sorry.

12 MR. CHEN: Sure.

13 JUDGE TORNQUIST: And this is you haven't
14 discussed it and Petitioner suggested possibly you are backing
15 away from argument of completely filling the hole. There has
16 been some briefing on that, I just want to know your response.

17 MR. CHEN: We just felt that what was said in the
18 briefing was pretty clear.

19 JUDGE TORNQUIST: Okay.

20 MR. CHEN: If you want I can address that.

21 JUDGE TORNQUIST: No, you don't need to, I just
22 want to make sure you're standing on your briefing.

23 MR. CHEN: Yes.

24 JUDGE TORNQUIST: Okay.

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1 MR. CHEN: So, for the 467 IPR, the central issue is
2 whether Emesh in combination with Mak would render obvious
3 the dual-chamber tungsten CVD process of the '893 patent. Now,
4 we don't need to talk about the claim again, but as a starting point,
5 Samsung doesn't dispute the fact that Emesh teaches a
6 single-chamber process. And, in fact, this is why Samsung has to
7 combine it with the Mak reference.

8 And there's also no real dispute that the Emesh and Mak
9 references teach different processes. These processes are
10 incompatible and not really designed to be used with each other.
11 Emesh is a process where you deposit -- where you form a
12 tungsten contact and a tungsten interconnect layer. In the Mak
13 process, you're forming a tungsten contact, but your interconnect
14 layer is actually aluminum PVD. So, you just wouldn't -- you
15 wouldn't merge these two processes. And neither one teaches the
16 dual-chamber deposition process that's claimed.

17 JUDGE CHANG: In the obviousness analysis, you
18 don't have to physically combine it. I mean, from what I
19 understand what the position from the Petitioner is that Mak is
20 just teaching that these chemical processes can be in dual
21 chambers.

22 MR. CHEN: Well, I think it's using it -- the chemical --
23 Mak -- Samsung's using the Mak reference, not really for its
24 process, because in the Mak reference, they only use one

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1 deposition chamber for one wafer. They do one tungsten CVD
2 deposition and that's it. So, it's not a dual-chamber reference.

3 What they're using it for is simply to demonstrate the
4 fact that you have these multi-chamber cluster tools. Because
5 what their argument boils down to is that everybody knew about
6 cluster tools and so that the mere existence of these tools and
7 popularity of these tools would have rendered the dual-chamber
8 process obvious to any person of ordinary skill in the art. So, I
9 think that's what they're using Mak and also the Chang reference
10 which was cited in their reply brief to show these tools were there
11 and a person of ordinary skill in the art would know about them.

12 In fact, this is what their expert has said. During his
13 cross examination, Dr. Rubloff was describing these tools and the
14 emergence of these cluster tools, somewhat breathlessly, and he
15 was saying that -- and this was, this is the highlighted portion,
16 this was so well known by the time of Miyazaki or Emesh that
17 anyone who saw, well, I want to do two layers and I want the
18 process conditions to be different and in particular for there to be
19 different temperatures, there's a benefit to using a cluster tool to
20 do that. And then he goes on to say, "And the benefits in
21 contamination control and throughput and so on were so
22 profound, that everyone went to that."

23 So, Dr. Rubloff is saying that everybody knew about
24 cluster tools and their advantages and if you wanted to do two

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1 layers with different process conditions, you would have used
2 these tools. But that's not really what the evidence that we've
3 seen shows.

4 So, for starters, it's true, the multi-chamber cluster tool
5 like the AMAT P5000 was well known. According to the article,
6 it was introduced in 1987, and with -- within one year had gone
7 from market entry to market leader. The article also says that
8 within five years, there were 50 different processes that were
9 available for use on this tool. So, there's no dispute. Those of
10 ordinary skill in the art would have known about cluster tools.

11 But even with the pervasiveness of such a tool, we don't
12 see the evidence showing the development of the dual-chamber
13 tungsten CVD process of the '893. If we look at some of the art
14 that Samsung has cited for its obviousness claim, first they cite
15 Chang. Chang came out in 1989, which is two years after the
16 introduction of the AMAT P5000. Chang talks about the tool but
17 Chang doesn't disclose a dual-chamber process. Chang uses one
18 chamber for tungsten CVD and one chamber for cleaning.

19 Mak, Mak also came out in 1991, four years after the
20 introduction of the tool, and Mak talks about the tool also as well
21 and he uses one chamber for the tungsten CVD and the other
22 chamber for etch-back. So, it also doesn't disclose dual
23 chambers.

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1 And Emesh, Emesh came out in 1992, long after the
2 cluster tool had become widespread, and according to
3 Dr. Rubloff, anybody who wanted to do these dual-chamber or
4 two -- deposit two tungsten CVD layers would have used these
5 tools, but yet the Emesh inventors still developed a
6 single-chamber process, they didn't even mention dual chamber in
7 the limitation.

8 And Miyazaki came out in 1995, a full eight years after
9 the introduction of the tool. And as you recall, the inventors in
10 Miyazaki still taught and emphasized the use of a single-chamber
11 continuous deposition process. Keep in mind that these are the
12 best references that Samsung cited.

