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Transcript of Sanjay K. Banerjee, Ph.D.

Date: September 27, 2024

Case: LAM Research Corp. -v- Inpria Corp. (PTAB)

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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

- - - - - x

LAM RESEARCH CORP., :
Petitioner. :
v. : Case No. IPR2024-00033
INPRIA CORP., : Patent No. 9,823,564
Patent Owner. :

- - - - - x

Deposition of SANJAY K. BANERJEE, Ph.D.
Washington, D.C.
Friday, September 27, 2024
9:07 a.m.

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1 Deposition of SANJAY K. BANERJEE, Ph.D.,
2 held at the offices of:

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10
11
12 Pursuant to Notice, before Janet A.
13 Hamilton, Registered Diplomate Reporter and Notary
14 Public in and for the District of Columbia.

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C O N T E N T S

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E X H I B I T S

(None marked)

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P R O C E E D I N G S

SANJAY K. BANERJEE, Ph.D.,
a witness herein, being duly sworn, testified as
follows:

EXAMINATION BY COUNSEL FOR THE PETITIONER
BY MS. PATITUCCI:

Q Good morning.

A Good morning.

Q Can you please state your full name and
address for the record?

A Sanjay, S-A-N-J-A-Y, Kumar, K-U-M-A-R,
Banerjee, B-A-N-E-R-J-E-E, 1742 Canonero Drive,
C-A-N-O-N-E-R-O, Austin, Texas, 78746.

Q Thank you. Have you been deposed before?

A Yes.

Q How many times?

A I don't remember exactly. More than a
dozen times.

Q All in your capacity as an expert?

A Yes.

Q Have you ever testified at a trial or a

1 hearing?

2 A Yes.

3 Q At a trial?

4 A At trial, yes.

5 Q How many times at trial?

6 A I think I testified at the ITC three or
7 four times and once I think in the Northern
8 District of California, if I remember right.

9 Q Have you ever been excluded as an expert
10 at a trial?

11 A You mean Daubert?

12 Q Mm-hmm, yes.

13 A No.

14 Q Do you understand that you're testifying
15 under oath today --

16 A Yes.

17 Q -- as if you were testifying in court?

18 A Yes.

19 Q And if you don't understand a question,
20 let me know and I'll try to restate.

21 A Okay.

22 Q Can I assume that if you answer my

1 question you've understood it?

2 A Yes.

3 Q And you'll answer my questions to the best
4 of your ability?

5 A Yes.

6 Q Is there any reason why you cannot testify
7 truthfully and completely today?

8 A No.

9 Q Are you being compensated for your time
10 testifying today?

11 A Yes.

12 Q And how much are you being compensated?

13 A \$500 an hour.

14 Q Do you understand that you are not allowed
15 to discuss the substance of your testimony until
16 the deposition is over?

17 A Yes.

18 Q When were you engaged by Inpria in this
19 matter?

20 A I don't remember exactly, but I think
21 several months ago.

22 Q Over the summer?

1 A Once again, I don't recall exactly but I
2 think so.

3 Q Before June?

4 A I have to look at my engagement letter. I
5 don't recall.

6 Q How did you come to be engaged by Inpria?

7 A My counsel contacted me. Oh, no, sorry.
8 No. There was a search firm who put us in touch,
9 yeah.

10 Q What, if anything, did you do to prepare
11 for this deposition?

12 A I reviewed my declaration. I reviewed the
13 documents that are cited in my declaration.

14 Q Did you meet with anyone?

15 A I met with my counsel yesterday.

16 Q For how long?

17 A Several hours.

18 Q Did you look at US Patent 9,823,564?

19 A Yes.

20 Q And you understand if I say '564 patent,
21 I'm referring to US Patent No. 9,823,564?

22 A Yes.

1 Q Did you look at any file histories of
2 patents?

3 A Yes.

4 Q Which patents?

5 A I looked at the '867 application.

6 Q Any others?

7 A I don't recall.

8 Q Did you look at any deposition
9 transcripts?

10 A No.

11 Q Did you review Dr. Holland's declaration?

12 A Yes.

13 Q Did you review Dr. McCloy's declaration?

14 A Yes.

15 Q Did you review the patent owner response
16 to the petition?

17 A I don't think I did. I don't think I -- I
18 don't remember. I don't think I did. I certainly
19 didn't refer to that in my declaration. Yeah, I
20 don't recall. I don't think I did. I may have.
21 I can't remember.

22 Q Did you review the motion to amend?

1 A I don't think I did either.

2 Q In preparing your declaration did you
3 consider any amendments to the claims of the '564
4 patent?

5 A I don't think I did that either.

6 Q So if you could turn to Exhibit 2009, your
7 July 31st, 2024, declaration.

8 A Okay.

9 Q This is the expert declaration that you
10 signed and submitted on July 31st, 2004 [sic];
11 correct? Or 2024, I'm sorry.

12 A Yes.

13 Q Anything that you would like to correct in
14 your declaration?

15 A No.

16 Q Anything that you would like to clarify in
17 your declaration?

18 A No.

19 Q And you submitted this declaration in part
20 to respond to a declaration by Dr. Holland;
21 correct?

22 A That's correct.

1 Q And Dr. Holland's declaration concerned
2 the invalidity of the '564 patent; correct?

3 A That's correct.

4 Q You said earlier that you reviewed the
5 declaration of Dr. McCloy in preparing for this
6 deposition; right?

7 A Yes.

8 Q In preparing the declaration you also
9 reviewed Dr. McCloy's declaration?

10 MR. WOLFE: Objection. Asked and
11 answered.

12 A The declaration represents my opinions,
13 but I did review Dr. McCloy's declaration.

14 Q Do you know Dr. McCloy?

15 A No, I do not.

16 Q Did you speak to him while preparing your
17 dec- -- I'm sorry.

18 Did you speak with Dr. McCloy while
19 preparing your declaration?

20 A No, I did not.

21 Q And your opinions are based in part on
22 Dr. McCloy's opinions?

1 A No. The opinions are mine. I did review
2 his declaration, but the opinions are mine.

3 Q On -- if we could turn to paragraph 17.

4 A Okay.

5 Q You state, "I generally agree with the
6 opinions expressed by Dr. McCloy in his
7 declaration, and portions of his analysis are
8 adopted as my own in this declaration, where
9 relevant."

10 Do you see that?

11 A You said paragraph 17?

12 Q 17, note 1.

13 A Oh, note 1, I'm sorry. Yes. I see that.

14 Q What did you mean by "generally agree"?

15 A I meant that I did review his declaration,
16 and I came to these conclusions that are described
17 in my declaration on my own, but then when I
18 reviewed the declaration of Dr. McCloy in the
19 parts that I cite to his declaration, I'm in
20 agreement with them, and in some cases I have
21 incorporated portions of his analysis as my own
22 because I did not see any point in, you know,

1 reinventing language in some cases.

2 Q So you came to all of your opinions in
3 this declaration before reviewing Dr. McCloy's
4 declaration?

5 A The opinions in the declaration are
6 mine -- in my declaration are mine. I did review
7 Dr. McCloy's declaration before writing mine, but
8 my -- the opinions in this declaration are not
9 contingent on the declarations -- on the opinions
10 that Dr. McCloy came to, provided in his
11 declaration.

12 Q And why are there some paragraphs in your
13 declaration that are identical to paragraphs in
14 Dr. McCloy's declaration?

15 MR. WOLFE: Objection. Asked and
16 answered.

17 A As I said, the opinions described in my
18 declaration are mine. I stand by those opinions.
19 I did review Dr. McCloy's declaration prior to
20 writing my report, and in a few cases that we saw
21 that our opinions are identical, I did not see the
22 need in reinventing language, and there may be a

1 few places where the language is identical.

2 Q Did you disagree with any of Dr. McCloy's
3 opinions?

4 A I don't believe so.

5 Q You don't believe so or no?

6 A Let me review Dr. McCloy's. It's been a
7 while since I looked at his declaration.

8 So the parts which I cite in my
9 declaration we're in agreement with, but I -- I
10 have to, you know, review this whole thing again
11 then to see if there are certain phrases that I
12 may or may not agree with.

13 Q Where did you cite to Dr. McCloy's
14 declaration in your declaration?

15 A In general the sections, you know, 6, 7
16 and 8 are areas where Dr. McCloy I believe also
17 had opined on, the following sections as rebutting
18 what Dr. Holland had written in her report. So
19 let's see. If you could point me to a section of
20 my report where I cite Exhibit 2001.

21 Q So it's correct that you only cite to his
22 declaration in paragraph 17; correct?

1 MR. WOLFE: Objection. Foundation.

2 A Okay.

3 Q When you said that you generally agree
4 with the opinions expressed by Dr. McCloy, what
5 did you mean by the word "generally"?

6 MR. WOLFE: Objection. Asked and
7 answered.

8 A By the word "generally" I was trying to
9 say that the opinions in my report are my
10 opinions. It's not that I am simply parroting
11 Dr. McCloy. That's what I had meant to say. Now,
12 in a few cases I may have, you know, quoted a few
13 sentences verbatim. If you can point me to that,
14 I can comment on that. I don't believe I
15 disagreed with Dr. McCloy.

16 Q So you agreed with all of Dr. McCloy's
17 opinions?

18 A I believe only certain parts of
19 Dr. McCloy's declaration overlapped with my
20 declaration. I do not believe I've opined on
21 every aspect. I mean off the top of my head I
22 remember he had some description about when you

1 spin the wafers, the centrifugal force depends on
2 the distance from the center and therefore that
3 will cause some thickness variation, and that's
4 physics, and I do agree with that, but I do not
5 cite to that in my report, for example.

6 Q So you agreed with all of Dr. McCloy's
7 opinions in his declaration, regardless of whether
8 you cited to them in your declaration?

9 MR. WOLFE: Objection. Asked and
10 answered.

11 A I did not say that. I said that the
12 segments of my report which have commonality with
13 segments with Dr. McCloy's we are in agreement,
14 but the opinions in my report are mine; they're
15 not simply copied from Dr. McCloy's, even if in a
16 few places the language may or may not be
17 identical. I don't recall offhand, and if they
18 are identical, it's simply because I did not want
19 to, you know, reinvent the wheel in terms of the
20 language.

21 In other sections -- I can't recall
22 offhand every word from Dr. McCloy's, but off the

1 top of my head I remembered he talked about when
2 you spin a wafer, the photoresist flies off due to
3 centrifugal forces, and the centrifugal force is
4 given by mass times omega squared. Omega is the
5 angular frequency in radians per second, times R
6 which is the radial distance from the center, and
7 Dr. McCloy opines that that radial force will be a
8 function of the distance from the center of the
9 wafer and, therefore, it will lead to thickness
10 variations, and while that happens he also opines
11 on the fact that the solvent will evaporate, and
12 all of these will cause thickness variations. So
13 we'll never get exactly the same thickness across
14 the entire wafer, and you have to talk in terms of
15 average thicknesses. I agree with that. I did
16 not, you know, comment on those aspects.

17 Q Okay. So I think I'm trying to get just a
18 simpler answer. My question was: Did you agree
19 with all of Dr. McCloy's opinions in his
20 declaration, regardless of whether you cited them
21 in your declaration?

22 MR. WOLFE: Objection. Asked and answered

1 and mischaracterizes.

2 A I cannot answer that because, once again,
3 I have to then sit down and, you know, review
4 Dr. McCloy's declaration in real time and look at
5 every statement and try to form an opinion whether
6 I agree or not.

7 Q Did you review his declaration in
8 preparation for this deposition?

9 A I did but, you know, sort of in a -- you
10 know, certain documents you review in greater
11 depth than others. So, for example, the '564
12 patent I reviewed in great detail. I mean there's
13 a lot of exhibits that I cite. I did not review
14 every single exhibit with equal, you know, with
15 equal rigor preparing for the deposition today, of
16 course.

17 Q Was there anything in Dr. McCloy's
18 declaration that you disagreed with?

19 MR. WOLFE: Objection. Asked and
20 answered.

21 A I don't recall offhand anything that I
22 disagreed with, but I really cannot comment

1 definitely on that.

2 Q Did you review any -- strike that.

3 You said in footnote 1 of paragraph 17
4 that you, that portions of Dr. McCloy's analysis
5 are adopted as your own in this declaration where
6 relevant. What did you mean by "where relevant"?

7 A Well, I'm not opining on every aspect of
8 the '564 patent. I was only asked to opine on
9 certain aspects of it by my counsel. That's what
10 I meant by "where relevant."

11 Q Did you review any Lam patents?

12 A I did not. I don't think I did. No, I
13 don't -- I don't recall. No, I don't think so.

14 Q Are you familiar with Lam?

15 A Yes.

16 Q Have you reviewed Lam patents outside the
17 context of this proceeding?

18 MR. WOLFE: Objection. Scope.

19 A I've done a lot of cases over the years.
20 I don't think so.

21 Q Did you review any Lam technical
22 documents?

1 A Not for the purposes of this case.

2 Q Have you reviewed any Lam technical
3 documents for a purpose other than this case?

4 MR. WOLFE: Objection. Scope.

5 A I don't think so.

6 Q Were there any materials you reviewed
7 while preparing your declaration that are not
8 cited in your declaration?

9 A I mean it's a pretty broad question. I
10 may have. I don't recall.

11 Q So in paragraph 17 you state at the last
12 sentence, "I reviewed any other materials I refer
13 to in this declaration in support of my opinions";
14 right?

15 A Yes.

16 Q So I guess my question is: Were there --
17 did you review any other materials that are not
18 referred to in your declaration?

19 MR. WOLFE: Objection. Asked and
20 answered.

21 A So I reviewed the documents listed in
22 paragraph 17, and I think there's a few other

1 documents that are not listed here that I referred
2 to in my declaration that I also did review. If
3 you're asking me if I reviewed any other documents
4 outside of that, I don't recall exactly, but I may
5 have.

6 Q Your opinions are based on what a person
7 of skill in the art would have known around June
8 1st, 2010, to August 5th, 2010; correct?

9 A That's correct.

10 Q And you'll understand if I refer to a
11 person of skill in the art as a POSA?

12 A Yes.

13 Q Would any of your opinions change if the
14 date of the invention was in 2015?

15 MR. WOLFE: Objection. Scope.

16 A I don't know. I can't answer that off the
17 top of my head sitting here.

18 Q You haven't considered what a POSA would
19 have known in 2015; is that right?

20 MR. WOLFE: Objection. Mischaracterizes.

21 A I have not for the purposes of this
22 declaration.

1 Q Have you considered it for the purposes,
2 or for any other purposes?

3 MR. WOLFE: Objection. Scope.

4 A I don't think so.

5 Q You applied the plain and ordinary meaning
6 of the claim terms in forming your opinions; is
7 that right?

8 A That's correct.

9 Q You considered the language of the claims
10 in forming your opinions? Is that true?

11 A Yes.

12 Q And you considered the specification in
13 forming your opinions?

14 A Yes.

15 Q And you considered the prosecution history
16 of the '564 patent in forming your opinions?

17 A Yes.

18 Q Did you consider any extrinsic evidence to
19 understand the meaning of the claims?

20 A I'm not sure what you mean by extrinsic
21 evidence. I mean I do have knowledge of the
22 English language.

1 Q I'll rephrase. Did you consider any
2 evidence other than the language of the claims,
3 the specification and the prosecution history to
4 understand the meaning of the claims?

5 A I don't think so. I used the plain and
6 ordinary meaning of the terms used in the '564
7 patent.

8 Q So you didn't consider any extrinsic
9 evidence to understand the meaning of the claims.
10 Is that true?

11 MR. WOLFE: Objection. Objection. Asked
12 and answered.

13 A I don't think so.

14 Q You assumed Dr. Holland's definition of a
15 person of ordinary skill in the art; correct?

16 A Yes.

17 Q Do you have an opinion on who a POSA is?

18 MR. WOLFE: Objection. Scope.

19 A I did not form any opinion of my own for
20 the purposes of the declaration. I adopted
21 Dr. Holland's.

22 Q And Dr. Holland's definition of a POSA is

1 a person with at least a graduate degree such as a
2 Master's or a Ph.D. in a relevant discipline such
3 as chemistry, materials science, chemical
4 engineering, physics or an equivalent field; is
5 that correct?

6 A Yes.

7 Q You do not hold any degree in chemistry.
8 Is that true?

9 A No.

10 Q Did you ever study chemistry?

11 A Yes.

12 Q And when was that?

13 A Well, I had many undergrad courses when I
14 was getting my Bachelor's in electrical and
15 computer engineering, and then in graduate school
16 my degrees are in electrical and computer
17 engineering but in the field of microelectronics
18 which is a highly interdisciplinary field
19 involving materials science, chemistry and
20 physics, so in the course of my graduate work I
21 had to study chemistry literature quite
22 extensively, and I've continued to study that

1 during my research after my Ph.D.

2 Q You took -- strike that.

3 I just want to make sure I'm understanding
4 correctly. You took chemistry courses during your
5 undergraduate degree in electrical engineering?

6 MR. WOLFE: Objection. Mischaracterizes.

7 A I remember taking chemistry courses on
8 physical chemistry, inorganic chemistry and
9 organic chemistry, three semester wide, long
10 courses when I was doing my undergrad, and then
11 during my graduate school I took courses on
12 microelectronics fabrication techniques involving
13 both theory and the lab, and as you know,
14 microelectronics depends heavily on knowledge of
15 chemistry during the processing. So it may not
16 have been formally listed as a course in chemistry
17 but it's a lot of chemistry in that, and during my
18 research always, as I've told you, you have to
19 study a lot of chemistry-related literature as
20 part of research.