13 Dr. Rubloff testified that he searched prior art,
14 nonpatent literature, textbooks, tool manuals, he searched
15 everything and he cited his best references. These are the best
16 ones.

17 And outside of what Dr. Rubloff -- outside of what
18 Dr. Rubloff characterizes as the illusion to dual chambers in the
19 Miyazaki references, he stated that he didn't find any other
20 references that talk about using these tools for a dual-chamber
21 tungsten CVD process. So, we submit that while Samsung
22 speculates that a person of ordinary skill in the art would have
23 found it obvious to design a dual-chamber process, that's not what
24 the evidence shows. The evidence shows that a person of

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1 ordinary skill, in the relevant time frame, knew about cluster
2 tools, and knew about the availability of multiple chambers. And
3 yet even with this option, those in the field continue to develop
4 single-chamber processes. This evidence doesn't show that the
5 '893 dual-chamber process was obvious; it shows that it wasn't.

6 Are there questions? I'm going to move on to the patent
7 claim.

8 (No response.)

9 MR. CHEN: So, Samsung also argues that Emesh in
10 combination with Mak renders obvious claim 8, and --

11 JUDGE CHANG: What slide number?

12 MR. CHEN: I'm sorry, slide number 79.

13 JUDGE CHANG: Thank you.

14 MR. CHEN: So, dependent claim 8 relates to the
15 tungsten hexafluoride flow rate, requires a tungsten hexafluoride
16 flow rate of between 50 and 90 sccm. Emesh discloses -- Emesh
17 does teach the flow rate, the range, the specific flow rate for the
18 second embodiment is 40, but Emesh discloses a range of 10 to
19 40 sccm for its flow rate, which is clearly outside the range.

20 So, again, Samsung engages in what we consider to be
21 hindsight reconstruction. Samsung is now saying that the
22 disclosed range in Emesh, 10 to 40 sccm, isn't important. And,
23 so, it recalculates a new range of 40 to 133, based on a ratio of the

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1 hydrogen to tungsten hexafluoride gas, and the hydrogen gas flow
2 rate itself.

3 Now, there's a number of problems with this, but one
4 thing I would like to address is that Samsung says that Emesh
5 says that the tungsten hexafluoride flow rate is important in that
6 the ratio is what's really important. And that's actually not what
7 the references -- what the reference says. The reference doesn't
8 actually say whether one thing is more important than another.

9 If you look at the Emesh reference at column 5, lines 36
10 to 43, that's where it discusses the flow rates and the ratio, and it
11 just talks about it all within the same paragraph. It just says, "the
12 gas flow rates were controlled to provide a gas mixture having a
13 predetermined H₂ to WF₆ ratio, and flow rates measured in sccm
14 as follows," and then it goes on to list the tungsten hexafluoride
15 flow rate of 10 to 40 sccm, the hydrogen gas flow rate of 240 to
16 800 sccm, and to provide a ratio of between 5 and 30, and a silane
17 flow rate of zero to 15 sccm, as well as the carrier gas, or inert
18 gas at a flow rate of roughly 90 sccm.

19 So, it talks about all of these parameters within the same
20 portion, and it doesn't say this is more important than the other, or
21 this is not important, or we can ignore this particular parameter.
22 It discloses all of them at the same time.

23 Now, the problem with Samsung's reconstruction is that
24 it directly contradicts the express teaching of the reference, right?

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1 This isn't a case where the reference Emesh is silent about the
2 flow rate and that Samsung is just filling in the blanks. The
3 reference is explicit and Samsung chooses to ignore that teaching.

4 Now, in their reply, they counter that, well, Emesh
5 doesn't actually teach away because it doesn't criticize or caution
6 against using a flow rate that's outside of the cited range, but
7 that's, again, kind of absurd. I mean, Emesh specifically states
8 that the tungsten hexafluoride flow rate should be between 10 and
9 40 sccm. Any person of ordinary skill reading this would
10 understand this to mean that the flow rate should not be below 10
11 and should not be above 40. That's what it means. And the fact
12 is, there's no reason for a person of ordinary skill to stray from the
13 specific ranges cited in the Emesh reference.

14 JUDGE TORNQUIST: Counsel, let me ask you a
15 question, I was looking at these numbers.

16 MR. CHEN: Yes.

17 JUDGE TORNQUIST: And there's a ratio between 5
18 and 30. How do you get a ratio of 5 with the numbers of tungsten
19 hexafluoride and hydrogen? Because as I calculated it, the best
20 you could do is -- the lowest you could go was six.

21 MR. CHEN: If you had --

22 JUDGE TORNQUIST: I would use the lowest amounts
23 of hydrogen at 240 and the highest amount of hexafluoride, I
24 would get a ratio of 6. I actually calculated that out.

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1 MR. CHEN: Oh, okay.

2 JUDGE TORNQUIST: How do you get to 5 with those
3 numbers? I mean, if you can't, doesn't that suggest that those
4 numbers weren't meant to be fixed? You can come back to it
5 later, if you like, I realize that's throwing some numbers at you.

6 MR. CHEN: No, no, no, the math is not easy to grasp.

7 JUDGE TORNQUIST: Okay.

8 MR. CHEN: But I think, you know, I don't think that
9 suggests that the flow rate given is unimportant, as much as it
10 suggests that perhaps the ratio that was provided of 5 and 30 may
11 have been a little bit broader. I think what -- what the reference is
12 teaching is that you want to try to adjust your parameters for the
13 process so that they meet all of these different requirements.

14 The ratio affects certain properties, right, which is I
15 think described in the reference as being the step coverage, but
16 the flow rate of the tungsten hexafluoride, which is one of the
17 primary gases in the tungsten CVD deposition, affects other
18 factors as well. And, so, I think they're not all necessarily
19 addressing the same properties of your deposition, right? Some
20 things could be addressing your deposition rate, some things
21 could be addressing, you know, other aspects of the process.

22 So, the fact that it teaches that you should use this
23 rate -- flow rate between this range, I think is important, because,
24 you know, it relates to some aspect of the process that the

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1 inventors have gone through and developed and have identified as
2 being kind of the critical range.

3 But that's a good question, Your Honor.

4 So, I mean, we've made the argument that what we
5 think Samsung is doing through Dr. Rubloff is effectively
6 hindsight reconstruction by basically, you know, using the patent
7 as a target and changing the reference into what fits your claim.

8 I want to point out one other thing about the arguments
9 related to this claim. In our response, our expert, Mr. Maltiel, had
10 pointed out that if you do modify the tungsten hexafluoride flow
11 rate range outside of the disclosed range, you would have to -- it
12 would affect the other parameters as well. So, you would have to
13 make adjustments to the other parameters. You know, whether
14 it's the flow rates of the other gases, other things would be
15 affected.

16 Now, in the reply, Dr. Rubloff disputes this point. He
17 says you wouldn't have to change the other parameters. Take
18 silane, for example. He says that -- this is in his declaration at
19 paragraph 4a, he says that a person of ordinary skill in the art
20 would have readily understood that the disclosed silane flow rate
21 of 0 to 15 sccm would not need to be changed with the increased
22 tungsten hexafluoride flow rate. Now, on cross, he says
23 something different. On cross, and this is in his reply cross
24 transcript at page 306, line 3 to 11, and this portion of the

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1 transcript was cited in the observations, he says, "so, for example,
2 if I wanted to, I would go to a higher flow rate. Then, what I
3 might do is turn up the tungsten hexafluoride by -- I don't know,
4 20 percent, 50 percent, and I would at the same time
5 proportionally increase the hydrogen and the silane so that I kept
6 the same distribution of reactive gases."

7 And, so, this shows two things. First, I think it shows
8 that Dr. Rubloff actually agrees with Mr. Maltiel that when you
9 adjust the tungsten hexafluoride flow rate, you would trigger
10 changes in the flow rates of the other gases. At least with respect
11 to silane and hydrogen. But I think it's also another example of
12 Dr. Rubloff saying one thing in his prepared declarations and
13 saying something different under cross, which goes to his
14 credibility on these issues.

15 Now, Samsung also argues that Emesh in combination
16 with Mak and Miyazaki renders obvious claim 10. Claim 10 is,
17 we've covered before with respect to the '466 IPR, it relates to the
18 time of the first tungsten CVD deposition, requiring a time of
19 between 10 and 100 seconds. Now, Emesh discloses a time for
20 embodiment 2 of 200 seconds. That's outside of the disclosed
21 range.

22 So, again, Samsung changes the reference. Samsung
23 says that there's an understanding, of course, that the deposition
24 time is a function of the thickness, divided by the deposition rate,

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1 and so Samsung recalculates the deposition rate based on the
2 disclosed thickness of Emesh, which is 5,000 angstroms, and that
3 teaches to deposit the first tungsten layer of 5,000 angstroms.

4 And, so, what Dr. Rubloff says is, well, 5,000
5 angstroms is not necessary. All you need is 2,000 angstroms to
6 accomplish whatever the goals are. And if you have 2,000
7 angstroms, then the deposition time is now 80 seconds, and I'm
8 within the claimed range again. Again, it directly contradicts the
9 teaching of the reference. Emesh teaches a person of ordinary
10 skill in the art to deposit 5,000 angstroms, which would take 200
11 seconds. Dr. Rubloff discards both these teachings. He says,
12 well, Miyazaki uses 2,000 angstroms, so that will work for
13 Emesh, but Miyazaki is a completely different process, with
14 different parameters. We don't know whether 2,000 angstroms
15 will work under the Emesh process conditions. There's no
16 evidence to show that it would work. And Dr. Rubloff didn't
17 perform any experiments to determine whether it would work.

18 Emesh taught 5,000 angstroms for a reason. And it's
19 worth noting that Dr. Rubloff doesn't even know the importance
20 of this parameter. So, how can he know the consequence of
21 changing it? Especially when the change isn't minor. He's
22 eliminating 60 percent of the disclosed thickness.

23 We don't think a person of ordinary skill in the art
24 would ignore the express teaching of a reference and make this

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1 modification. If you recall, as Dr. Rubloff testified, changing
2 parameters like this is verging on the irresponsible. He's only
3 doing it to fit the reference within the claim. It's hindsight
4 reconstruction and it can't be the basis of the obviousness
5 determination.