21 I also teach a graduate course. I've been
22 teaching that for the last 35 years on

1 microelectronics fabrication where in various
2 modules we talk about the chemistry of
3 photoresists, for example, chemistry of etching.

4 Q So you do not have a degree in chemistry,
5 materials science, chemical engineering or
6 physics; correct?

7 A My degrees are in electrical and computer
8 engineering, specializing in microelectronics
9 which involves knowledge of the fields that you
10 mentioned because, as I'm sure you know, in the
11 modern world you cannot stovepipe disciplines.

12 (The reporter requested clarification.)

13 A I mean all these disciplines -- many of
14 these disciplines are quite interdisciplinary, and
15 microelectronics definitely is one of those
16 involving knowledge of physics, chemistry and
17 materials science and chemical engineering.

18 Q So your degrees are not in the field of,
19 or not in chemistry, materials science, chemical
20 engineering or physics?

21 MR. WOLFE: Objection. Mischaracterizes.

22 A My formal degree is in electrical and

1 computer engineering, and I specialized in
2 microelectronics which involves knowledge of the
3 fields that you mention, namely, chemistry,
4 materials science, chemical engineering and
5 physics.

6 Q Do you have at least one year of
7 experience in the research of resist materials?

8 A So in my research work I make
9 microelectronic devices which involves doing
10 photolithography. So I've worked with EUV
11 photoresists and electron beam photoresists of
12 many different types in making my devices, and as
13 part of that work I've developed recipes for
14 achieving various thicknesses of these
15 photoresists depending on the end application by
16 controlling things like spin speeds during the
17 photoresist application, for example.

18 Q Which photoresists have you conducted
19 research with?

20 A So I've worked with several brands of AZ
21 photoresists. AZ is a company. I've worked with
22 electron beam resists such as PMMA and I believe

1 COP. I don't remember the brand names off the top
2 of my head. I don't remember the exact, you know,
3 the brand names of the formulation off the top of
4 my head.

5 Q So you purchased the photoresists from
6 commercial suppliers?

7 A That is correct.

8 Q You don't make photoresists in your lab on
9 your own?

10 A No. I use them, but then we change the
11 formulation, for example, if needed, by maybe
12 diluting them to make them less viscous if I need
13 a thinner film or change the spin speed to either
14 make it thinner or thicker or apply a photoresist
15 multiple times if you need to increase the
16 thickness.

17 So we work with photoresist in terms of,
18 you know, developing relevant thicknesses for the
19 end application such as etching in an underlying
20 film or using photoresist to block ion
21 implantation and so on and so forth.

22 Q So you don't form new photoresist

1 materials; you modify commercial resist materials.

2 Is that true?

3 A Yeah. We do not synthesize photoresist
4 materials but we work with the formulations that
5 we buy, and we adjust the processing conditions to
6 meet our target needs.

7 Q Have you ever designed or synthesized a
8 new photoresist?

9 A No, I have not.

10 Q What's the difference between a resist and
11 a photoresist?

12 MR. WOLFE: Objection. Scope.

13 A Photo, as the term implies, means light,
14 and resist, I believe the term originally came
15 from the fact that you are trying to protect a
16 layer underneath, so you are using, in the case of
17 photoresist, a material which would be sensitive
18 to light, and depending on the type of
19 photoresist, negative or positive, you -- in the
20 case of negative, the exposed regions would be
21 retained after you develop a photoresist. In the
22 case of positive, the exposed regions would be

1 removed. Therefore, you create a profile in the
2 photoresist, and then using that you can etch the
3 films underneath, so you are resisting the etching
4 in the regions of film that are protected by the
5 photoresist that's left behind.

6 Q So you just mentioned positive tone and
7 negative tone; correct?

8 A Yes.

9 Q And positive tone, what is -- I just want
10 to make sure I'm understanding. Positive tone is
11 when you expose and what is exposed is developed
12 away?

13 A Yes. So you expose the resist through
14 what is called a mask or a radical which has clear
15 transparent regions and opaque regions. You shine
16 radiation through the -- you have light radiation
17 impinging on the mask, but it will pass through
18 the clear regions of the mask, and it will impinge
19 on the photoresist. In the case of positive,
20 those are the regions that will subsequently be
21 developed away.

22 Q And how are they developed away?

1 A That depends on the chemistry of the
2 photoresist. I teach all of this, by the way, in
3 my graduate class. I'm happy to discuss this. So
4 in the case of many positive photoresists you form
5 an acidified region.

6 (The reporter requested clarification.)

7 A Yeah, acid, acidified region in the
8 photoresist which is then subsequently removed in
9 a basic developer such as sodium hydroxide.

10 Q So the photoresist forms an acidified
11 region. That's what you said; right?

12 A In certain positive tone photoresists.
13 That wasn't the general statement.

14 Q Okay. So in some scenarios that's the UV
15 or radiation forms an acidified region? And how
16 does that work?

17 A Have I opined on that in my declaration?

18 Q Well, you just told me how, what a
19 positive tone resist, and I'm just trying to
20 understand what your understanding of a positive
21 tone resist is and how they work.

22 MR. WOLFE: Objection. Scope.

1 A My understanding was in this declaration
2 to clarify any questions you might have about my
3 report, and I'm happy to do that. I gave you a
4 general answer.

5 Q Well, I'd still like an answer to my
6 question just so that I make sure that we're on
7 the same page and I'm understanding everything
8 correctly.

9 So how does a -- how does the exposure
10 create an acidified region in some resists?

11 MR. WOLFE: Objection. Scope.

12 A Once again, it's not -- I don't believe
13 it's discussed in my report, but I can give you a
14 very broad, general answer.

15 So in certain organic photoresists you
16 have a six-member carbon ring, a benzene ring, and
17 then you have soft photons that undergoes a
18 so-called Wolff rearrangement.

19 (The reporter requested clarification.)

20 A Wolff, W-O-L-F-F, rearrangement, and that
21 makes it into carboxylic acid which is then etched
22 away, but that's not relevant to what I discuss in

1 my report.

2 Q So the carbon ring absorbs photons and
3 changes it into a -- did you say carboxylic acid?
4 Is that what you said?

5 A Yes.

6 MR. WOLFE: Objection. Form. Objection.
7 Scope. Dr. Banerjee, let me make my objections.

8 Q Are there any other mechanisms for
9 photoresists?

10 MR. WOLFE: Objection. Form. Objection.
11 Scope.

12 A Could you point me to a section in my
13 report where I have discussed those aspects?

14 Q You said that -- you started giving an
15 explanation of how photoresists work. So just --
16 and you pointed to one example. So I was
17 wondering if you could give me other examples
18 other than the acidified region that you pointed
19 to earlier of mechanisms for resists.

20 MR. WOLFE: Objection. Form. Objection.
21 Scope.

22 A I don't believe I have discussed any of

1 those in my report, and I can give you a very
2 broad discussion, the sort of things that I talk
3 about in my graduate school, but I do not believe
4 that's relevant to this deposition or to my
5 report.

6 Q So I mean you, you said that -- you gave
7 one example already. So I'm just asking for
8 additional examples of types of photoresists and
9 how they work.

10 So you gave -- your first example was for
11 positive tone, you said in some types of
12 photoresists they can create an acidified region
13 which, for example, can change a benzene into a
14 carboxylic acid; right?

15 A Yes.

16 Q And what -- are there any other mechanisms
17 for photoresists?

18 A Yes.

19 MR. WOLFE: Objection. Form. Objection.
20 Scope.

21 Q And what are -- can you give me an example
22 of another --

1 MR. WOLFE: Objection.

2 Q -- type?

3 MR. WOLFE: Sorry. Object to scope.

4 A I don't believe I discuss any of that in
5 my report. If I did, I'd be happy to expound on
6 that further.

7 Q I'm asking you generally.

8 A Okay. I can give you a general answer,
9 but sometimes these general answers can be taken
10 out of context. So with that caveat, I can tell
11 you that in the case of negative photoresists
12 where the exposed parts are parts that stay
13 behind, you undergo a cross-linking reaction of
14 small organic molecules leading to a larger
15 molecular weight compound, and in the case of
16 negative, certain types of negative photoresists,
17 those larger molecules are less soluble in organic
18 solvents such as toluene, but none of that is
19 relevant to this, my declaration or this
20 deposition. So I don't want my statement to be,
21 you know, taken out of context.

22 Q So what if the resist was a sulfonic acid?

1 How would that work?

2 MR. WOLFE: Objection. Form. Objection.

3 Scope. Incomplete hypothetical.

4 A Could you point me to my report where I
5 have discussed that?

6 Q I'm just asking you generally if you have
7 an understanding of how a photoresist, a sulfonic
8 acid photoresist would work?

9 MR. WOLFE: Objection. Form. Objection.
10 Scope.

11 A I cannot give you an answer, you know, off
12 the top of my head sitting here without looking at
13 relevant documents.

14 Q So you don't know?

15 MR. WOLFE: Objection. Form.

16 A I did not say that. I'm saying that I did
17 not opine on that I believe in my report, and I
18 don't want to give you an answer without looking
19 at any documents that you might provide and
20 without reviewing them.

21 Q So do you know how a sulfonic acid
22 photoresist works?

1 MR. WOLFE: Objection. Form. Objection.
2 Scope.

3 A Where do I discuss that in my report?

4 Q I'm just asking you generally if you know
5 how a sulfonic acid photoresist works?

6 MR. WOLFE: Objection. Scope.

7 A So in a general sense you can design these
8 resists with either positive tone or negative
9 tone, and as we are discussing a few minutes
10 earlier, in the case of positive tone the exposed
11 parts will be removed and underdevelopment, and
12 for the negative tone the exposed parts would stay
13 behind.

14 Q But that doesn't answer my question. Do
15 you know how a sulfonic acid photoresist works?

16 MR. WOLFE: Objection. Scope.

17 A Where have I discussed that in my report?

18 Q I'm just asking you generally.

19 A I cannot give you a general answer off the
20 top of my head.

21 Q So you don't know sitting here today how a
22 sulfonic acid photoresist works?

1 A I did not say that.

2 MR. WOLFE: Objection. Mischaracterizes.

3 Q You said, "I cannot give you a general
4 answer off the top of my head."

5 That's right?

6 A So in the case of the '564 patent, for
7 example, it talks about having these metals, metal
8 ions, with this peroxide ligands, and then when
9 you expose it to UV photoresist, you break --
10 that's on the cover figure of the patent -- you
11 break those oxygen-oxygen bonds, and ultimately
12 from this cross-linking then you have MOM bonds,
13 thereby by making it a negative tone photoresist.
14 So that's an example that's described in the '564
15 patent.

16 Q But that's not a sulfonic acid
17 photoresist; right?

18 A I have not opined on sulfonic acid
19 photoresist chemistry.

20 Q Okay. You don't know how sulfonic acid
21 photoresists work. That's fine.

22 MR. WOLFE: Objection. Mischaracterizes.

1 Q Do you know how sulfonic acid works --
2 photoresist works or do you not know how sulfonic
3 acid photoresist works?

4 MR. WOLFE: Objection. Scope.

5 A Have I opined on that in my report?

6 Q I'm not asking about what's in your
7 report. I'm asking about your knowledge. So if
8 you know how a sulfonic acid photoresist works, I
9 would like an answer to my question.

10 MR. WOLFE: Objection. Scope.

11 A I cannot opine on that on the spot.

12 Q Have you ever worked with metal oxide
13 resists?

14 A I have worked with hafnium dioxide and
15 zirconium dioxide and used them in gate
16 dielectrics, and I've patterned and etched them,
17 but I've not worked on metal oxide resists per se,
18 but...

19 Q So the hafnium dioxide resists that you've
20 worked with, are those the same as what is
21 disclosed in the '564 patent?

22 MR. WOLFE: Objection. Mischaracterizes.

1 A I did not say I use hafnium dioxide
2 resists. I used hafnium dioxide as a gate
3 dielectric in MOSFETs and zirconium dioxide as a
4 gate dielectric in MOSFETs.

5 Q Oh. So my question was if you had ever
6 worked with metal oxide resists. Is the answer to
7 that no then?

8 A I have not worked on metal oxide resists.

9 Q Your opinion is that a POSA would have
10 understood that the inventors had possession of
11 the invention recited in claim 1 of the '564
12 patent including the 5-2 -- 5 nanometer to 30
13 nanometer average thickness range; correct?

14 A Yes.

15 Q Would a POSA have understood that the
16 inventors had possession of a thickness, average
17 thickness range of 25 nanometers to 35 nanometers?

18 MR. WOLFE: Objection. Scope.

19 A I don't believe I opine on the specific
20 thickness range in my report. I've opined on 5 to
21 30 and I believe 5 to 25.

22 Q So you would have to consider each

1 thickness range independently?

2 A I think that would depend on the context.
3 The '564 I believe claims priority to the '867
4 application which was filed circa July-August
5 2010, I believe, and in that application the
6 inventors have descriptions about how one could
7 achieve different target thicknesses by
8 controlling things such as the viscosity of the
9 photoresist or the spin speed, and furthermore
10 they cite various exemplary thicknesses that I
11 describe in paragraph 27 which is no more than one
12 micron, no more than 250 nanometers, in other
13 embodiments from 1 nanometer to 40 nanometers.
14 And then I believe they also say that a POSA would
15 recognize that additional ranges of thicknesses
16 within the explicit ranges above are contemplated
17 within the present disclosure.

18 Q So in the context of the '867 application
19 what ranges would a POSA have understood the
20 inventors to have possession of?

21 MR. WOLFE: Objection. Scope.

22 A First of all, I believe a POSA would have

1 known as an engineer how to achieve different
2 thicknesses by adjusting things like the
3 viscosity, the composition and therefore the
4 viscosity of the photoresist or the spin speeds.
5 In general, lower the viscosity and higher the
6 spin speed you have thinner thicknesses. Higher
7 the viscosity, lower the spin speed, you have
8 thicker thicknesses. And then, as I mentioned
9 right now, they also talk about various exemplary
10 thicknesses and thickness ranges, and then the
11 inventors state that the POSA would recognize
12 additional thickness ranges within the explicit
13 ranges, exemplary ranges that I mentioned, would
14 also be achievable.

15 Q Would a POSA have known that the inventors
16 had possession of any and all sub ranges within
17 the explicit ranges mentioned in the '867
18 paragraph you quote in paragraph 27 of your
19 declaration?

20 MR. WOLFE: Objection. Scope.

21 A I believe for my declaration I have opined
22 specifically on the range 5 to 30 which was

1 mentioned in claim 1 and 5 to 25 in the dependent
2 claim. That's what I've specifically opined on,
3 but as I just told you, '564 claims priority to
4 '867 where other ranges are mentioned including
5 sub ranges within the exemplary ranges.

6 Q Would a POSA have known that the inventors
7 had possession of any and all sub ranges within
8 the explicit ranges mentioned in the '867
9 application?

10 MR. WOLFE: Objection. Scope.

11 A In my report I was asked to opine on two
12 specific ranges: 5 to 30 and 5 to 25. For the
13 other ranges you have to, you know, give me more
14 context.

15 Q So would a POSA have understood that the
16 inventors had possession of a range from 21 to 38
17 nanometers?

18 MR. WOLFE: Objection. Scope.

19 A I've not contemplated that specific range
20 in my report, but since '564 claims priority to
21 '867 and the range that we just mentioned falls
22 within some of the exemplary ranges in '867, in a

1 broad sense I'd say yes, but you'd really have to
2 give me more context to answer that more
3 definitively.

4 Q I'm asking in the context of paragraph 27
5 of your report, the citation to the '867, page 23,
6 lines 18 to 22 that you quote, and then the
7 subsequent lines 23 to 24.

8 Would a POSA have understood that the
9 inventors had possession of a range from 21 to 38
10 nanometers?

11 MR. WOLFE: Objection. Scope.

12 A In preparing my report I haven't analyzed
13 that specific range. I'd really need more
14 context.

15 Q What context did you use to form your
16 opinion that a POSA would have understood that the
17 inventors possessed the claimed range of 5
18 nanometers to 30 nanometers?

19 A The context was (A) '867 has a general
20 teaching of how viscosity and spin speeds,
21 viscosity meaning comp- -- which is related to the
22 compilation of the resist, and spin speeds can be

1 used to engineer different thicknesses, and then
2 it has different exemplary ranges specified, and
3 the 5 to 30 falls squarely within some of those
4 exemplary ranges.

5 Q The range of 5 to 30 nanometers is not
6 mentioned in the '867 application; correct?

7 A I don't think that specific range is
8 explicitly mentioned in '867, but it falls
9 squarely within the range, for example, of let's
10 look at the narrowest range that's relevant that's
11 specified explicitly. So it talks about the
12 embodiments from about 1 nanometer to about 40
13 nanometers, and 5 to 30, of course, lies within
14 that range.

15 Q So any range that falls squarely within
16 the ranges provided would be a range that a POSA
17 would have understand the inventors to have
18 possessed?

19 MR. WOLFE: Objection. Scope.

20 A I've not opined on that specifically in my
21 report.

22 Q You have to consider each range

1 independently?