6 JUDGE TORNQUIST: But 5,000 angstroms in Emesh,
7 it would seem it doesn't matter much because they're going to
8 planarize it anyway. It could be really thick if they wanted it to
9 be, where in Miyazaki they put another layer on it. Does that
10 come into the calculus here?

11 MR. CHEN: I mean, it's true, in Emesh, there's a
12 planarization process, so it removes whatever tungsten ultimately
13 is deposited on the surface. But it's not entirely clear how much
14 of that is necessary to not just fill the contact hole, but also -- and
15 this is discussed in Dr. Rubloff's cross examination, not to
16 propagate a crevice within the hole that might appear if you were
17 to planarize. So, what you don't want to do is deposit, you might
18 completely fill a hole, but then leave a seam at the top where the
19 layer comes together.

20 And, so, and then if you planarize that seam that could
21 result in a void when you deposit your next layer of tungsten over
22 it, and you don't want that to happen. So, what you want to make
23 sure is you deposit enough thickness to not just fill the hole, but

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1 also that you don't have that seam or crevice that could then be
2 propagated after your etch-back step.

3 JUDGE TORNQUIST: So, what you're saying is that
4 number is not in the art? As to what would be necessary?

5 MR. CHEN: It's not stated. Right, the art says do 5,000
6 angstroms. And, you know, Dr. Rubloff says in his testimony,
7 well, you don't need that, and even in addressing the seam or the
8 crevice, he says, oh, well I think this still should be enough
9 because -- you know, but it's just speculation. And it's not what
10 the reference teaches. And I mean, at some point we have to look
11 at what the evidence actually says as opposed to, you know, the
12 speculation of the experts. I understand it's evidence as well, but
13 one thing is a document and what the document actually says.

14 I don't have anything else.

15 JUDGE TORNQUIST: I have no other questions.

16 JUDGE CHANG: Thank you.

17 MR. RENNER: I believe it's 27 minutes. Is that
18 correct?

19 JUDGE CHANG: Yes.

20 MR. RENNER: May it please the Board, I'll start with
21 the '997 patent, and that's where we began, just talking for a few
22 moments about it. Slide 27, please, if I could.

23 With respect to "over," and the construction of "over"
24 and the application of the art, fairly short comments with respect

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1 to that. So, I thought we would begin with them. We talked
2 about the paper and the pencil kind of scenario. If we look at the
3 proverbial pencil in red in the drawing that is figure 3b of Doshi,
4 we know that that corresponds to the oxide that's grown on the
5 side wall of the gate electrode. And we indeed see that that's
6 formed over, that is above and covering part of at least the --
7 there you go, thank you very much -- the relevant region in
8 yellow. So, you can see that the oxidation that's grown there is
9 indeed over, even if the word "covering" is the adopted
10 construction as it's been advanced.

11 So, we wanted to just point that out in the first instance.
12 We, of course, maintain that the word "over" should be broad
13 enough to mean above, but we wanted to just clarify on that
14 point.

15 Additionally, we noted that there was some early
16 testimony by the expert that the diffusion region may be either
17 covered or uncovered with oxide, and yet we know that in the --
18 thank you very much -- in the original declaration here that's
19 shown, it's even if the source/drain regions were covered by a thin
20 layer of gate oxide is what is said here, during the implementation
21 step, one of ordinary skill, it says, in the art, would recognize that
22 the gate oxide covering the source/drain will grow thicker, which
23 makes sense, during the thermal oxidation of the gate structure.

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1 In other words, there were questions and answers asked
2 when you read the transcripts of the deposition with respect to
3 whether there is oxidized material above the relevant region, but
4 what we see is whether there is or not, there is testimony that if it
5 were clear, there would be oxidation during this process. And as
6 you can see highlighted here, when there is recognized to be
7 some oxidation, oxide above that region, it also will oxidate and
8 become thicker and form the oxide that's necessary.

9 So, what you would end up with, if you look at 3b
10 again, considering this, not only the red region, which is shown
11 above the diffusion region, and next to the gate electrode, you
12 would see an extension of that running along the top of the
13 diffusion region, and no matter how you construe a covering, we
14 believe you would see full coverage, in fact, that is a full layering
15 atop of in this realm.

16 Questions on that? If not, we will move to "spacer" for
17 a moment, please.

18 (No response.)

19 MR. RENNER: So, if we could, let's look at Figures 3g
20 and 3k of the patent. We've heard a lot of conversation about
21 these are Figure 3g on the top, Figure 3k on the bottom, straight
22 from the patent itself. And there has been a great deal of
23 discussion about whether or not Figure 3g is a reliable rendering.

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1 That's essentially it, right? Is Figure 3g a reliable rendering? Is
2 it, in fact, supported by the text of the specification?

3 Earlier you heard me describe for you what we believe
4 the specification says when it mentions brief and anisotropic, but
5 we know that Figure 3k undeniably, it's here in the record as well
6 and it's part of the patent disclosure, and you can see it's talking
7 about albeit the bit-line contact hole is what it's dealing with, they
8 actually line up pretty well here vertically, or they did a moment
9 ago, in that you can see the bit-line contact hole above that's
10 drilled out in the lower, it's shown with no conformal layer left in
11 it. But you can see right next to it, that is either on the right or the
12 left, there is a -- there is an electrode, a gate electrode, and on the
13 other side of it is a plug contact hole.

14 Now, this more mature rendering of the process, this,
15 you know, Figure 3k being one that follows a couple of steps, you
16 can see that's now filled with material, because we've undergone
17 some other processes. But when you look inside of that plug
18 contact hole on the opposite sides, if you will, of where this
19 bit-line contact line is cleared, you will see indeed that there is
20 shown the same thing that's shown in Figure 3g, and there's a
21 good reason for that, but just to be clear, it's the conformal layer
22 in a vertical dimension is shown in that, even in Figure 3k.

23 So, one of skill not only would see Figure 3k as we
24 believe not being a full representation of what's happening in a

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1 bit-line contact hole, but when it actually looks to the relevant
2 hole, it's going to find the layer that you need for the spacer, that
3 which was relied upon by Samsung in its briefing.

4 Now, just one more thought on this is, it makes sense
5 and I just want to make sure that we're all walking away from this
6 with the technological perspective of what has happened here in
7 this hole, in the bit-line contact hole. Let's go up to Figure 3g on
8 the top, and in that hole, you can see, again, the width of the
9 window which defines how the etching is going to occur, the
10 width of that window is -- Figure 3g, actually, please.

11 If you look at the width of that one, you're going to see
12 that it's correspondingly wide, such that the -- that region that
13 David is pointing to, if you extend down the left margin of the
14 window from the mask, you're going to see it come right next to
15 the gate electrode. If, in fact, there was etching that was done
16 long enough to remove layer 30, which is a silicon nitride layer,
17 that same etching would take out 11, and you recall the text that
18 we pointed to earlier, we saw that the patent itself expressly says,
19 a main objective is to not disturb 11, right?

20 And when you look at column -- you don't need to go
21 there, but column 7, lines 57 to 61, or you can, that tells us that
22 the bit-line -- I'm sorry, that the -- that the filament 11, it's
23 actually made of silicon nitride. So, the same material that is
24 used for the conformal layer that we're talking about here, the

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1 filament 11 right next to it, it also is formed of the same material.
2 So, if you're going to etch longer, long enough, indeed, to remove
3 30, you're going to take out 11 also. And that's going to expose
4 you -- I'm sorry to do this to you again, but go back to figure 3g.

5 That's going to expose you to a short, right? If you have
6 no material in between, there's going to be a short. And whether
7 there's no material, some material, this isn't even part of the
8 conversation. The patent is clear, Doshi's teachings are clear, it
9 wants -- it wants to disturb nothing in between that gate and that
10 plug. It wants to make sure there's material there to make sure
11 there's no actual shorting.

12 So, questions about '997 patent? If not, I'll say a few
13 words about the '893 patent.

14 (No response.)

15 MR. RENNER: So, as to the '893 patent, let me make
16 sure I'm giving you the right number here. This is the 00466
17 proceeding, and this is with respect to the Miyazaki reference.
18 Judge Tornquist, you asked I thought an insightful question of me
19 earlier and I wanted to just follow up on that just for a moment.
20 You asked during my direct, you noted that embodiments 3 to 5,
21 that they're directed to only one, a single-chamber embodiment,
22 and I acknowledged that that was, in fact, the case. And maintain
23 that.

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1 I thought it might be helpful, though, to say a few more
2 words, and in specific to note that our contention is simply that
3 embodiment 6, which is clearly -- well, which has in it partly a
4 multi -- a multi-chamber embodiment, right, multi-chamber
5 embodiment, that's going to draw on the information that's
6 disclosed in 3 through 5. Now, it gets interesting when you
7 actually look back at the reference and you notice that
8 embodiment 6 isn't fully a multi-chamber embodiment. It's
9 primarily in its description about thickness in the beginning and
10 so presumably it's about a single-chamber embodiment, right?

11 So, the idea of bringing the parameters into embodiment
12 6 is a no-brainer. You know, you're still talking about the first
13 single-chamber embodiment, we believe. It's only at the end of
14 embodiment 6 where it says, hey, you know, we've been talking
15 about a continuous process, that's not so important to us, take
16 what we've talked about, and you can use it in a multi-chamber
17 embodiment.

18 Now, it's talking about thickness, specifically
19 embodiment 6 was, but we believe its teachings had already
20 subsumed the teachings on the, you know, parameters that were
21 being used in the patent. So, when it said in embodiment 6, about
22 embodiment 6, move to a multi-chamber embodiment, we believe
23 that it brings along, it's even more compelling when you think

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1 about its reliance and its teaching those of skilled in the reference
2 that you would put these parameters in place.

3 JUDGE TORNQUIST: So, your feeling is one of skill
4 in the art would understand, despite the changes in temperature
5 and the like, that those would work?