2 MR. WOLFE: Objection. Scope.

3 Q Is that true?

4 A In a broad sense, no, but in a specifics
5 manner, so you have to give me the context to give
6 a definitive yes or no, but in a broad sense, no,
7 you don't have to consider each range
8 independently.

9 Q So what context would you need to know
10 whether a POSA had possession of a specific range
11 that falls within the ranges you quote in the '867
12 application?

13 MR. WOLFE: Objection. Scope.

14 A I don't have this answer to your question,
15 but I can give you a hypothetical. Suppose a POSA
16 only had access to a spinner with a very low
17 maximum spin speed. Then she would not be able to
18 achieve maybe sufficiently thin photoresist
19 thicknesses. That's a hypothetical, and that may
20 or may not be relevant here.

21 Q So that did not answer my question.

22 A Would you repeat your question, please?

1 Q What context would you need to know or
2 would you need to have to know whether a POSA had
3 possession of a specific range that falls within
4 the ranges in the '867 application that you quote
5 in paragraph 27 of your declaration?

6 MR. WOLFE: Object to scope.

7 A For purposes of my report I only analyze
8 the 5 to 30 nanometer and the 5 to 25 nanometer
9 ranges. I haven't thought extensively about other
10 specific ranges, but I gave you a general answer
11 that a POSA in general who would know how to
12 achieve different thicknesses by controlling
13 composition, spin speed, and once again, in
14 general there are exemplary ranges that are
15 mentioned in the '867 application.

16 Q So you would have to consider each and
17 every range to determine whether a POSA would know
18 that the inventors had possession of that
19 particular range?

20 MR. WOLFE: Objection. Scope.

21 A I haven't considered that question for the
22 purposes of this report.

1 Q So in paragraph 29 you say, "Moreover, the
2 inventors explicitly stated that a person of
3 ordinary skill in the art will recognize that the
4 additional ranges of thicknesses within the
5 explicit ranges above are contemplated and are
6 within the present disclosure. I agree with this
7 statement in the specification."

8 So you have considered whether a POSA
9 would have possession of all ranges that fall
10 within the ranges that you cite in paragraph 27 of
11 your report.

12 MR. WOLFE: Object --

13 Q Is that true?

14 MR. WOLFE: Objection. Mischaracterizes.
15 Objection. Scope.

16 A As I state in paragraph 29, a POSA would
17 have, would have understood that the inventors
18 were in possession of these additional ranges,
19 including the specific ranges in issue 5 to 30.

20 Q And what additional ranges would a POSA
21 have understood the inventors to have been in
22 possession of?

1 MR. WOLFE: Objection. Scope.

2 A Another specific range would be the 5 to
3 25 that I discuss.

4 Q Any others?

5 MR. WOLFE: Objection. Scope.

6 A I haven't opined on any other specific
7 ranges in my report.

8 Q You just said that a POSA would have
9 understood that the inventors were in possession
10 of these additional ranges.

11 So my question is: What are these
12 additional ranges?

13 A That's a general statement, and these
14 additional ranges -- I mean, for example, in this
15 case would fall within the ranges specified in the
16 paragraph that I cite in my paragraph 27, namely,
17 no more than 1 micron, no more than about 250
18 nanometers, about 1 nanometer to about 50
19 nanometers and 1 nanometer to 40 nanometers and 1
20 to 25 nanometers, and the ranges within those.

21 So in a general sense a POSA would know
22 how to achieve specific ranges within those

1 exemplary ranges, but for the purposes of my
2 report I was asked to specifically consider the 5
3 to 30 and 5 to 25 nanometers.

4 Q So a POSA would understand the inventors
5 to have possessed any and all ranges within the
6 ranges that you just cited: No more than 1
7 micron, no more than about 250 nanometers, from
8 about 1 nanometers to about 50 nanometers, to
9 about -- from about 1 nanometer to about 40
10 nanometers or about 1 nanometer to about 25
11 nanometers?

12 MR. WOLFE: Objection. Scope.

13 A I believe in the general sense that's
14 true, but once again, for my declaration I was
15 asked to specifically consider two ranges: The 5
16 to 30 and 5 to 25.

17 Q And the range of 5 nanometers to 30
18 nanometers is not mentioned in the '867
19 application?

20 MR. WOLFE: Objection. Asked and
21 answered.

22 A That specific range is not mentioned, but

1 it, once again, falls squarely within the range of
2 1 nanometer to 40 nanometers in the '867.

3 Q And the range of 5 nanometers to 25
4 nanometers is not mentioned in the '867
5 application; correct?

6 A That specific range is not mentioned, but
7 once again, that falls squarely in the range of 1
8 to 40 nanometers in the '867.

9 Q So any range that falls squarely within
10 the ranges of the 8, reported in the '867
11 application a POSA would have understood the
12 inventors to have possessed. Is that true?

13 MR. WOLFE: Objection. Scope.

14 A I believe that's true, but for the
15 purposes of my report my counsel asked me to
16 consider two specific ranges: 5 to 30 and 5 to
17 25.

18 Q In your declaration you explain that spin
19 coating can be a desirable approach to deposit a
20 coating material on a substrate; correct?

21 A Where do I say that in my report?

22 Q At paragraph 24 you're quoting the '867

1 application, about three lines down?

2 A Yes.

3 Q And you explain that the '867 application
4 discloses, quote, "other techniques for depositing
5 the coating material"; correct?

6 A Yes.

7 Q What other techniques does the '867
8 application disclose?

9 A Page 67 talks about spray coating, dip
10 coating, knife edge coating, printing a process
11 such as inkjet printing, screen printing and the
12 like.

13 Q Do you have an understanding of how spray
14 coating works?

15 A I have a general sense but I've used -- I
16 have not used spray coating myself.

17 Q What is your understanding of how spray
18 coating works?

19 A I don't believe I've opined on that in my
20 report.

21 Q Well, you have referred to these methods
22 in your report. So I would like you to answer my

1 question of how does -- what is your understanding
2 of how does spray coating work?

3 A I mean frankly I'd be -- the vast majority
4 of cases people use spin coating or in a few cases
5 inkjet printing.

6 Q So you don't know how spray coating works?

7 MR. WOLFE: Objection. Mischaracterizes.

8 A I have a general sense but I have not
9 studied that in detail.

10 Q So what is your understanding of how spray
11 coating works?

12 A So my general sense is you spray vapors of
13 the photoresist onto the wafer and have them
14 condense on the wafer, but actually I'm not a
15 hundred percent sure on this.

16 Q Is there anything else that you don't
17 understand in the '564 patent?

18 MR. WOLFE: Objection. Form.

19 A I couldn't answer that. I mean I've only
20 opined on certain aspects of the '564 patent in my
21 declaration, and I certainly do understand that,
22 and I do have an understanding of the '564 patent

1 in general.

2 Q You reviewed the '564 patent in
3 preparation for this deposition; right?

4 A Yes.

5 Q And you said earlier that you reviewed it
6 in great detail. Is that true?

7 A Yes.

8 Q So is there anything else that you don't
9 understand in the '564 patent other than how spray
10 coating works?

11 MR. WOLFE: Objection. Mischaracterizes.

12 A So the most important parts of a patent I
13 was told are the claims, and I do understand every
14 single element of these claims that are at issue.

15 Q Do the claims of the '564 patent require
16 spin coating?

17 A Under the claims themselves don't use the
18 term spin coating, but the specifications do, and
19 my knowledge in the field tells me that in the
20 vast majority of cases people use spin coating to
21 spin off a resist. That's a predominant
22 technique.

1 Q So the claims say coating. Is that a spin
2 coating?

3 A The claims say coating and, once again, in
4 the vast majority of cases in industry people use
5 spin coating to deposit the photoresist.

6 Q What is a coating?

7 A You start with the original substrate.
8 That is what you are trying to make the devices on
9 in this case, and you put a layer on top of it.
10 In this case that will be the photoresist.

11 Q You put a layer of liquid on the
12 substrate?

13 MR. WOLFE: Objection. Form.

14 A In the case of -- in the case of spin
15 coating that's what you do.

16 Q What about the other techniques disclosed
17 in the '867 application? You put a layer of
18 liquid onto a substrate using those techniques as
19 well; correct?

20 MR. WOLFE: Object to form. Object to
21 scope.

22 A I don't believe I've opined on those other

1 techniques in my report.

2 Q You have referred to the techniques
3 disclosed in the '564 application -- or I'm sorry
4 -- '564 patent. So the techniques disclosed in
5 the '564 patent deposit a liquid onto the
6 substrate to form coating?

7 MR. WOLFE: Object to form.

8 Q Is that true?

9 A In the case of spin coating you do deposit
10 a liquid that is then spun in a spinner.

11 Q What do you understand a coating to be?

12 A In this case I understand the coating to
13 be a material of certain specified thicknesses
14 where in this context the coating comprises metal
15 ions with radiation sensitive ligands.

16 Q So what would you understand the word
17 "coating" to mean?

18 A I'd understand that as the layer that you
19 are putting on top of the substrate.

20 Q And you said coating material. How is
21 coating different than coating material?

22 A I interpret the word "coating" by itself

1 as a layer, but the layer has to be made of
2 something, and that's a material, and in this case
3 that material comprises metal ions with radiation
4 sensitive ligands.

5 Q Is a coating and a film synonymous?

6 A I don't think I've opined on that in my
7 report.

8 Q I'm asking you now. Is a coating and a
9 film synonymous?

10 MR. WOLFE: Objection. Scope.

11 A Could you point me to where in my report
12 I --

13 Q I'm asking about your understanding
14 sitting here today. Is a coating and a film
15 synonymous?

16 MR. WOLFE: Objection. Scope.

17 A Where is the word "film" used in my
18 report?

19 Q I'm asking you as you are sitting here
20 today, is a coating and a film synonymous?

21 MR. WOLFE: Objection. Scope.

22 A Is the word "film" used in the patent?

1 Q Have you heard of the term "film" before?

2 A Yes, in a general sense, of course.

3 Q And have you heard of the term "film"
4 before as it relates to semiconductor fabrication?

5 A Yes.

6 Q And what is your understanding of what a
7 film is?

8 A See in my course I talk about thin film
9 deposition by various techniques of different
10 materials, but in a -- you have to give me the
11 context to interpret these words, right, because
12 these terms may have different meaning depending
13 on the context. You grow a thin film of an oxide,
14 for example, or you can do chemical deposition of
15 a thin film of oxide.

16 Q So let's turn to your, the table of
17 contents of your declaration. Section 7 says
18 "Impact of Differences in Ratios and
19 Concentrations of Materials and Processing
20 Conditions on Resulting Films."

21 Do you see that?

22 A Yes.

1 Q What did you mean by film there?

2 A I think in this context film and coating
3 would be synonymous.

4 Q And in paragraph 1 of your report about
5 halfway through the paragraph you say, "I have
6 also been asked to provide opinions relating on
7 the formation of resist films."

8 Do you see that?

9 A Yes.

10 Q And what did you mean by "resist film"
11 there?

12 A I meant the photoresist films that you
13 deposit on the substrate.

14 Q So is a coating and a film synonymous?

15 A I believe in this context it is.

16 Q And you previously used the term thin
17 film. Is there a difference between a coating and
18 a thin film?

19 A I think that will depend on the context.

20 Q So you just used the term thin film. What
21 does that term mean to you?

22 A I think what's thin or not, once again,

1 depends on context what's thin or thick.

2 Q Can the term "thin film" have different
3 meanings in semiconductor processing?

4 MR. WOLFE: Object. Form.

5 A Yes. I think depending on the context it
6 will have different -- it could refer to different
7 thicknesses depending on the context.

8 Q Is 5 to 30 nanometers a thin film?

9 MR. WOLFE: Objection. Scope.

10 A I mean it's context dependent.

11 Q What context would you need to know
12 whether 5 to 30 nanometers is a thin film?

13 A I'd need to know what the material is and
14 what the end application is.

15 Q So in the context of the '564 patent is 5
16 to 30 nanometers a thin film?

17 A In the context of '564 I regard that as a
18 thin film.

19 Q I think we've been going for about an hour
20 and a half. Would you like a break?

21 A Very much so, yes. Thank you.

22 Q And in the future if you need a break,

1 just let me know.

2 A Sure.

3 Q And I just ask that you finish whatever
4 question is pending.

5 A Thank you.

6 (A recess was taken.)

7 BY MS. PATITUCCI:

8 Q Did you discuss any of your testimony with
9 counsel during the break?

10 A No.

11 Q And you understand that you're not
12 permitted to discuss the substance of your
13 testimony until the deposition's over; correct?

14 A Yes.

15 Q You state that the '867 application
16 explains that the thickness of the coating can
17 generally be a function of the precursor solution
18 concentration, viscosity and the spin speed;
19 correct?

20 A Yes.

21 Q How does the precursor solution
22 concentration affect the thickness?

1 A In general if you dilute the solution, for
2 example with ultra pure water which I think the
3 patent talks about, the viscosity will go down and
4 you'll get a thinner film.

5 Q Does the concentration of the precursor
6 solution affect anything other than the thickness?

7 A Yes, it could.

8 Q What else could the concentration of the
9 precursor solution affect?

10 A So in paragraph 31, for example, I talk
11 about how changing the concentration can make the
12 films more stable and therefore have an improved
13 shelf life.

14 Q Is there anything else the concentration
15 of the precursor solution can affect?

16 A In paragraph 34 I discuss how
17 concentrations can impact the contrast following
18 radiation exposure, and that, in turn, would lead
19 to better patterning and shorter development
20 times.

21 Q Is there anything else modifying the
22 concentration could affect?

1 A I believe those are the ones that I opined
2 on in my report.

3 Q Could modifying the concentration of the
4 precursor solution cause any chemical changes?

5 A It could.

6 Q What chemical changes could modifying the
7 precursor solution concentration cause?

8 MR. WOLFE: Objection. Scope.

9 A I don't think I have opined on that
10 specifically in my report, but in a broad sense
11 the patent talks about if you increase the ratio
12 of the peroxide ligands to the metal, you get
13 different ratios I think of at least up to 2 and
14 at least -- I can't find it right now but I'm
15 speaking from memory -- if you increase the ratio
16 of these peroxide ligands to the metal at least up
17 to 2 or at least up to 5, it makes the films more
18 stable by inhibiting the formation of these so-
19 called solid particles.

20 Q So modifying the precursor solution
21 concentration could affect the thickness, the
22 shelf life, better contrast or shorter exposure;

1 correct?

2 A So the contrast has an impact on exposure.

3 Q What do you mean by "the contrast has an
4 impact on exposure"?

5 A So the term "contrast" refers to as I'm
6 exposing the photoresist, depending on whether
7 it's positive tone or negative tone, if it's
8 positive tone, more and more of the film will
9 disappear after the development. If it's negative
10 tone, more and more of the film will stay put. So
11 this difference of the radiation dose which is the
12 number of incident, in the case of EUV, number of
13 incident photons per area, on the horizontal scale
14 would impact this transition from how much of the
15 film is staying put versus how much is being
16 removed. I mean generally you want a sharper
17 transition from the film being retained to the
18 film being removed.

19 Q So you can modify the concentration to
20 optimize the contrast?

21 MR. WOLFE: Objection. Form.

22 A It says increasing the ligand

1 concentration in this case, in the case of '564,
2 led to greater contrast. Whether that's optimal
3 or not, once again, will depend on the context.

4 Q Greater contrast is a desirable property;
5 correct?

6 A Once again, that really depends on
7 context, but in general that's a desirable
8 property.

9 Q So you can -- so modifying the
10 concentration can optimize the contrast or --
11 strike that.

12 MR. WOLFE: Objection. Form.

13 Q I'll restate that. So one can optimize
14 the contrast by modifying the concentration?

15 MR. WOLFE: Objection. Form.

16 A One can vary the contrast by modifying
17 concentrations. Here they talk about increasing
18 the ligand concentration increased contrast.

19 Q So you stated that modifying the
20 concentration affects the thickness, the shelf
21 life, better contrast and a shorter exposure;
22 correct?

1 A In some cases that can lead to shorter
2 exposure times, yes.

3 Q So modifying the concentration can affect
4 the thickness, the shelf life, the contrast and
5 exposure time; correct?

6 A It modifies the first three that you
7 mentioned, and then contrast, in turn, can have an
8 impact on the exposure times as they're required.

9 Q Is there anything else the modification of
10 the precursor solution concentration can affect?

11 A It could, but I haven't opined on that in
12 my report.

13 Q You've only opined that modifying the
14 concentration can affect the thickness, the shelf
15 life, the contrast which in turn can affect the
16 exposure time; right?

17 A I believe that's true.

18 Q How does the precursor solution viscosity
19 affect the thickness?

20 A In general the more viscous the film is,
21 assuming you keep the same spin speed and spin
22 times, a more viscous film will lead to a

1 thicker -- more viscous coating, more viscous
2 liquid would give rise to a thicker film.

3 Q Does the viscosity affect anything other
4 than the coating thickness?

5 A It could.

6 Q What could the viscosity affect other than
7 the coating thickness?

8 A Have I opined on that in my report?

9 Q You've opined on the viscosity. So I'm
10 asking you, does the viscosity, or what does the
11 viscosity affect, if anything, other than film
12 thickness?