6 MR. RENNER: In fact, yes, Your Honor.

7 JUDGE TORNQUIST: In embodiment 6?

8 MR. RENNER: Yes, Your Honor. And, in fact, as you
9 may recall, the change in the temperature range and the flow rate
10 in the teachings of Miyazaki are precisely the same as what was
11 in the subject patent.

12 So, we actually think that at the time of the invention,
13 these are parameters that were known to work, with respect to
14 what you're trying to achieve, in the first deposition, high stress,
15 the second deposition, low stress, but the filling in the first.
16 These are parameters that were to be used in the environment,
17 which was to create a -- to put the layers in place, whether you
18 put that in place during a deposition continuously, or you did one
19 and then the other, as long as you put those in place, we believe
20 that -- and Rubloff has said, there is an expectation of success.
21 And that's in his declaration.

22 And it stands to reason, doesn't it? When you think
23 about the fact that the subject patent discloses precisely the same
24 ranges, it's not like there was some significant change that indeed

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1 had to occur. You know, you're kind of -- it bears out, frankly,
2 that these ranges were sufficient for those of skill in the art. And
3 that's all that Rubloff needed to say and that's all he was required
4 to say.

5 So, within the level of skill, let's see, slide 49, if you --
6 thank you. The level of skill, I wanted to make sure that we were
7 all looking at this as well, that the idea of using the parameters
8 that were earlier disclosed in a multi-chamber environment, that
9 there is disclosure that is evidence on the record, paragraph 6B of
10 the declaration given by Rubloff, to confirm that this was
11 something that people of skill would reasonably have expected to
12 work.

13 And again, I say to you that expert aside, you know, it
14 just stands to reason that we're using the same parameters that
15 were indeed disclosed by the subject patent itself.

16 HSC recognizes that Doshi is telling someone to apply
17 its embodiment 6 to this two-chamber -- this two-chamber
18 embodiment, and they refute nevertheless that the POSITA would
19 integrate some but not all of its teachings. So, the idea that I
20 think we heard earlier was that you might pull some of what's in
21 those embodiments in, that would be thought to be reasonable,
22 but just not those parameters. And, you know, our -- we believe
23 it's a whole reference, we believe that when one reads the
24 reference they would be informed as they approach and in as

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1 much as Rubloff -- as the reference didn't itself teach alternatives,
2 then naturally you would turn to the specification that it actually
3 did provide.

4 So, why wouldn't you apply teachings for embodiments
5 3 to 5 to 6? This is clearly a question that was asked earlier, of
6 opposing counsel. And we think that's a great question. That,
7 you know, the idea that a POSITA wouldn't know how to modify,
8 again, we do believe that this is undermined by the specification
9 itself laying out those parameters that are, indeed, assuming
10 enablement, shown proof to survive.

11 HSC cites to Rubloff's cross examination testimony, and
12 it cited to that to suggest that there was some -- that it would be
13 outlandish to think that you could modify a parameter. I want to
14 make sure we address that. When you look at the testimony
15 itself -- I don't have the slide for that that's there, the question that
16 was asked I think is really important.

17 Rubloff, as you'll see, if you read through his papers,
18 he's a pretty careful guy. He's pretty academic. He came
19 forward, you may recall, with the notion of the shoulder being not
20 right in the figure 3g in the other proceeding. He's not -- anyway,
21 he's here to have his own voice. And when he hears this question,
22 he said -- we were talking about this, he says, "the question was
23 about manufacturing." It says -- here it is, "when you're doing
24 semiconductor manufacturing" -- doing the manufacturing, okay,

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1 so you're in the process of manufacturing -- "is it important to
2 follow the recipes that are provided?" So, this is someone who
3 has been provided recipes and they're in the process of
4 manufacturing, and I stand behind what he said. If I've got
5 someone in the fab, and they've got a run going, and they've been
6 told how to run it, I don't want them moving those dials around
7 either, right? That does border on, you know, what is it?
8 Irresponsible.

9 But that's not what we're talking about here. We're not
10 talking about someone on the floor trying to make a decision
11 about whether they modify the parameters. That's not at all what
12 we're talking about.

13 What we're talking about is whether someone who is
14 designing this understands that that the ranges that have been set
15 before them are sufficient to teach how to enable the invention.
16 And the answer is yes. But this testimony doesn't bear on that.

17 I'm not walking away from it, it's just that this is about
18 manufacturing. And we tried to, you know, make that clear in
19 our responsive briefing and he did with the responsive
20 declaration, we would commend those two to the Board.

21 The last thing I guess I would say on this in particular is
22 if we look at slide 10 of -- I think it's 10 of the opposing counsel's
23 slides. This is the slide that just has the formula in it. Again, to
24 make it easy to look at what we're talking about, not otherwise.

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1 But there was some conversation about whether or not the 0.35
2 hole size was a stretch, whether you could get to that. What was
3 that like?

4 And there was some conversation about whether or not
5 when you have a hole that diminishes in size, is there a
6 corresponding change in the layer. Whether or not there's
7 precision, and Rubloff speaks to this in his declaration, but --
8 speaks to the fact that there is a corresponding change in the
9 dimension of that layer, but whether or not it's precisely the same
10 degradation, if you will, you don't need that to get to the timing
11 that's here.