13 A I believe I've only opined on one aspect
14 of viscosity in terms of how it impacts the
15 thickness, and I've just told you how that, what
16 the dependence is. I have not opined on other
17 impacts that viscosity can have.

18 Q How does the spin speed affect thickness?

19 A So assuming you keep the other parameters
20 such as viscosity fixed, higher spin speeds in
21 general would lead to thinner films.

22 Q Does the spin speed affect anything other

1 than the thickness of a coating?

2 A Yes, it could.

3 Q What could the spin speed affect in a
4 coating other than the thickness?

5 A Once again, I don't believe I have
6 commented on that in my report, but in general I
7 could tell you, as we discussed before the break,
8 higher spin speeds could mean more centrifugal
9 forces where the centrifugal force is given by
10 mass times omega squared times radial distance
11 from center, omega being the angular speed in
12 radians per second.

13 So if you had a higher spin speed, you'd
14 have a greater variation of the centrifugal force
15 from center to edge, and that, in turn, could lead
16 to greater thickness variation, for example.

17 Q So you've only opined on how the spin
18 speed can affect thickness of the coating; right?

19 A The average thickness of the coating, yes.

20 Q The '867 application provides examples of
21 spin speeds during spin coating; is that correct?

22 A I believe it does.

1 Q If you turn back to paragraph 25 of your
2 declaration. You quote the '867 application as
3 saying "In some embodiments a wafer can be spun at
4 rates from about 500 RPM to about 10,000 RPM, and
5 further embodiments from about 1,000 RPM to about
6 7500 RPM and in additional embodiments from about
7 200 RPM to about 600 RPM. The spinning speed can
8 be adjusted to obtain a desired thickness."

9 Do you see that?

10 A Yes.

11 Q All of these are ranges of spin speeds;
12 correct?

13 A Yes.

14 Q Does that paragraph that you quoted in
15 your declaration, paragraph 25, disclose a speed
16 of 300 RPM?

17 A I believe the '867 has a general teaching
18 of different speeds because the highlighted
19 sentence, "the spinning speed can be adjusted to
20 obtain a desired thickness," in principle will
21 cover the 300 RPM, but that's not within the cited
22 exemplary ranges. Oh, no, I take that back.

1 There is a range, 200 RPM to about 600 RPM. So
2 yes, 300 RPM is within the range.

3 Q How would a POSA know what spin speed to
4 select to achieve a particular thickness?

5 A Well, she would know what the end
6 application is. The end application could be, for
7 example, etching a film underneath or doing ion
8 implantation through these open windows in the
9 photoresist. So based on that she would know what
10 the target thickness would be, and then depending
11 on the viscosity of the photoresist she'd be able
12 to determine what the appropriate spin speed
13 should be.

14 Q So how would a POSA know how to achieve a
15 thickness -- strike that.

16 How would a POSA know what spin speed to
17 select to achieve a thickness of 15 nanometers?

18 MR. WOLFE: Objection. Scope.

19 A So in some cases that might involve some
20 experimentation which, you know, my students do
21 regularly during the research. So you may -- the
22 brand of photoresist that you are working with,

1 you spin it on maybe at a certain speed, and if
2 it's much thicker than that, you spin it faster.
3 If it's thinner than the 15 nanometer, you spin it
4 slower. It's a bit of an Edisonian approach.

5 Q So you would test each photoresist to
6 understand what spin speed to use to achieve a
7 specific thickness?

8 A I mean generally you don't operate
9 completely in the blind. So when you buy these
10 photoresists, the manufacturer very often will
11 have characteristic curves of thickness versus
12 spin speed for different viscosities. So you'd
13 use that as a guide.

14 Q What if the photoresist was not purchased
15 but it was made, how would a POSA know what spin
16 speed to use to achieve a particular thickness?

17 MR. WOLFE: Objection. Form. Objection.
18 Scope.

19 A I don't believe I've opined on any of
20 those aspects in my report.

21 Q How would a POSA know what spin speed to
22 select to achieve a particular thickness of the

1 photoresists in the '564 application?

2 A In column 14 of '564, if you look at lines
3 24 to roughly 42, the inventors talk about spin
4 coating can be a desirable approach to cover the
5 wafer -- cover the substrate, and then a wafer can
6 be spun at rates from 500 RPM to 10,000 RPM, and
7 then there are various other exemplary ranges
8 mentioned, and the POSA would know how to adjust
9 the speed to obtain a desired thickness, and this
10 coating can also be done for -- the spinning can
11 be done for different times also from five seconds
12 to about five minutes, and there are other
13 exemplary times mentioned. So speed and time are
14 the two factors.

15 Q So how would a POSA know how to achieve a
16 thickness of 5 nanometers in using a photoresist
17 of the '564 patent?

18 A Because I told you it will be -- if she
19 was operating with no prior knowledge at all of
20 this particular material, she would coat the
21 material and then would spin it at a certain
22 speed. She would measure the thickness, and then

1 depending on whether it's thicker or thinner she
2 would adjust the speed accordingly. If it was
3 thicker, she would spin it faster. If it was
4 thinner, she'd spin it slower. It would be an
5 experimental Edisonian approach to some extent.

6 Q So a POSA would have to test
7 experimentally to determine what spin speed to use
8 to achieve the thickness of 5 nanometers?

9 A Yeah. If no information was provided to
10 her from the manufacturer or whoever made the
11 resist, yes.

12 Q And the spin speed would change for each
13 different photoresist. Is that true?

14 A The spin speed will have to be targeted
15 for each type of photoresist as well as the end
16 application because for a particular brand of
17 photoresist you can design the process to achieve
18 different target thicknesses.

19 Q So in the '564 application, the
20 photoresists in the '564 application, to achieve a
21 thickness of 5 nanometers a POSA would have to
22 test each photoresist to determine the spin speed

1 to achieve 5 nanometer thickness?

2 MR. WOLFE: Objection. Scope.

3 A I don't think I've opined on those aspects
4 in my report, and if I look at the claims, they
5 are structure claims, not method claims. So I'm
6 not sure the question's really germane to the
7 issue.

8 Q I'd still like an answer to my question.

9 A POSA would have to test each photoresist in the
10 '564 patent to determine what spin speed to
11 achieve a 5 nanometer thickness. Is that true?

12 A And the POSA would have to test the spin
13 speed. Since this is at the lower range of the
14 thicknesses, I'd encourage her to try faster
15 speeds and work down from higher speeds.

16 Q And a POSA would have to test each
17 photoresist in the '564 patent to determine what
18 spin speed to use to achieve a thickness of 15
19 nanometers?

20 A She would have to try a certain speed,
21 measure what she got, and then, you know, either
22 go up or down in rotational speed accordingly.

1 There would be some experimentation involved.

2 Q So there would be some experimentation
3 involved for each photoresist in the '564 patent
4 to achieve a particular thickness; correct?

5 A Yes, but these are relatively short loop
6 and simple experiments. My students do that
7 regularly. We have a bunch of these wafers or
8 coupons. You spin coat them, you spin them at
9 different speeds, measure the thickness. This is
10 not rocket science. It's not extensive
11 experimentation by any means.

12 Q So would a POSA also have to modify the
13 concentration of a precursor solution to achieve a
14 thickness of 5 nanometers for a photoresist in the
15 '564 patent?

16 MR. WOLFE: Objection. Form.

17 A A POSA could do that. There's two knobs,
18 two main knobs. So there's multiple knobs, but
19 the two main knobs are viscosity and speed, as I
20 mentioned before.

21 Q So the viscosity and the speed of spinning
22 and the time of spinning are all factors or

1 variables that a POSA would need to select to
2 achieve a specific thickness for each photoresist
3 in the '564 patent; is that correct?

4 A And some parameters matter more than
5 others in general. From my experience viscosity
6 and speed are the most important. Time matters
7 also, but speed matters more. Yes, the POSA would
8 have to play around with those parameters.

9 Q Let's look at the '867 application. It's
10 Exhibit 1004. Will you look at page 32.

11 A Page 32 of the application itself or the
12 exhibit page 32?

13 Q Page 32 of the application itself. That's
14 page 34 of the stamp at the bottom.

15 A Okay.

16 Q Example 2 provides the preparation and
17 deposition of coating materials; correct?

18 A Yes.

19 Q And starting at the bottom of that page it
20 says, "The spin coater was spun at 100 RPM for 5
21 seconds to spread the resist across the wafer and
22 then at 3,000 RPM for 30 to 60 seconds to cast the

1 resist film."

2 Do you see that?

3 A Yes.

4 Q And in example 3 on page 33 it says, "The
5 coating material was produced according to the
6 method of example 2 with a zirconium oxide plus 2
7 based coating composition."

8 Do you see that?

9 A Yes.

10 Q The coating material was deposited at a
11 thickness from 10 to 50; correct?

12 A Yes.

13 Q And thicknesses from 10 to 50 were
14 achieved using the same precursor solution;
15 correct?

16 A Same precursor solution as in example 2.

17 Q So example 3 says, "The coating material
18 was produced according to the method of example 2
19 with a zirconium oxide 2-plus based coating
20 composition. The coating material was deposited
21 at a thickness from 10 to 50 nanometers."

22 So my question is, the same coating

1 material was deposited at different thicknesses
2 between 10 to 50 nanometers; correct?

3 A Yes.

4 Q Therefore, the concentration of the
5 coating material was the same each time; correct?

6 A Well, example 2 refers back to example 1
7 where the inventors talk about not just
8 concentrations but also I believe the sequence in
9 which they mix SOx, something called the rest
10 time. I don't really talk about that. Let me --

11 (The reporter requested clarification.)

12 A Something called the rest time. Let me
13 double check.

14 Q So if you look at page 32 of the actual
15 application, lines 6 through 10, is that what
16 you're referring to?

17 A Yeah, the diluting the solution, yeah,
18 then waiting for five minutes, yeah, exactly.

19 Q So they're only making one zirconium oxide
20 based coating material; right?

21 A If you look at page 32 of the application.

22 Q Yes.

1 A Not the reference, and if you look at line
2 3, for example, they talk about selected ratios of
3 the component solutions, part A-1 or part A-2,
4 part B and part C were measured. So it appears
5 that they're actually making different, different
6 coating solutions over here, and they're trying
7 them out.

8 Q So line 11 through 19 gives the particular
9 volumes of the components: Part A-1, B, C or part
10 A-2, part B and part C; correct?

11 A Yes.

12 Q So turning back to example 3 on page 33,
13 "The coating material was deposited at a thickness
14 from 10 to 50 nanometers."

15 Do you see that?

16 A Yes.

17 Q So the same coating material was deposited
18 at several thicknesses between 10 to 50
19 nanometers; correct?

20 A Yeah. That appears to be the case.

21 Q How long would a person of skill in the
22 art spin the coating material in example 3 to

1 achieve a thickness of 10 nanometers?

2 A How long or how fast?

3 Q How long?

4 A Well, that will depend on the spin speed.

5 Q How fast would a person of skill in the
6 art spin the coating material in example 3 to
7 achieve a thickness of 10 nanometers?

8 A I mean I can't tell you that sitting here.
9 She would have to do some experimentation.

10 Q How fast would a person of skill in the
11 art spin the coating material in example 3 to
12 achieve a thickness of 25 nanometers?

13 A Once again, I cannot tell you a definite
14 answer sitting here, but I could give you a
15 general guideline, and that would be, keeping all
16 the other parameters the same, she would have to
17 spin the material fastest to achieve 10
18 nanometers, slowest to achieve 50 and some
19 intermediate speed to achieve the 25 nanometers
20 that you mentioned.

21 Q Would a POSA spin the coating material in
22 example 3 for the same amount of time to achieve a

1 thickness of 10 nanometers compared to 25
2 nanometers?

3 A I can't answer that. I mean there are
4 multiple variables that we are discussing, right?
5 So you have the concentration reaching that
6 viscosity, the speed, and then for each of those
7 you could spin them for different times. It's a
8 three-dimensional problem, but as I told you, of
9 those three, the time matters less than the other
10 two. That's been my experience.

11 Q Let's turn to page 34, and this is example
12 4; correct?

13 A Yes.

14 Q And beginning on page line, or on line 1
15 of page 34, it says, "The coating material was
16 produced and deposited according to the example 2
17 with a hafnium oxide plus 2-based coating
18 composition"; correct?

19 A Yes.

20 Q If we go down to line 29, it says, "The
21 resist was applied with a thickness of 20
22 nanometers by spin coating on a silicon wafer

1 followed by a post apply bake of 50 degrees
2 Celsius."

3 Do you see that?

4 A Yes.

5 Q What spin speed would a POSA use to
6 achieve a thickness of 20 nanometers using the
7 coating material in example 4 of the '867
8 application?

9 A I can't tell you that sitting here. As I
10 told you before, the POSA will have to try
11 different spin speeds and keeping the speed up or
12 down to achieve the target thickness. The recipe
13 is quite straightforward, and it's not undue
14 experimentation that's involved.

15 Q Would the spin speed be the same to
16 achieve a 20 nanometer thickness using the
17 material in example 4 and the material in example
18 3 of the '867 application?

19 A I can't tell you that without further
20 information, but in general I would guess they
21 would not be the same because you are looking at
22 two different compositions, and chances are they

1 have different viscosity.

2 Q Would you turn to page 21 of the '867
3 application, page 23 of Exhibit 1004. Beginning
4 on line 15 the application says, "For other
5 coating processes the thickness can generally also
6 be adjusted through the selection of the coating
7 parameters."

8 Do you see that?

9 A Yes.

10 Q In your opinion what coating parameters
11 could be -- strike that.

12 Does the '867 application disclose what
13 those parameters are?

14 A Yes. I think it does.

15 Q What are the parameters that the '867
16 application discloses?

17 A Within the paragraph right before that on
18 the same page it talks about different spin
19 speeds. So that's an example of a coating
20 parameter.

21 Q So the sentence "For other coating
22 processes the thickness can generally also be

1 adjusted through the selection of the coating
2 parameters" refers to spin coating?

3 A Since the previous sentence talks about
4 spin speed, I presume it does.

5 Q Beginning at line 24 on page 21, the '867
6 application says, "The thickness can be evaluated
7 using noncontact method of x-ray reflectivity
8 and/or ellipsometry based on the optical
9 properties of the film."

10 Do you see that?

11 A Yes.

12 Q X-ray reflectivity is one method to
13 measure the thickness of a film; correct?

14 A Yes.

15 Q And ellipsometry is a different method to
16 measure the thickness of a film; is that correct?

17 A Yes.

18 Q When is the thickness measured?

19 MR. WOLFE: Objection. Form.

20 A You could measure it at different stages.

21 Q Is the thickness measured when the coating
22 is wet?

1 MR. WOLFE: Objection. Form.

2 A Once again, you could measure it at
3 different stages: When it's wet or after a bake.

4 Q And in that same paragraph that we've
5 already talked about today it says, "In some
6 embodiments the coating materials can have an
7 average thickness of no more than about 1 micron,
8 in further embodiments no more than about 250
9 nanometers, in additional embodiments from about 1
10 nanometer to about 50 nanometers, in other
11 embodiments from about 1 nanometer to about 40
12 nanometers, and in some embodiments from about 1
13 nanometer to about 25 nanometers."

14 Do you see that?

15 A Yes.

16 Q What does "about 1 micron" mean here?

17 A As we were discussing earlier, when you
18 spin on the photoresist, it will not have the same
19 thickness everywhere. There will be some
20 variation across the wafer. So you have to take
21 some average of that, and I interpret this word
22 "about" as to mean that the average thickness

1 would be about 1 micron.

2 Q What does it mean for an average thickness
3 to be about 1 micron?

4 A You measure the photoresist thickness at
5 different points on the wafer using, for example,
6 ellipsometry. You take the average of those
7 readings, and that value is about 1 micron, and
8 that actually would depend on the context of the
9 application.

10 Q Would about, an average thickness of about
11 1 micron include 1.1 microns thickness?

12 MR. WOLFE: Objection. Scope.

13 A I don't believe I have opined on, on the
14 range of thicknesses we should qualify as about.
15 That would depend on the context.

16 Q In the context of the '867 application
17 what does -- strike that.

18 In the context of the '867 application
19 would about, an average thickness of about 1
20 micron include an average thickness of 1.1
21 microns?

22 MR. WOLFE: Objection. Scope.

1 A I've not opined on, you know, the degree
2 of fuzziness about that 1 micron number which
3 would count as about. Once again, that depends on
4 the context I think.

5 Q What does "about 25 nanometers" mean in
6 this paragraph of the '867 application?

7 MR. WOLFE: Objection. Scope.

8 A I mean, in my report I have not opined on
9 the ranges around these exemplary thicknesses we
10 should, you know, qualify as, for example, about
11 25 nanometers, but I can tell you from an
12 application point of view, end application point
13 of view, a POSA would know what's good enough or
14 what about 25 nanometers for that particular
15 application.

16 Q And you're a POSA in this field, in the
17 field of the '564 application as it's been defined
18 by Dr. Holland; correct?

19 A Hopefully I'm better than a POSA. I'm
20 hopefully an expert, but I'm interpreting the
21 patent in the mindset of a POSA.

22 Q And so what -- you said a POSA would know

1 what's good enough or what about 25 nanometers for
2 that application; correct?

3 A Yes.

4 Q So what would a POSA know is good enough
5 to be about 25 nanometers as it's written in the
6 '867 application?

7 MR. WOLFE: Objection. Scope.

8 A I've not discussed any of that in my
9 report, but I can give you a generic answer based
10 on these sorts of things that I teach in my class,
11 but I don't think it's discussed in my report so I
12 don't want those to be taken out of context.

13 Q So what would a POSA know is good enough
14 to be about 25 nanometers as it's written in the
15 '867 application?

16 MR. WOLFE: Objection. Scope.

17 A So, once again, with the caveat that I
18 have not discussed any of that in my report, I
19 will tell you that if you're trying to etch a film
20 underneath the photoresist, you'll always have
21 what's known as a selectivity of the etch between
22 the photoresist and the film, meaning that as I'm

1 etching the film, the photoresist will erode away.
2 You have to take into account the variability of
3 the thicknesses of the film, variability of
4 thicknesses of the photoresist, and from that you
5 can determine whether by the time I do the etching
6 of the film whether the photoresist will stay put
7 or get eroded away. We discuss these sort of
8 things ad nauseam in my class but in a general
9 context.

10 Q Do you know -- do you understand that
11 during prosecution of the '564 patent the word
12 "about" was deleted from the claims?

13 A I don't recall that.

14 Q If we could turn to Exhibit 1007.

15 A 1007?

16 Q Mm-hmm.

17 A I don't seem to have a copy of that.
18 1007? It's not in this set.

19 Q I have an excerpt for you. Would you turn
20 to page 508 of the exhibit. Are you there?

21 A Okay.

22 Q In the first full paragraph starting on

1 the third line, the fourth line, "Claim 1 has been
2 amended to remove the term "about" in order to
3 advance prosecution."

4 Do you see that?

5 A Yeah, I see that.

6 MR. WOLFE: Counsel, I'd just like to note
7 for the record that this is not the complete
8 Exhibit 1007. It appears to be pages 487 through
9 514. Like you said, it's an excerpt.

10 MS. PATITUCCI: Yes, it's an excerpt.
11 Thank you.

12 Q Page 508 says, "The examiner has argued
13 that 35 nanometers is within the range about 30.
14 While applicant maintains the argument that about
15 30 is not obvious over Stowers, claim 1 has been
16 amended to remove the term 'about' in order to
17 advance prosecution."

18 Do you see that?

19 A Yes, I see that.

20 Q So do you agree that about 30 nanometers
21 does not include 39 -- or 35 nanometers?

22 MR. WOLFE: Objection. Scope.

1 A I have not discussed any of this in my
2 report, so sitting here I cannot comment on that
3 is.

4 Q You said a POSA would know what is good
5 enough to be about 25 nanometers as it's written
6 in the '867 application; correct?

7 A Yes. I think I did say that.

8 Q And so a POSA -- would a POSA know what is
9 good enough to be about 30 nanometers --

10 MR. WOLFE: Objection. Scope.

11 Q -- as it was written in the claims?

12 MR. WOLFE: Objection. Scope. Objection.
13 Mischaracterizes.

14 A I don't think I've analyzed the degree of
15 aboutness in my report.

16 Q Do you understand the scope of the claims?

17 A In '564?

18 Q Yes.

19 A Yes.

20 Q And you have analyzed the '867 application
21 and the '564 patent from the perspective of a
22 POSA. That's true?

1 A Yes.

2 Q And so would a POSA understand that about
3 30 nanometers does not include 35 nanometers?

4 MR. WOLFE: Objection. Scope.

5 A I have not analyzed that question for the
6 purpose of preparing my report.

7 Q But you've analyzed the '867 application
8 and the '564 patent from the perspective of a
9 POSA; correct?

10 A Yes.

11 Q So from that perspective of a POSA, would
12 a POSA understand about 30 nanometers to include
13 35 nanometers?

14 MR. WOLFE: Objection. Asked and
15 answered. Objection. Scope.

16 (A discussion was held off the record.)

17 Q So from the perspective of POSA, would a
18 POSA understand 30 nanometers to include 35
19 nanometers in the '867 application?

20 MR. WOLFE: Objection. Mischaracterizes.
21 Objection. Scope.

22 A Once again, I did not analyze what

1 qualifies as, as meeting the requirement of about,
2 but I did say that the POSA would know what
3 "about" means in '867, but that's context
4 dependent. Okay.

5 So, for example, and this is a
6 hypothetical, if a 35 nanometer film achieved the
7 same functionality as a 30 nanometer film in terms
8 of 35 nanometer photoresist film compared to 30
9 nanometer photoresist film achieved the same end
10 goal in terms of being able to etch some film
11 underneath without eroding the photoresist, I'd
12 say that would qualify as meeting the requirement
13 of about. If, on the other hand, it didn't, it
14 would not meet the requirement. So it's all
15 dependent on the context.

16 Q How would you know -- strike that.

17 How would a POSA know whether a 35
18 nanometer film had the same functionality as a 30
19 nanometer film?

20 MR. WOLFE: Objection. Scope.

21 A I haven't talked about any of those
22 details in my report, but staying within this very

1 general discussion that I was mentioning, she
2 could do experiments where you etch some
3 underlying film and then you examine the end
4 structure and see if the photoresist had been
5 completely eroded away or not.

6 Q So you said that a POSA would know what
7 "about" means in the '867 application. What would
8 a POSA know "about" to mean in the '867
9 application?

10 MR. WOLFE: Objection. Scope.

11 A I've not, once again, discussed what
12 "about" means in my report. I believe it's, you
13 know, beyond the scope of my deposition, frankly,
14 and no, not -- I don't know if you call this a
15 deposition, whatever. Yeah, I feel it's beyond
16 the scope, but I think I've given you a general
17 answer in the context of '867.

18 Q So to determine the scope of the claims
19 experimentation would be required?

20 MR. WOLFE: Objection. Mischaracterizes.

21 A During the claims of '564 the word "about"
22 doesn't appear. It does appear in '867.

1 Q So in the '867 application experimentation
2 would be required to understand the scope of
3 "about" as it relates to the film thickness?

4 MR. WOLFE: Objection. Mischaracterizes.

5 A Once again, I've not analyzed that aspect
6 in my report, but I -- it would involve context of
7 the end application.

8 Q In the context of the paragraph that we
9 were just reading in the '867 application which is
10 Exhibit 1004, page 23 of the exhibit, 21 of the
11 application, says, "A film -- a thickness --
12 coating materials can have an average thickness
13 from about 1 nanometer to about 25 nanometers."

14 Do you see that?

15 A You're looking at Exhibit 1004?

16 Q Yes.

17 A Page 21.

18 Q 21 of the application, yes.

19 A Could you repeat the sentence, please?

20 Q Line 21 says, "In some embodiments from
21 about 1 nanometer to about 25 nanometers."

22 Do you see that?

1 A Yes.

2 Q In the context of this paragraph in the
3 '867 application, what would a POSA understand
4 about 25 nanometers to mean?

5 A A POSA would understand "about" to mean
6 approximately 1 nanometer or approximately 25
7 nanometer where, once again, the degree of
8 approximation that good enough would be context
9 dependent.

10 Q What degree of approximation is good
11 enough in the context of the '564 patent?

12 A No. When I said context, I meant in the
13 context of end application. You deposit the
14 photoresist not just for the sake of depositing
15 the photoresist. You want to do some processing
16 using that such as etching a film underneath or
17 maybe doing an implantation through the windows in
18 the photoresist. That's the context I had in
19 mind.

20 MR. WOLFE: Maybe now is a good time for
21 lunch. We've been going for well over an hour
22 now. Is that okay?

1 MS. PATITUCCI: No. We want to finish
2 this topic before we break.

3 MR. WOLFE: But we have been going for
4 about an hour and 15 now.

5 Q So the degree of approximation is
6 dependent on what a POSA would do with the
7 photoresist after it has been developed? Is that
8 true?

9 MR. WOLFE: Objection. Form.

10 A I haven't analyzed any of that in my
11 report. I was speaking in general terms in the
12 context of the 8 -- related to the '867
13 application.

14 Q But you've analyzed the '564 patent for
15 your declaration; correct?

16 A Yes.

17 Q And this paragraph in the '867 application
18 is also produced or included in the '564 patent;
19 correct?

20 A Yeah. The '564 claims priority to '867.

21 Q So it has -- the '564 patent has the
22 identical paragraph that is on page 23 of Exhibit

1 1004, lines 14 through 26?

2 A Does '564 have the exact same language in
3 the specification? I don't know.

4 Q If you look on column 14 of Exhibit 1001.

5 A Yes.

6 Q Starting at about line 46?

7 A Yes, I see that.

8 Q You've given opinions on thicknesses in
9 your declaration; correct?

10 MR. WOLFE: Objection. Form.

11 A I've discussed the thickness range of 5 to
12 30 nanometers and 5 to 25 nanometers in my
13 declaration.

14 Q And you've given opinions on how a POSA
15 could modify or achieve specific thicknesses in
16 your declaration; is that correct?

17 A Yes.

18 Q And so what would a POSA understand a
19 thickness of about 25 to mean?

20 MR. WOLFE: Objection. Scope.

21 A In my report I've discussed a range of 5
22 to 25, not 5 to about 25 in my report, because

1 that's -- in the claims the word "about" does not
2 appear.

3 Q So 5 to -- a thickness of 5 to 25 is
4 different than a thickness of about 5 to about 25
5 nanometers? Is that true?

6 MR. WOLFE: Objection. Mischaracterizes.
7 Objection. Scope.

8 A I've not discussed what qualifies as
9 "about" in my declaration.

10 Q Do you know what "about" means in the
11 context of the '564 patent?

12 A I mean the specifications it does use the
13 word "about" in '564, and in a general sense, yes,
14 I do, but I have not analyzed that in my report.

15 MR. WOLFE: Counsel, we've given you
16 pretty broad leeway --

17 MR. BREGMAN: No, we've been going for --
18 (Unreportable crosstalk)

19 MR. WOLFE: Please don't talk over me.

20 MR. BREGMAN: We can go three hours before
21 we --

22 MR. ZEILBERGER: You can't just interrupt

1 him. Let him finish talking.

2 (Unreportable crosstalk)

3 MR. BREGMAN: I'm letting him talk. You
4 can talk.

5 MR. WOLFE: We've been going for a
6 significant amount of time over the last time so
7 we have suggested a break which is well over an
8 hour and 15 minutes, and we continue pressing on
9 this same topic and trying to loop these together,
10 but it's not happening, but if you wish --

11 MR. BREGMAN: Right, but we're going to
12 finish the line of --

13 MR. WOLFE: -- to keep hammering at it --

14 MR. BREGMAN: -- questioning, and if it
15 goes for two hours, it goes for two hours, and if
16 you want to call the board on that, I am more than
17 willing to do that.

18 MR. ZEILBERGER: You're not understanding
19 us, Dion. We're not suggesting you can't ask the
20 questions you want to ask. It's outside the --

21 MR. BREGMAN: Well, we're not taking a
22 break.

1 MR. ZEILBERGER: -- scope. Please let me
2 finish. We're just suggesting that you shouldn't
3 push Dr. Banerjee not to have any breaks at all.
4 You're refusing to break for lunch even though
5 it's --

6 MR. BREGMAN: Let's call the board.

7 MR. ZEILBERGER: -- past noon now. We've
8 been going for an hour and a half.

9 MR. BREGMAN: Let's call the board. Let's
10 do it.

11 MR. ZEILBERGER: About whether breaks are
12 allowed in depositions?

13 MR. BREGMAN: Whether you won't let us
14 finish our line of questioning.

15 MR. ZEILBERGER: We are letting you finish
16 your --

17 MR. BREGMAN: Then let us finish the line
18 of questions.

19 MR. ZEILBERGER: -- of questions, but
20 let's take a break.

21 MR. BREGMAN: Let's finish the line of
22 questions. Then you'll take a break. That's

1 standard practice in every deposition. So let's
2 finish the line of questioning.

3 MR. WOLFE: Dr. Banerjee, do you feel
4 comfortable continuing?

5 THE WITNESS: I'd like to take a break,
6 but I don't know the rules are.

7 MR. WOLFE: If Dr. Baner --

8 MR. BREGMAN: I'm going to ask for him to
9 continue until this line of questioning. We've
10 only been going an hour 15 since the last break.
11 It's not like we've been going for three hours.
12 We'll finish the line of questioning.

13 MR. WOLFE: First, it's been an hour and
14 20.

15 MR. BREGMAN: Okay. You call it --

16 MR. WOLFE: Second, Dr. Banerjee said he's
17 uncomfortable.

18 MR. BREGMAN: Okay.

19 MR. WOLFE: But if you want to press
20 through Dr. Banerjee being uncomfortable because
21 you feel like you're entitled to it instead of
22 arguing after the break the same line of

1 questioning, then you're going keep pressing him.

2 Is that correct?

3 MR. BREGMAN: If you want to take the
4 break, if you don't go into the same room with
5 Dr. Banerjee, we can take the break. If he wants
6 to go to the rest room, you guys want to stay
7 here, that's fine.

8 MR. WOLFE: You understand that we're
9 prohibited --

10 MR. BREGMAN: Do you want to do that?

11 MR. WOLFE: -- from discussing the
12 substance of his testimony on --

13 MR. BREGMAN: Do you want to do that or
14 not?

15 MR. WOLFE: I don't agree to go to --

16 MR. BREGMAN: Okay. Let's --

17 MR. WOLFE: -- separate rooms for a
18 strange procedure that you're demanding.

19 MR. BREGMAN: Let's continue the line.

20 MR. WOLFE: Just for the record, we're
21 continuing even though Dr. Banerjee said he's
22 uncomfortable continuing.

1 BY MS. PATITUCCI:

2 Q So you do not know what the term "about"
3 means in the '564 patent. Is that true?

4 MR. WOLFE: Objection. Mischaracterizes.

5 A I don't think I said that.

6 Q So what does the word "about" mean in the
7 '564 patent?

8 MR. WOLFE: Objection. Asked and
9 answered.

10 A First, I have not analyzed the word
11 "about" in my report, but sitting here you're
12 asking me a general question about what "about"
13 means, something that's not analyzed in my report.

14 Q You have given an opinion on how that a
15 POSA would understand how to achieve the
16 thicknesses within the '564 application. Is that
17 true?

18 A Yes.

19 Q How would a POSA achieve a thickness of
20 about 25 nanometers?

21 MR. WOLFE: Objection. Scope.

22 A A POSA would know that higher spin speeds

1 and lower viscosities would give you thinner
2 films. Slower spin speeds and high viscosities
3 would give you thicker films. So that's the
4 rubric under which you would do some
5 experimentation to achieve certain thicknesses.

6 Q And when would a POSA know that they have
7 achieved a thickness of about 25 nanometers?

8 MR. WOLFE: Objection. Scope.

9 A I was asked to opine on whether a POSA
10 would know how to achieve a thickness of 5 to 25
11 nanometers, not about 25 nanometers. I haven't
12 analyzed that.

13 Q So we reviewed the prosecution history
14 where the word "about" was removed from the claims
15 of the '564 patent; correct?

16 A Yes, part of it, but not the whole thing.

17 Q And your opinion is that a POSA would
18 understand how to achieve a thickness within the
19 scope of the claims; is that correct?

20 A Yes.

21 Q And if -- how would a POSA achieve a
22 thickness of about 30 nanometers?

1 MR. WOLFE: Objection. Scope.

2 A I've not analyzed that.

3 Q Do you understand how Inpria obtained the
4 allowance of the '564 patent?

5 MR. WOLFE: Objection. Form.

6 A I'm not sure what you mean by that. They
7 got it approved as a valid patent.

8 Q Did you review the prosecution history of
9 the '564 patent in preparing your declaration?

10 A I looked at the file history of the prior
11 application '867. I don't know if I reviewed the
12 prosecution history of the '564. I could have. I
13 don't remember.

14 Q Did you review Dr. Holland's declaration
15 in preparing your declaration?

16 A Yes, that I did.

17 Q Do you understand what it means to make an
18 amendment during prosecution of a patent
19 application?

20 MR. WOLFE: Objection. Form.

21 A I'm not a lawyer, but as a nonlawyer I
22 imagine it means making some changes.

1 Q And you understand that Inpria deleted the
2 word "about" from the claims of the '564 patent
3 during prosecution; is that correct?

4 A I see that in this excerpt that you gave
5 me, but I really should probably look at the
6 entire prosecution history of '564 to answer that.

7 Q Do you believe that the attorneys who
8 wrote that response were not being truthful to the
9 Patent Office?

10 MR. WOLFE: Objection. Form. Objection.
11 Scope.

12 A I do not know.

13 Q Do you have any reason to believe that the
14 attorneys misrepresented the amendments that they
15 made during prosecution to the Patent Office?

16 MR. WOLFE: Objection. Form. Objection
17 scope.

18 A I was not asked to opine on any of those
19 in preparing my report.

20 Q Do you have any reason to believe that in
21 the prosecution history excerpt that is in front
22 of you that Inpria did not delete the word "about"

1 from the claims?

2 MR. WOLFE: Objection. Form. Objection.

3 Scope.

4 A I was not asked to opine on that in my
5 report.

6 Q As you're reading that excerpt of Exhibit
7 1007 today, do you have any reason to believe that
8 Inpria did not delete the word "about" from the
9 claims?