12 What we know is if you have a 0.35 micron wide hole
13 and you're going to layer into it. You know, a layer is two
14 different sides, right? We also have another layer in there of
15 material that we don't even need to talk about. And that's why
16 2,000 angstroms works for the complete filling of the hole
17 argument. You'll notice in there there's another layer. But even if
18 you were only going to fill it with tungsten, divide it in half, 0.35,
19 it's 1,750 angstroms. Use that flow rate, which we have
20 established in the record, 17.5 angstroms per second, and you're
21 at 100 seconds.

22 So, unless we're here saying -- unless the decision
23 would be that Felix's sized hole is absolutely not able to be
24 addressed here, in a reference that says more than -- you know,

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1 not more than -- sorry, not more than 0.5, unless that's the case,
2 we know that this formula bears out the claimed range at 0.35,
3 and we also know that it's not realistic to have just tungsten in
4 that hole. There are teachings in the actual reference that tell us
5 that.

6 I think I'll leave the rest of my time to you, Rob.

7 MR. DEVOTO: Thank you, Your Honors. So, I would
8 like to begin by addressing some of the comments made with
9 respect to the '244 patent. The first comment I would like is that
10 it appears that the HSC has actually modified their claim
11 construction at this oral hearing from what they have advanced in
12 their briefs and now they have asserted that it's not simply a
13 single-process step that achieves the results in that removing the
14 fourth dielectric layer limitation, but rather have now
15 acknowledged that it could be a process, meaning that it could
16 encompass multiple steps.

17 This is what I would argue is a new argument, a new
18 position, perhaps a position they've recognized in view of how
19 untenable it is to assert that a single-process step would achieve
20 all three of those results.

21 Now, what I would like you to be aware of, though, is
22 that that process, in that limitation, does not tell you what the
23 intermediary steps are besides the removal of the fourth dielectric
24 layer to achieve those results. And, in fact, those intermediary

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1 layers or those intermediary steps could very well include
2 removal of the third dielectric layer as well as removal of the
3 photoresist. It's not specified in the claim.

4 So, clearly, given that those intermediary steps in that
5 multi-step process fail to be specified in the limitation, then it is
6 clear that Nakamura, which does have intermediary steps, it does
7 remove the fourth dielectric layer, and it does achieve all three of
8 those results, with intermediary steps of removing the resist layer
9 as well as this third dielectric layer, that it indeed satisfies that
10 feature, even under this new construction that HSC is advancing.

11 Secondly, I would like to talk briefly about
12 Dr. Rubloff's testimony, as they have pointed to it as being
13 consistent with their narrow construction of asserting that this
14 limitation should be read as simple a single etch step using the
15 resist layer to drill through two layers of dielectric. Dr. Rubloff
16 explicitly stated in his declaration in paragraphs 23 to 25 of his
17 second declaration that he was envisioning the preferred
18 implementation in making this statement. And his later
19 statements directed to the claims are correct in that he was
20 speaking about the claims in the context of the preferred
21 implementation.

22 And lastly, as Your Honors are well aware -- and could
23 you put the slide up -- as Your Honors are well aware, under the
24 *Phillips* standard, the intrinsic evidence, the intrinsic evidence is

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1 controlling, and it's clear from both the claim language and the
2 plain language of the claim that HSC's overly narrow read of this
3 feature is simply not supported.

4 Now I would like to also touch upon briefly the
5 modification of the third embodiment based on the first
6 embodiment. One of the themes of the -- of HSC's assertions is
7 this notion of we're using hindsight all the time. It's not true. For
8 every modification we have laid out, we have laid out
9 groundwork to show why the primary reference would have a
10 need or indicate applicability to a change, and then we've asserted
11 benefits for that change.

12 That has been true for the deposition time where we
13 have shown that Miyazaki, for example, applies to contact holes
14 not greater than 5 microns, it could be less than 5 microns, and
15 we've shown how the deposition time would change when you
16 apply it to smaller contact holes.

17 Similarly, we've also shown that the -- that the Emesh
18 reference envisions a more important parameter, the ratio being
19 more important than these other parameters. This isn't -- this isn't
20 a robot who's reading a recipe and doesn't bring knowledge to
21 bear and thinks everything is on equal parody. I can't change a
22 parameter at all because, oh, then I would be changing what their
23 reference specifically says.

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1 No, a skilled artisan looks at the reference and
2 understands and brings their own knowledge to bear, and in this
3 case, would understand that there are benefits to be had by
4 changing those gas flow parameters. It's not hindsight, it's
5 benefits that we noted about reducing residence time of harmful
6 CXD or CVD byproducts. That helps prevent damage to the
7 devices. The benefits of easier regulation of these gas flows.
8 These are all benefits that are brought to bear and it's with these
9 benefits, in view of the context of Emesh showing the importance
10 of the WF6 ratio as being more important to achieve the desirable
11 characteristics that would have led a skilled artisan who is not a
12 robot, who is not automaton, to bring together a combination, just
13 like you bring together pieces of a puzzle. Perfectly consistent
14 with *KSR* and its notion of common sense and how a skilled
15 artisan brings common sense to bear.