10 MR. WOLFE: Objection. Form. Objection.

11 Scope.

12 A I was not asked to review that by my
13 counsel in preparing my report.

14 Q Did you give an opinion on the ranges of
15 the thicknesses in the '564 patent?

16 MR. WOLFE: Objection. Form.

17 A Can you repeat the question, please?

18 Q Did you give an opinion on the ranges of
19 the thicknesses in the '564 patent?

20 A Yes, I did.

21 Q And the ranges of the thicknesses in the
22 '564 patent include the word "about." Is that

1 true?

2 MR. WOLFE: Objection. Form.

3 A So the claims don't use the word "about,"
4 and that's what I was asked to opine on.

5 Q Did you review the paragraph in column 14
6 of Exhibit 1001, "in some embodiments" -- sorry --
7 beginning "the thickness of the coating," which
8 starts on line 43? Did you review that paragraph?

9 A Yes.

10 Q And you gave an opinion on the ranges of
11 thicknesses that are included in that paragraph;
12 correct?

13 A I only opined on two ranges, 5 to 30 and 5
14 to 25 nanometers, in my report.

15 Q Do you understand the paragraph beginning
16 on line 43 of column 14 in Exhibit 1001, the '564
17 patent?

18 A Yes.

19 Q What does the word "about" mean in column
20 14, lines 43 through 61 of Exhibit 1001, the '564
21 patent?

22 A I was not asked to analyze the word

1 "about" in my report, which I have not done.

2 Q Do you know what the word "about" means?

3 MR. WOLFE: Objection. Form. Objection.
4 Scope.

5 A I know the word "about" means in a general
6 sense.

7 Q Do you know what the word "about" means in
8 the paragraph of column 14, lines 43 through 61 of
9 Exhibit 1001, the '564 patent?

10 MR. WOLFE: Objection. Scope.

11 A My counsel did not instruct me to analyze
12 that in my report or opine on that.

13 MR. WOLFE: Counsel, it's been another ten
14 minutes since you --

15 MR. BREGMAN: No, it's not.

16 MR. WOLFE: -- refused to take a break --

17 MR. BREGMAN: No, it's not.

18 MR. WOLFE: -- even though Dr. Banerjee
19 clearly indicated he wanted to take a break.

20 MR. BREGMAN: Dr. Banerjee, do you want to
21 go for a walk and then come back? We'll all wait
22 here for you. Would you like to do that?

1 MR. ZEILBERGER: Okay. This is
2 ridiculous.

3 MR. WOLFE: Would you like to give
4 Dr. Banerjee --

5 MR. ZEILBERGER: Counsel, we've been going
6 for an hour and a half. We're going to take a
7 break. If you want to call the Board about your
8 refusal to give the doctor a break, so be it.

9 MR. BREGMAN: Take a break. Take a break.
10 Get us and walk out in the middle of my -- first
11 thing, we're not finished with our line of
12 questioning, by the way.

13 MR. ZEILBERGER: We never said you were.

14 MR. BREGMAN: Counsel's taking a break in
15 the middle of our line of questioning. Please let
16 the record show that.

17 (A recess was taken at 12:20 p.m.)

18 BY MS. PATITUCCI:

19 Q Dr. Banerjee, would you like to take a
20 break for lunch?

21 A I'd like to but depends on my counsel.

22 MS. PATITUCCI: We can break for lunch.

1 THE WITNESS: Okay.

2 (A lunch recess was taken at 12:25 p.m.)

3 (The afternoon session commenced at 1:05
4 p.m.)

5 BY MS. PATITUCCI:

6 Q Dr. Banerjee, did you discuss with counsel
7 the substance of your communication [sic] during
8 lunch?

9 A No.

10 Q What did you discuss during lunch?

11 A Only thing he said was can I get you a
12 Coke?

13 Q So we were talking about paragraph, on
14 column 14, lines 43 through 61 of Exhibit 1001
15 which is the '564 patent. Can you turn to that,
16 please?

17 A You say column 14?

18 Q Column 14.

19 A Line?

20 Q 43 through 61. And you've given an
21 opinion on what a POSA would have understood this
22 paragraph to include; correct?

1 A Yes.

2 Q And what does the word "about" mean in
3 this paragraph on column 14, lines 43 through 61
4 of the '564 patent?

5 MR. WOLFE: Objection. Scope.

6 A In my declaration I was asked by my
7 counsel to opine on whether the claim range of 5
8 to 30 nanometers was covered by the discussion in
9 the '867 are also column 14 of '564. I believe
10 the set of variations are more or less the same.

11 Q So you did not consider all of the words
12 in that paragraph in forming your opinion?

13 MR. WOLFE: Objection. Mischaracterizes.

14 A I wasn't asked to. I was asked to
15 determine whether the claimed range of 5 to 30
16 nanometers which is the language that appears in
17 claim 1 of '564 would be covered by the '867
18 application.

19 Q And when you read that paragraph, you did
20 not understand what the word "about" meant?

21 MR. WOLFE: Objection. Mischaracterizes.

22 A No. As we were discussing before lunch, I

1 do understand the word what "about" means in a
2 general sense, but I was not asked to provide any
3 opinion about that.

4 Q And what do you understand the word
5 "about" to mean?

6 MR. WOLFE: Objection. Asked and
7 answered.

8 A I wasn't asked to opine on that aspect,
9 and I did not, but during the lunch break I took
10 the liberty of, you know, reading the excerpt from
11 the prosecution history that you gave me.

12 Q That's Exhibit 1007 excerpt?

13 A Yeah, and on page 8 of the excerpt, if you
14 look at section C, it states, "Applicants argue
15 that it is very respectfully submitted that the
16 term 'about' is a well settled term of
17 approximation." As I was telling you before the
18 lunch break, that in a general sense "about" means
19 approximate, but I wasn't asked specifically to
20 opine on that in my declaration.

21 Q So 35 nanometers is not 30 nanometers. Is
22 that true?

1 A Yeah. 35 nanometers is not 30 nanometers.

2 Q Is 35 nanometers about 30 nanometers?

3 MR. WOLFE: Objection. Form. Objection.

4 Scope.

5 A I wasn't asked to opine on that.

6 Q As you sit here today, do you know whether
7 35 nanometers is about 30 nanometers?

8 MR. WOLFE: Objection. Scope.

9 A I did not opine on that. I did read the
10 excerpt from the prosecution history of '564 that
11 you gave me. I really should probably read the
12 entire prosecution history to give a well-thought-
13 out answer, but on the last -- on page 8, I'm
14 reading from it, "With regard to claim 1, the
15 combination of Stowers and Meyers does not teach
16 or suggest the thickness of between about 5
17 nanometers and about 30 nanometers. Rather,
18 Stowers teaches a thickness of 35 nanometers or
19 greater. Examiners argue that 30 nanometers is
20 within the range of about 30 nanometers. While
21 applicant maintains that the argument at about 30
22 nanometers is not obvious over Stowers, claim 1

1 has been amended to remove the term 'about.'"

2 I'm reading this, but I have not analyzed
3 that in preparing my declaration.

4 Q So as you sit here today, you do not know
5 the meaning of the word "about" as it's used to
6 describe the thickness in the '564 patent
7 specification?

8 MR. WOLFE: Objection. Mischaracterizes.
9 Objection. Scope. Asked and answered.

10 A I was not asked by counsel to analyze the
11 word "about" in preparing my declaration.

12 Q But as you sit here today, you don't know
13 the meaning of the word "about" as used to
14 describe the thickness in the '564 patent
15 specification. Is that true?

16 MR. WOLFE: Objection. Mischaracterizes.
17 Objection. Scope. Objection. Asked and
18 answered.

19 A As I told you, I was not asked to focus on
20 the word "about" in preparing my declaration.

21 Q And I'm asking you today, you relied on
22 this paragraph in forming your opinions, and do

1 you know the meaning of "about" as used in
2 describing the thickness in the '564 patent
3 specification?

4 MR. WOLFE: Objection. Form. Objection.
5 Scope.

6 A I wasn't asked, once again, to analyze the
7 word "about" when analyzing the 5 to 30 nanometers
8 in claim 1.

9 Q Once again, I'm asking you today if you
10 have an understanding of what the word "about" is
11 or what the word "about" means when used to
12 describe the thickness in the '564 patent
13 specification?

14 MR. WOLFE: Same objections.

15 A I understood what the inventors were
16 saying in paragraph 14, lines 43 to 61, where the
17 word "about" appears, but I did not try to
18 interpret that word "about" in writing my report
19 specifically about the phrase 5 to 30 nanometers
20 in claim 1.

21 Q So you understood what the inventors were
22 saying in paragraph 14, lines 43 to 61, of the

1 '564 patent. That's what you just said; right?

2 A Yes. I do understand.

3 Q And what did the inventors mean by "about
4 25 nanometers"?

5 MR. WOLFE: Objection. Scope.

6 A I was not asked to provide any analysis
7 about the word "about 25 nanometers."

8 Q You said that you understood what the
9 inventors were saying in paragraph, or in column
10 14, lines 43 to 61. So what -- I'd like you to
11 tell me what your understanding is and what "about
12 25 nanometers means."

13 MR. WOLFE: Objection. Scope. Objection.
14 Form.

15 A There's a lot of detail in '564 that I
16 don't opine on in my report, and my understanding
17 is this deposition is restricted to opinions
18 expressed in my report.

19 Q You're required to answer the questions
20 that I'm asking, and you've said that you
21 understood what the inventors were saying in
22 column 14, lines 43 to 61, and so my question is,

1 what do you understand the inventors to have meant
2 when they said "about 25 nanometers"?

3 MR. WOLFE: Objection. Scope.

4 A Once again, I did not analyze the word
5 "about" in preparing my report, but as I told you
6 before lunch and I think I told you few minutes
7 back, in a broad sense to me "about" means
8 approximate.

9 Q What does "approximate" mean to you?

10 A About.

11 Q So they mean the same thing? So -- strike
12 that.

13 So "approximate" and "about" mean the same
14 thing; correct?

15 A I think you have to give me context to
16 answer that. I was speaking in broad general
17 terms over here.

18 Q Is 35 nanometers about 30 nanometers in
19 the context of the '564 patent?

20 MR. WOLFE: Objection. Scope.

21 A I was not asked to analyze that for the
22 purposes of my report.

1 Q As you sit here today, do you know whether
2 35 nanometers is about 30 nanometers in the
3 context of the '564 patent?

4 MR. WOLFE: Objection. Scope.

5 A When I'm looking at the prosecution
6 history of '564 that you handed me today which I
7 have not analyzed before, it appears in
8 paragraph -- on page 8 that the inventors do not
9 consider 35 nanometers to be in the range of about
10 30 nanometers.

11 Q And what would the inventors have
12 understood be within the range of about 30
13 nanometers?

14 MR. WOLFE: Objection. Form. Objection.
15 Scope.

16 A I did not analyze that aspect for the
17 purposes of this report.

18 Q You just said that the inventors do not
19 consider 35 nanometers to be in the range of 30
20 nanometers -- of about 30 nanometers; correct?

21 A I was reading from the prosecution history
22 that you just handed me, and I'm reading one of

1 the sentences on page 8: "Rather, Stowers teaches
2 a thickness of 35 nanometers or greater," and I
3 believe the inventors of '564 did not believe that
4 about 35 -- about 30 nanometers included 35
5 nanometers. However, they amended the claim and
6 removed the word "about" in claim 1.

7 Q Did the inventors understand about 30
8 nanometers to include 34 nanometers?

9 MR. WOLFE: Objection. Scope.

10 A Sitting here I can't comment on that.
11 I've not analyzed that.

12 Q And you can't comment on that even though
13 you have read the '564 patent in great detail in
14 preparation for this deposition today; correct?

15 MR. WOLFE: Objection. Scope.

16 A I did read the '564 patent thoroughly, but
17 I was only asked to comment on narrow aspects of
18 '564 by my counsel, and that's what I did, and I
19 wasn't asked to comment on those aspects.

20 Q But you did comment on the paragraph in
21 column 14, lines 43 through 61 of the '564 patent;
22 correct?

1 MR. WOLFE: Objection. Form. Objection.

2 Asked and answered.

3 A Are you talking about commenting in my
4 report or in my verbal deposition?

5 Q In your report you commented on the
6 paragraph in column 14, lines 43 through 61 of the
7 '564 patent; correct?

8 A In my report I believe I was citing the
9 '867 application where similar language appears
10 but not specifically the column 14 of the '564.

11 Q So in the '867 application did you have an
12 understanding or do you have an understanding of
13 what the word "about" means as you cited it in
14 your declaration?

15 MR. WOLFE: Objection. Asked and
16 answered. Objection. Scope.

17 A As I think I've told you several times, I
18 do have an understanding of the term, but I was
19 asked to analyze whether 5 to 30 nanometers in
20 claim 1 fall within the range of thicknesses
21 discussed in the '867 patent or, for that matter,
22 column 14 of the '564 patent.

1 Q And in paragraph 27 of your declaration
2 you said that "Specific example thickness ranges
3 are provided."

4 Do you see that?

5 A Yes, I see that.

6 Q And one of those specific example
7 thickness ranges is about 1 nanometer to about 25
8 nanometer; correct?

9 A Yes.

10 Q And what does "about 25 nanometer" mean as
11 you've cited it in paragraph 27 of your
12 declaration?

13 MR. WOLFE: Objection. Scope.

14 A I understood the term "about" to mean
15 approximate, as the prosecution history that you
16 just handed me also seems to suggest, but I was
17 not asked to analyze the degree of aboutness, if
18 you will.

19 Q But you said that this was a specific
20 example of a thickness range; correct?

21 A Yes. It does have a range. It's quite
22 specific.

1 Q It's quite specific. Okay. So what does
2 specifically about 25 mean?

3 MR. WOLFE: Objection. Scope.

4 A I was not asked to analyze the degree of
5 variability, if you will, about around 1 nanometer
6 or the degree of variability around 25 nanometers.
7 I did not analyze that aspect.

8 Q So you don't know whether about 1
9 nanometer to about 25 nanometers would include
10 zero to 26 nanometers?

11 MR. WOLFE: Objection.

12 Q Is that true?

13 MR. WOLFE: Mischaracterizes. Objection.
14 Scope.

15 A I was not asked to analyze that, but I can
16 tell you it would not include zero because that
17 would be a silly number, meaning that no
18 photoresist was being applied.

19 Q Would about 1 nanometer to about 25
20 nanometers include 0.5 to 25.5 nanometers?

21 MR. WOLFE: Objection. Scope.

22 A I was not asked to analyze that. You have

1 to give me, you know, more details about what
2 exactly you have in mind.

3 Q So I'm asking you about the paragraph that
4 you've cited in paragraph 27 of your declaration
5 where you said that about 1 nanometer to about 25
6 nanometers is a specific example of thickness
7 range, and I'm asking what your understanding was
8 when you wrote that of what about 25 nanometers
9 meant?

10 MR. WOLFE: Objection. Asked and
11 answered. Objection. Scope.

12 A So I understood that as, take 25
13 nanometers, for example, it will be 25 nanometers
14 plus or minus X, but the mean value would be 25
15 nanometers at the upper end, and similarly there
16 will be a range which is not specified around the
17 1 nanometers, but they're very specific about the
18 mean values between 1 and 25. That's what I mean
19 by that's what the inventors meant and they
20 understood the specific thickness ranges to mean,
21 but they're silent about the degree of variability
22 around these values, and I have not analyzed that

1 in my report.

2 Q So a POSA, even when reading the '564
3 patent as carefully as you have, couldn't tell you
4 exactly what the word "about" means. Is that
5 true?

6 MR. WOLFE: Objection. Form. Objection.
7 Scope.

8 A Once again, I was not asked to analyze
9 that aspect, but secondly, I'm not a lawyer, but
10 I've been told that the most important part of a
11 patent are the claims, and in the claims the word
12 "about" does not appear, and I believe a POSA
13 would know what 5 to 30 or 5 to 25 nanometers
14 means. I mean he or she will interpret the claims
15 in light of the specifications but not be limited
16 by that. That's what I was told.

17 Q And did the word "about" occur in the
18 claims during prosecution of the '564 patent?

19 MR. WOLFE: Objection. Scope. Objection.
20 Asked and answered.

21 A I don't believe I cite the prosecution
22 history of '564 in my report. I honestly can't

1 remember if I was asked to review that. You gave
2 me an excerpt from that today, and that's all that
3 I have to go by.

4 Q Did you review Dr. Holland's declaration
5 in preparing your declaration?

6 A Yes, that I did.

7 Q Did you review the references cited within
8 Dr. Holland's declaration in preparing your
9 declaration?

10 A I just reviewed her declaration. I did
11 not review the references within the declaration.

12 Q So you formed your opinions without
13 looking into the references that Dr. Holland
14 cited. Is that true?

15 MR. WOLFE: Objection. Mischaracterizes.

16 A I looked at Dr. Holland's declaration, but
17 if you point me to specific exhibits she had, I
18 can answer that more accurately, but I did not
19 make an effort to dig up every exhibit and review
20 the results. I was not asked to.

21 Q So you only looked at some exhibits but
22 not all of the exhibits cited in Dr. Holland's

1 declaration?

2 MR. WOLFE: Objection. Mischaracterizes.

3 A I looked at the exhibits which are cited
4 in my declaration, paragraph 17, along with
5 certain other exhibits that I mentioned in the, in
6 the declaration itself, but I did not -- I was not
7 asked to review other exhibits that are not among
8 this list, for example, in Dr. Holland's
9 declaration. My counsel did not ask me to.

10 Q So you only reviewed the exhibits that
11 counsel requested that you review in preparing
12 your declaration?

13 A I believe by and large that's true.

14 Q So would a person of skill in the art need
15 something other than the intrinsic record to
16 understand what the word "about" means as you
17 quoted it in paragraph 27 of your declaration?

18 MR. WOLFE: Objection. Scope.

19 A Intrinsic record is whatever the language
20 is in the patent itself; right?

21 Q The patent itself, the claims, the
22 prosecution history. Would a person of skill in

1 the art need to review any other information to
2 understand what the word "about" means as you
3 quoted it in paragraph 27 of your declaration?

4 MR. WOLFE: Objection. Scope.

5 A As I state in paragraphs 20 and 21 of my
6 report, I assumed the same definition of a POSA as
7 Dr. Holland, and that is he or she would be a,
8 would have a graduate degree, Master's or Ph.D. in
9 the disciplines listed over here, and then he or
10 she would have one to three years of experience in
11 research, design, development and testing of
12 resist materials, and then -- yes.

13 So I mean she would read '564 and the
14 prosecution history of '564 and interpret that
15 using the plain and ordinary meaning of the terms
16 used in this intrinsic evidence, but then I
17 believe she would interpret that not in a vacuum,
18 if you will, but using the rubric of her general
19 knowledge in the field, and that's what I think
20 the sentence that Dr. Holland wrote and I adopted
21 suggests, right, because she says, "Such a person
22 in the art would have one to three years

1 experience in the research, design, development
2 and testing of resist materials." I mean that's a
3 broader universe than just '564 itself, right.

4 Q So yes or no, as we sit here today, you're
5 unable to tell me what "about 25 nanometers"
6 means?

7 MR. WOLFE: Objection. Scope. Objection.
8 Asked and answered.

9 A I was not asked to opine on or analyze the
10 term "about" in preparing my report.

11 Q So is that a no, you do not know as we sit
12 here today what 25 nanometers -- what "about 25
13 nanometers" means?

14 MR. WOLFE: Objection. Form. Objection.
15 Scope. Asked and answered.

16 A I was not asked to analyze that aspect.

17 Q So I'd like you to just answer my
18 question. Yes or no, as we sit here today, you're
19 unable to tell me what 25 nanometers means?
20 Strike that.

21 As we sit here today, you're unable to
22 tell me what "about 25 nanometers means"?

1 MR. WOLFE: Objection. Scope. Objection.
2 Asked and answered.

3 A Again, I did not analyze what the term
4 "about" means. I was not asked to by my counsel
5 in preparing my report, but I do have a general
6 understanding of what that would mean in the
7 context of the specifications of the '564 patent,
8 but I was not asked to analyze the specifics of
9 that.

10 Q And so what would "about 25 nanometers"
11 mean in the context of the specification of the
12 '564 patent?

13 MR. WOLFE: Objection. Scope.

14 A Once again, I was not asked to analyze
15 what "about" means, but as I told you before, in a
16 broad sense reading the patent "about" would mean
17 approximately, but I was not asked to analyze that
18 in detail, and I really would need more
19 information and more time to do so.

20 Q What more information would you need to
21 determine what "about 25 nanometers" means in the
22 context of the specification of the '564 patent?

1 MR. WOLFE: Objection. Scope.

2 A I was not asked to analyze that aspect for
3 my report.

4 Q I understand that, but you said that you
5 would need more information to determine what
6 "about 25 nanometers" means in the context of the
7 specification of the '564 patent, and so I'm
8 asking what additional information you would need?

9 MR. WOLFE: Objection. Scope.

10 A Once again, I did not analyze that, but
11 I'm reading from page 8 of the excerpt from the
12 prosecution history that you just handed me. In
13 section C let me read what they say. "Applicants
14 argue that it is very respectfully submitted that
15 the term 'about' is a well settled term of
16 approximation. Well settled case law" -- I'm not
17 a lawyer -- "shows that a suitable construction is
18 to identify a particular reference to accused
19 device falls within the claim range with the upper
20 limit of the range being the stated value as
21 modified by the term 'about.' Such broad usages
22 as 'about' must be given reasonable scope. It

1 must be viewed by the decision-maker as to -- as
2 they would be understood by the person of --
3 person experienced in the field of the invention."
4 I guess that means a POSA. "The meaning of the
5 term 'about' is dependent on the facts of a case,
6 the nature of the invention and the knowledge
7 imparted by them, totality of the earlier
8 disclosure to those skilled in the art."

9 So I'm reading from the prosecution
10 history, and that in general comports with my
11 understanding of "about" also, but I was not asked
12 to analyze the term specifically in my
13 declaration.

14 MR. WOLFE: Just to be clear, for the
15 record he was on page 495 to 496 of the record --
16 of the exhibit.

17 Q What does "approximately" mean?

18 MR. WOLFE: Objection. Scope.

19 A In this context it means "about," and then
20 I'm reading from the, in the prosecution history,
21 "About then becomes dependent on the facts of the
22 case, the nature of the invention and the

1 knowledge imparted to a POSA," basically, but I
2 did not analyze that aspect in my report. I was
3 not asked to.

4 Q So the meaning of the word "about" would
5 be dependent on additional facts. Is that true?

6 MR. WOLFE: Objection. Mischaracterizes.
7 Objection. Scope.

8 A I did not analyze the word "about" at the
9 level of detail that you're asking me about now,
10 but reading the last sentence of page 495 of the
11 Lam Research Exhibit 1007 says, "The meaning of
12 the term 'about' is dependent on the facts of the
13 case, the nature of the invention and the general
14 knowledge of a POSA." So you would have to give
15 me more specifics about what you had in mind.

16 Q So the meaning of the word "about" depends
17 on what an accused infringing product would be?

18 MR. WOLFE: Objection. Mischaracterizes.
19 Objection. Scope.

20 A I did not say that.

21 Q So what facts of the case would it depend
22 on -- would the meaning of the word "about" depend

1 on?

2 MR. WOLFE: Objection. Scope.

3 A I was not asked to analyze that aspect in
4 my report, but as I was telling you I believe
5 right before lunch, I gave a hypothetical example
6 in a very broad sense about a POSA in etching a
7 film using photoresist would know about the
8 inherent variabilities of thicknesses of the
9 photoresist and the film, variabilities of etch
10 rate, and should then be able to determine whether
11 the end goals were met. That would be an example,
12 I believe, of the facts of the case, but I'm
13 speaking without careful analysis of all the
14 parameters. I was not asked to analyze that.

15 Q You've used the term -- strike that.

16 What is the post exposure bake?

17 A So you spin on the photoresist, and then
18 you typically do what's called a soft bake to
19 drive off some of the solvents, but not too much.
20 Then you do the exposure, and then sometimes you
21 can do -- sometimes -- this is optional -- in some
22 cases you do a heat treatment after the exposure

1 but prior to the development. That's called a
2 post exposure bake.

3 Q Are there any examples where a post
4 exposure bake changes the chemical properties of
5 the photoresist?

6 A Yes, it could.

7 Q Could you give me an example of when a
8 post exposure bake changes the chemical properties
9 of a photoresist?

10 A In my report on paragraph, in paragraph 43
11 I talk about one example that a POSA would have
12 understood that the exposure to UV or EUV
13 radiation can result in some changes but this --
14 I'm not reading every single sentence, "but the
15 dissolution rate -- the differential dissolution
16 rate...can also be the result of steps in the
17 lithography process other than the actual exposure
18 of the radiation such as a post exposure bake,"
19 and I cite Exhibit 2007. If you look at page 7
20 talks about acids generated from a photo acid
21 generator catalytically receives this organic
22 molecule t-BOC during the post exposure bake, and

1 that's the thing that's causing the change in the
2 dissolution rate, not the radiation itself.

3 Q Does Exhibit 2007 refer to metal oxide
4 photoresists?

5 A No. This one is an organic photoresist.

6 Q Do the metal oxide photoresists in the
7 '564 patent use a photo acid generator mechanism?

8 A Figure 1 of '564 I don't think does
9 because this will be an example of a negative tone
10 photoresist where you are doing cross-linking of
11 molecules. We're breaking these peroxide bonds
12 leading to the formation of these MOM bonds. They
13 were making it insoluble, so that tells me it's a
14 negative tone resist, but the patent, I believe,
15 talks about both positive and negative tone
16 resists. I can't remember offhand if it
17 specifically talks about the details of the
18 positive tone using photo acid generators. I
19 don't recall.

20 Q So you don't know how the photoresists in
21 the '564 patent work?

22 MR. WOLFE: Objection. Mischaracterizes.

1 A No. I just told you that you can make
2 negative tone resists by breaking the peroxide
3 bonds, and then that links up with adjacent
4 molecules to form metal oxide metal bonds, and
5 that's how negative tone resists work.

6 Q Can the photoresists of the '564 patent
7 work as a positive tone resist?

8 MR. WOLFE: Objection. Scope.

9 Q If I could point you to claims 10 and 11
10 in column 24.

11 A Yes. Okay. Thank you. Yeah. So 10
12 would be an example of a negative tone resist,
13 right, because the exposed parts are insoluble.
14 But 11 would be an example of a positive resist,
15 yes.

16 Q And does the positive tone resist of the
17 '564 patent use the photo acid generator
18 mechanism?

19 MR. WOLFE: Objection. Scope.

20 A I wasn't asked to analyze those aspects.
21 The cover page has an example, as I told you, of a
22 negative tone resist using this cross-linking

1 reaction.

2 Q So in paragraph 43 of your declaration you
3 rely on Exhibit 2007 which relates to a photo acid
4 generator. So my question is whether a photo acid
5 generator is the same as what is described in the
6 '564 patent?

7 MR. WOLFE: Objection. Scope.

8 A I don't know if photo acid generators are
9 specifically discussed in '564, but the point of
10 this paragraph wasn't that. The point was to
11 discuss that things other than the radiation
12 itself could be the responsible factors for
13 creating a change of the dissolution rate, so to
14 illustrate the principle.

15 Q Did you provide any examples where a metal
16 oxide photoresist requires a post exposure bake to
17 cause the differential dissolution rates you
18 described in paragraph 43 of your declaration?

19 A I don't think I did.

20 Q Do you have an example where a post
21 exposure bake alone causes a differential
22 dissolution rate in a photoresist?

1 MR. WOLFE: Objection. Form.

2 A I'm not sure what you mean by post
3 exposure bake alone because the very fact you're
4 using the phrase post exposure bake implies that
5 you have to have done exposure prior to the bake,
6 right. So the two have to work in concert, if I
7 understand.

8 Q So a post exposure bake could induce an
9 additional change to the photoresist to cause the
10 differential dissolution rate; is that correct?

11 MR. WOLFE: Objection. Mischaracterizes.

12 A Do you mind repeating your question,
13 please?

14 Q So a post exposure bake could induce an
15 additional chemical change to the photoresist to
16 cause the differential dissolution rate; is that
17 correct?

18 MR. WOLFE: Objection. Form.

19 A Yes. The photo -- the post exposure bake
20 can, depending on the type of resist, cause
21 additional chemistry increasing the dissolution
22 rate in the case of positive tone. I mean that's

1 how chemically amplified resists work.

2 (The reporter requested clarification.)

3 A Chemically amplified resists work.

4 Q Does claim 1 of the '564 patent require
5 that the differential dissolution rates result
6 solely from EUV, UV or e-beam exposure?

7 A Well, claim 1, once again, is a structure
8 claim, not a method claim. Maybe at some level
9 it's agnostic as to the method of exposure, but it
10 does specify specifically UV, EUV and/or EBL
11 resists. So I think in this case it's restricted
12 to those three.

13 Q So the claim specifically requires that
14 only UV, EUV or e-beam causes a change in the
15 chemistry to create an exposed coating material
16 with differential dissolution rates between the
17 exposed and unexposed regions?

18 MR. WOLFE: Objection. Form.

19 A Yes. Claim 1 talks about UV, EUV or
20 electron beam radiation to create the chemical
21 changes in the exposed parts that will ultimately
22 lead to different dissolution rates within the

1 exposed and the unirradiated parts.

2 Q Does claim 1 exclude a post exposure bake
3 from contributing to the differential dissolution
4 rates?

5 A I wasn't asked to opine on that, and I
6 don't see it in my report.

7 Q But in paragraph 43 you do give an opinion
8 on how a post exposure bake or other processing
9 conditions can cause chemical changes that result
10 in differential dissolution rates; is that
11 correct?

12 A Yes, that's correct.

13 Q So you don't know whether claim 1 excludes
14 a post exposure bake to contributing to the
15 differential dissolution rates?

16 MR. WOLFE: Objection. Mischaracterizes
17 testimony. Scope.

18 A I think claim 1 is silent as to that
19 aspect, and I was not asked to opine on that
20 aspect, and I didn't.

21 Q In paragraph 41 of your declaration you
22 state that a POSA would have known that exposure

1 to UV or EUV radiation could alter a physical
2 property of the material as opposed to a chemical
3 property of the material; correct?

4 A Yes.

5 Q What did you mean by "physical
6 properties"?

7 A I was citing Exhibit 2007 -- sorry -- 6,
8 column 1, lines 18 to 21, where Eliau, et. al,
9 state: "The chemical or physical properties of
10 the photoresist can be changed by being exposed to
11 light."

12 Q Did you find this document, the Exhibit
13 2006, yourself?

14 A No, I did not.

15 Q Where did you -- who found this article --
16 or I'm sorry -- this patent, Exhibit 2006?

17 MR. WOLFE: I'm just going to caution the
18 witness not to divulge any content of any
19 privileged conversations between the attorneys and
20 the witness, but if you can answer otherwise,
21 please.

22 A I did not -- I don't think I found the

1 patent myself. I believe my counsel gave it to
2 me.

3 Q Did you look for any other documents
4 showing that exposure to UV or EUV could alter a
5 physical property of a photoresist?

6 A I did not because I was not asked to.

7 Q So in forming your opinion you relied only
8 on the documents given to you by counsel?

9 MR. WOLFE: Objection. Mischaracterizes.

10 A I relied on those documents, but I
11 interpret those documents, you know, under the
12 general knowledge of the field.

13 Q And when reading Exhibit 2006, what is a
14 physical property that could change due to
15 exposure to UV or EUV radiation?

16 A Well, I haven't analyzed that
17 specifically, but one could postulate that it can
18 cause localized heating, so therefore somewhat
19 akin to a localized bake perhaps. That could be
20 an example of a physical property, but I have not
21 analyzed those details in my report.

22 Q So you haven't analyzed in your report

1 what types of physical properties could change due
2 to exposure to EUV or UV radiation?

3 A No, I have not.

4 Q And what physical changes could exposure
5 to EUV or UV radiation cause that would not be a
6 chemical change?

7 MR. WOLFE: Objection. Form.

8 A So, once again, in my report I was citing
9 Elian, et al., in making that statement, but in a
10 broad sense one could think of a photoresist
11 that's spun and it's not baked much at all, so
12 it's in a very soft, gooey state, and then you
13 expose selected regions UV to harden that, and
14 then that soft, gooey part might exposed away, or
15 might develop away, but that's a hypothetical that
16 I'm proposing.

17 Q So a change from a gel to a solid would be
18 only a physical change and would require no
19 chemical changes?

20 MR. WOLFE: Objection. Form.

21 A So, once again, for the purposes of my
22 declaration I was citing the relevant section in

1 the Elian patent, but in a broad sense one could
2 postu- -- one could propose a scenario where, you
3 know, photoresists have three basic components.
4 You have a photoactive group, a so-called resin
5 which is the bulk of the photoresist which is the
6 one that does the resisting, mixed in with a
7 solvent to keep it in a liquid state. So when you
8 expose it, you might just evaporate the solvent
9 making those exposed parts denser and harder, and
10 then during the development stage those parts
11 would not develop. So that would be an example of
12 a physical change without any chemistry.

13 Q Are you aware of any actual examples where
14 UV radiation is used to make only a physical
15 change and not a chemical change?

16 MR. WOLFE: Objection. Asked and
17 answered.

18 A I was citing this Elian patent. Sitting
19 here I cannot cite any other prior art. I did not
20 look for any.

21 Q Does Exhibit 2006, the Elian patent,
22 include any examples where only -- where exposure

1 to UV or EUV causes only a physical change but not
2 a chemical change to the photoresist?

3 A Could you repeat that question, please?

4 Q Does Exhibit 2006 include any examples
5 where exposure to EUV or UV causes only a physical
6 change but not a chemical change to the
7 photoresist?

8 A Well, the main focus of this patent is
9 electron beam resist. They're discussing UV.
10 This is only the background section, and I don't
11 think it has any specific details.

12 Q And your opinion in paragraph 43 is that
13 exposure to UV or EUV radiation can result in a
14 physical change to the resist material; correct?

15 A Yeah. It's my opinion based on this
16 relevant cite, Exhibit 2006, line -- column 1,
17 lines 18 to 20.

18 MR. WOLFE: So I also received an e-mail
19 that the gentleman that can fix the drawer is
20 ready, just to make you aware.