16 Now, I want to mention one last thing about the
17 modification of Nakamura's third embodiment based on the first
18 embodiment, just to refresh your memory. That modification
19 would keep the resist in place, the resist in place through both the
20 etching of the fourth dielectric layer as well as the etching of the
21 third dielectric layer, and in that case, you would have that resist
22 in place, in a situation where that etching process would achieve
23 all three of those results at the end of that etching process.

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1 Mind you, it's still a process, it's a two-step process.
2 That would satisfy their new narrow construction of the relevant
3 fourth dielectric layer removal feature, and the opposing side has
4 asserted somehow that a skilled artisan looking at Nakamura
5 wouldn't recognize, hey, I am etching back in the second
6 embodiment and etching back more in the third embodiment and
7 I know that planarization is one goal, not every goal, but it's a
8 goal in the process, and there would be scenarios when I etch
9 these back, depending on the thicknesses of the layers, where I, in
10 fact, could still achieve a benefit of planarization by doing this
11 modification.

12 So, this notion that the third embodiment has only one
13 goal, one monolithic goal, you can't change the planarization,
14 that's the only goal, that is a simplistic assertion, not only is it
15 not -- not only is that goal still met by modification that simply
16 brings common sense and logic from a skilled artisan as
17 Dr. Rubloff has stated in his declaration to show that that goal can
18 still be met, but also is monolithic.

19 Dr. Rubloff describes many goals of these processes.
20 These things aren't simple. There's a lot of goals. You trade off
21 simplicity for low cost, you trade it off for yield lost by loss of
22 depth focus and loss of planarity. These are all things that a
23 skilled artisan looking to design a recipe would, in fact, consider.

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1 And as far as that quote my colleague showed, this
2 notion that this is such an arcane field of art that I can't diverge
3 anywhere without being what they appear to be implying, undue
4 experimentation, is not credible. That verging on irresponsible
5 quote is just taken totally out of context. It's a person on the line
6 who has been given a recipe, is processing a bunch of devices,
7 and decides to change an ops. Well, of course it's irresponsible to
8 do that, but that's not the case we have here.

9 Now, I would like to mention one last thing about
10 Emesh, if I could. So, HSC attempts to argue, they create a
11 strawman argument that we are asserting that because cluster
12 tools existed and they were known to exist, that every system that
13 would have, say, a dual tungsten deposition or might not even
14 have a dual tungsten deposition, that they would start using
15 cluster tools. And the fact that they point out to a bunch of
16 references that they say don't use cluster tools and use a
17 single-chamber deposition as somehow evidence that -- of
18 nonobviousness in using a dual-chamber, dual tungsten
19 deposition.

20 Well, that's just a strawman argument. The bottom line
21 is, first of all, Chang describes use of a single tungsten deposition
22 in that chamber, but it's an AMAT 5000 chamber, it's a cluster
23 chamber and it begins the process by receiving from one of its
24 ports a wafer that has tungsten in it, and then it cleans it and then

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1 deposits another layer on top of it. Well, guess what? It would
2 have been obvious, given that that slit through which it received it
3 is part of the same AMAT multi-cluster tool because that could
4 easily have been deposited in another chamber of that AMAT
5 5000 cluster tool.

6 So, their own reference that they say is limited to a
7 single chamber is not limited. We don't know how that other
8 tungsten layer was done. It could have been done with another
9 tungsten deposition in a different -- in a different chamber of that
10 same tool. So, it's a mischaracterization of the reference.

11 Regarding Miyazaki, Miyazaki clearly discloses
12 multiple chambers with multiple tungsten depositions. My
13 colleague has spoken to that at length.

14 And regarding an Emesh and Mak, well that's why we
15 use obviousness. That's what the legal doctrine of obviousness is
16 for. So, again, that shows no added evidence of nonobviousness
17 that appears to be what they're attempting to shoehorn into this.

18 I think I have one minute 29 seconds left, and then
19 lastly, the one thing I want to say is this notion that they keep
20 repeating about the need to perform experiments, Dr. Rubloff, did
21 you perform experiments to do this? Well, we are in the
22 predictable arts, Your Honors. What's needed is a reasonable
23 expectation of success. We've shown that, and that's a *prima*
24 *facie* case that has been established.

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1 When you start talking about experimentation, well you
2 show me that there's undue experimentation that's needed. We've
3 shown our case based on Rubloff's testimony, which remains
4 un rebutted on most of these points, and we've shown it based on
5 the intrinsic record that we've made the *prima facie* case.
6 Experiments aren't needed in the predictable fields of arts to make
7 that case.

8 So, when you start talking about that, well you better be
9 talking about undue experimentation instead of some hand
10 waving that hindsight is needed whenever I change any parameter
11 of the reference. There were reasons why we changed every
12 parameter and they were supported by testimony as well as
13 evidence.

14 Are there any questions of me?

15 (No response.)

16 MR. DEVOTO: Thank you very much.

17 JUDGE CHANG: Thank you, everyone. The cases
18 will be submitted.

19 **(Whereupon, at 4:04 p.m., the hearing was adjourned.)**