21 MR. BREGMAN: Let's finish this. Okay.

22 Q So other than the single sentence in

1 example 2006 you have no evidence of a photoresist
2 where exposure to EUV or UV results in only a
3 physical change to the resist material. Is that
4 true?

5 MR. WOLFE: Objection. Mischaracterizes.

6 A I did not look for any other references,
7 and there's only one that I cited.

8 Q Do you consider Exhibit 2006 to be a
9 reliable source for the assertion that a physical
10 change can occur in UV or EUV lithography?

11 MR. WOLFE: Objection. Form.

12 A Well, although I'm not a lawyer, but I've
13 been told that there's a presumption of validity
14 in approved patents, and secondly, I see that this
15 patent is from Infineon which is a very reputable
16 company in Europe. So the fact that their
17 employees wrote the patent I think lends some
18 credence to the statement.

19 Q And Exhibit 2006 doesn't include any
20 examples where UV or EUV cause a physical change
21 only to photoresist material. Is that true?

22 A I don't think it does because, once again,

1 the main focus of this is electron beam resist, so
2 I don't believe they analyzed UV photoresists, but
3 I could scan through it.

4 I don't think it has more detail about
5 that statement.

6 Q I think this might be a good time for a
7 break if you'd like to take a break.

8 (A recess was taken.)

9 BY MS. PATITUCCI:

10 Q Dr. Banerjee, did you discuss the
11 substance of your testimony with anyone during the
12 break?

13 A No.

14 Q Claim 1 of the '564 patent requires a
15 coating material comprising metal ions with
16 radiation sensitive ligands; correct?

17 A Yes.

18 Q What are radiation sensitive ligands?

19 A So these would be the species that are
20 attached to, in this case the metal core, and
21 there's some chemistry that will go on in that
22 ligand upon exposure to radiation.

1 Q Does claim 1 require that the radiation
2 sensitive ligand is attached to the metal?

3 A I believe it does because it talks
4 about -- yeah. I think it does.

5 Q And why is that? Or let me rephrase.

6 Why is it your opinion that claim 1
7 requires the radiation sensitive ligand be
8 attached to the metal?

9 A Well, the claim itself is silent about
10 that. I was told that you always interpret the
11 claims in light of the specifications, not get
12 limited by that, and when I look at, for example,
13 the cover page and my, my experience has been, you
14 know, they put the most important figure in the
15 concept on the cover page very often, and that
16 shows the peroxide ions, the peroxide, the
17 peroxide ligand attached to the metal, and when
18 you shine photons, that's HU [sic] it's causing a
19 change in that ligand, and that leads to this
20 cross linking making it insoluble which is what a
21 negative tone does.

22 Q So your understanding that the radiation

1 sensitive ligand must be attached to the metal is
2 based on the experimental examples in the '564
3 specification. Is that true?

4 MR. WOLFE: Objection. Mischaracterizes.

5 A Well, the phrase "comprises metal ions
6 with radiation sensitive ligands" in claim 1, to
7 me I think that's also strongly indicative of the
8 ligand being attached to the metal ion.

9 (A discussion was held off the record.)

10 BY MS. PATITUCCI:

11 Q What about the phrase "comprises metal
12 ions with radiation sensitive ligand" indicates to
13 you that the ligand is attached to the metal ions?

14 A As I told you, I was interpreting the
15 claim language in light of the specification, and
16 the exemplary case shows peroxides attached, the
17 peroxide ligands attached to the metal, and I
18 think that's supported by the word "comprises,"
19 the phrase "comprises metal ions with radiation
20 sensitive ligands."

21 Q Are you interpreting the word "with" to
22 mean "attached"?

1 A Yes, in light of the specification, once
2 again.

3 Q If a ligand absorbs radiation, is it
4 radiation sensitive?

5 MR. WOLFE: Objection. Form.

6 A No. In my opinion just absorbing it would
7 not make it radiation sensitive. It has to cause
8 some changes of the chemistry, and ultimately it's
9 a change of the chemistry which would lead to this
10 differential dissolution rate.

11 Q So am I understanding you correctly if I
12 say that radiation sensitive ligands are ligands
13 in which exposure to radiation leads to a chemical
14 change in the ligand?

15 MR. WOLFE: Objection. Form.

16 A It leads to a change. I think in all the
17 cases I can think of there will be a chemical
18 change, and it's -- I interpret the word
19 "sensitive" as the change aspect of it.

20 Q So --

21 A Not just absorbing the radiation.

22 Q So it's true that a radiation sensitive

1 ligand has to change to be radiation sensitive?

2 A I think so. Otherwise it's not a function
3 of the photoresist, and I kind of discuss that in
4 section 9 of my declaration. I kind of expound on
5 that.

6 Q Does the --

7 A Yeah. No. It is 9.

8 Q Does the '564 patent disclose any
9 radiation sensitive ligands?

10 A Yes.

11 Q What radiation sensitive ligands does it
12 disclose?

13 A It's this peroxide group that's on the
14 cover page.

15 Q Are there any others disclosed in the --
16 any other radiation sensitive ligands disclosed in
17 the '564 patent?

18 A It talks about peroxide groups in column
19 15, line 38. Offhand I can't think of any other
20 examples of the cite, but it could be. It's a
21 long document.

22 Q What about in column 6, lines 9 through

1 14? Does that disclose any radiation sensitive
2 ligands?

3 A Yes. It does talk about it.

4 Q What radiation sensitive ligands are
5 disclosed in column 6, lines 11 through 14?

6 A It talks about other inorganic peroxides
7 or it could be an organic peroxide, but they
8 discourage use of organic components because
9 carbon contamination is a problem in
10 microelectronics in general. So that's why they
11 discourage using it.

12 Q And it says, "Hydrogen peroxide provides a
13 desirable radiation sensitive ligand" on --

14 A Yes.

15 Q Okay. And is hydrogen peroxide the same
16 thing as peroxide?

17 A Well, hydrogen peroxide is H₂O₂. So
18 that's an example of a peroxide.

19 Q So if we turn back to the figure that you
20 pointed to earlier, I think it's on the cover of
21 the '564 patent?

22 A Okay.

1 Q You pointed to the peroxide group as the
2 radiation sensitive ligands; is that correct?

3 A Yes.

4 Q Is that hydrogen peroxide or is that just
5 peroxide?

6 A It's not hydrogen peroxide as shown. It's
7 oxygen-oxygen bonds. That's peroxide.

8 Q So how would hydrogen peroxide be a
9 radiation sensitive ligand?

10 A I don't know if I analyze those details in
11 my report, but when I read this, the way I
12 interpreted that was hydrogen peroxide would be an
13 example of a precursor in the solution that you
14 mix with, you know, I believe, the HfSO_x that
15 they get by reacting hafnium oxychloride with
16 hydrogen sulfate -- or sulfuric acid. So these
17 are all precursors that are mixed in, ultimately
18 leading to this all peroxide attached to the metal
19 such as hafnium or zirconium.

20 Q So is it fair to say that the '564 patent
21 refers to a radiation sensitive ligand in some
22 situations as the precursor such as hydrogen

1 peroxide?

2 A No. I think I was reading the sentence in
3 column 6, line 9, as "Hydrogen peroxide provides a
4 desirable radiation sensitive ligand." So you mix
5 it up, and it's leading to this all double bond
6 attached to the metal. That's the way I was
7 reading the thing, but I haven't analyzed those
8 details in my report.

9 Q Does the '564 patent disclose any other
10 radiation sensitive ligands that do not comprise a
11 peroxide group?

12 A I don't recall, but maybe if it does you
13 can point me to it. I don't recall it does.

14 Q How would a POSA determine whether a
15 particular ligand is radiation sensitive?

16 A Well, she would expose it to the
17 appropriate radiation and then measure the
18 dissolution rate between exposed versus unexposed
19 photoresist and see if there's a difference.

20 Q So they would have to -- a POSA would have
21 to test each individual ligand to determine
22 whether it is radiation sensitive or not?

1 MR. WOLFE: Objection. Form.

2 A I mean I would think that a POSA would be
3 given these resists by some manufacturer or some
4 third party, and then she would test it along the
5 lines that I mention.

6 Q Claim 1 of the '564 patent does not
7 require that the radiation sensitive ligand is a,
8 or comprises peroxide; correct?

9 A That's correct.

10 MR. WOLFE: Objection. Form. You can
11 answer.

12 A Yeah. That's agnostic as to the type of
13 radiation sensitive ligand.

14 Q What other types of radiation sensitive
15 ligands would a POSA understand claim 1 to include
16 other than peroxide radiation sensitive ligands?

17 A I don't know. I haven't thought of that
18 or I haven't opined on that.

19 Q Sitting here today do you have an opinion
20 on what other radiation sensitive ligands claim 1
21 would include other than peroxide --

22 MR. WOLFE: Objection to scope.

1 Q -- ligands?

2 A I've not analyzed that in my report, and
3 sitting here, no, I don't have an opinion.

4 Q If the '564 patent does not include other
5 examples of radiation sensitive ligands, how would
6 a POSA know which radiation sensitive ligands
7 would be suitable to use in the structure of claim
8 1 of the '564 patent?

9 MR. WOLFE: Objection. Form. Objection.
10 Scope.

11 A I've not analyzed that or thought about
12 that in preparing the report, but if you look at
13 claim 1, once again, it's a structure claim. And
14 it's agnostic as to the specific metal or the type
15 of specific radiation sensitive ligand.

16 Q You have considered what a radiation
17 sensitive ligand is in the context of the '564
18 patent though; correct?

19 A Yes.

20 Q And so in the context of the '564 patent
21 what would be a radiation sensitive ligand that a
22 POSA could use in claim 1 that is not peroxide?

1 MR. WOLFE: Objection. Scope.

2 A I wasn't asked to consider any specific
3 chemical group in terms of the ligand when writing
4 my report. Once again, the only specific example
5 that I saw was the peroxide group.

6 Q So you only know for sure that peroxide
7 would be a suitable radiation sensitive ligand for
8 claim 1 of the '564 patent?

9 MR. WOLFE: Objection. Mischaracterizes.

10 A Yeah. I know the peroxide could be a
11 radiation sensitive ligand, but there could be
12 others that I haven't thought of or considered.

13 Q Is there something in the '564 patent
14 specification that would help you determine
15 whether a particular ligand is a radiation
16 sensitive ligand suitable for use in the structure
17 of claim 1 of the '564 patent?

18 A Yeah. If the POSA was a synthetic
19 chemist, he or she could, you know, mix up this
20 precursor solution and then expose that resist and
21 then measure the etch rate and the developer and
22 compare them between the exposed and the

1 nonexposed parts. That would be one experimental
2 technique that you could use.

3 Q So a POSA would need to test by creating
4 the precursor solution and exposing that resist
5 and then measuring the etch rate and the
6 development and compare to understand whether a
7 ligand is radiation sensitive such that it is
8 suitable for use in claim 1 of the '564 patent?

9 MR. WOLFE: Objection. Scope.

10 A I've not discussed any of that or analyzed
11 any of that in my report, but in general the
12 answer is yes. R&D takes time.

13 (The reporter requested clarification.)

14 Q What is an extinction coefficient?

15 A Extinction coefficient is also known as
16 the absorption coefficient. So when you shine
17 light on the surface of a solid or a liquid, or
18 even a gas, in fact, the light can get absorbed by
19 the atoms or molecules in the material, and that
20 causes a decrease of intensity of the light as
21 function of depth. Typically it's an exponential
22 detail: D to the power minus α times depth,

1 the alpha would be the extinction of the
2 absorption coefficient.

3 Q Dr. Holland defined it as the property
4 that determines how strongly a material absorbs
5 radiation at a particular wavelength. Do you
6 agree with her?

7 A Yeah.

8 Q In your declaration in paragraph 45 you
9 state: "Water, which absorbs radiation at a
10 different strength than a metal, does not become a
11 radiation sensitive ligand even if it is added to
12 a metal and the extinction coefficient of water
13 plus metal is expected to be different than the
14 extinction coefficient of the metal alone";
15 correct?

16 A Yes.

17 Q And in your example is water a ligand?

18 A I didn't write it in that context. It's
19 just discussing this aspect of, you know, what
20 radiation, what absorption coefficient or
21 extinction coefficient means, and just because
22 it's different in different fields doesn't imply

1 radiation sensitivity. As I think I discussed
2 earlier, the term sensitivity in my opinion
3 implies absorbing the radiation, causes a change
4 in the chemistry of the ligand leading to a
5 difference of the dissolution rate between exposed
6 versus unexposed photoresist. The simple act of
7 absorption of light does not make it radiation
8 sensitive.

9 Q To be radiation sensitive does a ligand
10 need to absorb radiation?

11 MR. WOLFE: Objection. Form.

12 A It has to interact with radiation somehow.
13 Otherwise there will be no change possible.

14 Q What do you mean by the ligand has to
15 interact with radiation somehow?

16 A Well, there's different types of radiation
17 that '564 talks about -- UV, EUV and electron beam
18 -- and the interaction physics is very different
19 in all these cases.

20 So, for example, as the wavelength of the
21 radiation becomes smaller, the frequency new
22 corresponding gets larger, and that's the H views

1 that the patents talk about. That's the energy of
2 the photon. So for higher frequency photons the
3 photons getting more punch, and then they can, you
4 know, depending on the material that it's
5 interacting with can cause different chemical
6 reactions subject to, you know, quantum chemical
7 rules, quantum selection rules.

8 In the case of electron beam resist the
9 physics are very different. It causes, you know,
10 depending on the type of e-beam resist, positive
11 or negative, it can cause chain breakages or chain
12 scission. It all depends on the type of radiation
13 and the type of material.

14 Q Is interacting with radiation different
15 than absorbing radiation?

16 A I mean in this context I think the two are
17 the same, but I can't think of in a pathological
18 example not really germane to this where could
19 have differences, but here I think it really means
20 the two are related to each other.

21 Q Going back to your example in paragraph 45
22 of your declaration. Water -- you say "Water,

1 which absorbs radiation at a different strength
2 than a metal, does not become a radiation
3 sensitive ligand."

4 Is water a ligand in general?

5 MR. WOLFE: Objection. Scope.

6 A I haven't thought of that while writing my
7 patent [sic]. Maybe there's some chemistries
8 where it could be. I don't know.

9 Q Is water a ligand in the context of the
10 example that you gave in paragraph 45 of your
11 declaration?

12 A Here I wasn't analyzing that aspect of the
13 question. I was merely trying to clarify what in
14 my opinion the term radiation sensitive means, not
15 just for ligands but in general, and what I was
16 trying to emphasize was the simple act of
17 absorption of radiation does not equate radiation
18 sensitivity. It has to cause some change of
19 chemistry so that it would act as a photoresist.

20 Q So I guess I don't understand your example
21 then because if -- if you add water to metal, is
22 water a radiation sensitive ligand in your

1 example?

2 MR. WOLFE: Objection. Asked and
3 answered.

4 A In section 9 as we're back in Dr. Holland,
5 and she was quoting Stowers 2008 where Stowers
6 discusses that adding peroxide is expected to
7 change the absorption or extinction coefficient,
8 and then she makes a jump in logic that that
9 automatically means that this ligand is also going
10 to be radiation sensitive. So I was trying to
11 decouple those concepts and clarify misconceptions
12 that just having differences of absorption or
13 extinction coefficient of the radiation doesn't
14 automatically imply radiation sensitivity in the
15 context of '564. That's all I was trying to
16 expound on in this section.

17 Q So your example in paragraph 45 doesn't
18 apply to the '564 patent because water is not a
19 ligand? Is that true?

20 MR. WOLFE: Objection. Mischaracterizes.

21 A Another key point as it pertains directly
22 '564 will be the statement from Stowers 2008 where

1 he says that the extinction coefficient would be
2 different with or without a peroxide. Dr. Holland
3 took that statement and made this jump in logic to
4 say that that necessarily means that a peroxide is
5 radiation sensitive. It could be, and of course
6 we know now that it is radiation sensitive, but I
7 was simply trying to make a finer distinction
8 between radiation absorption and radiation
9 sensitivity, and that's the intent of this analogy
10 with water on metal. I wasn't trying to imply
11 that water is a ligand attached to the metal.

12 Q Claim 7 of the '564 patent requires that
13 the coating material has high absorption of EUV
14 radiation relative to conventional radiation-based
15 resists; correct?

16 A Yes.

17 Q How is absorption of EUV of the coating
18 material measured?

19 MR. WOLFE: Objection. Scope.

20 A I haven't analyzed that in my report, but
21 I will tell you in general how these things are
22 measured.

1 Q Okay. So the heading of section 10 of
2 your report on page 26 is "Mass Density of a
3 Material is Not the Only Factor in Determining A
4 Resist Film's EUV Absorption"; correct?

5 A Yes.

6 Q So how do you determine a resist film's
7 EUV absorption?

8 A I don't -- I don't discuss that
9 specifically in my report but when I do similar
10 experiments in my lab with other types of films,
11 what one does is one prepares a thin film of that
12 appropriate material, you shine radiation of a
13 known intensity, say on the left-hand side, and
14 then using an instrument you can measure the
15 intensity on the right-hand side, and knowing the
16 thickness of the film you can fit it to the
17 experiment performed: Transmitted intensity
18 equals incident intensity times exponential, $E^{-\alpha d}$
19 the power minus absorption coefficient times the
20 thickness of the film. So you could
21 experimentally measure it like that, but I don't
22 go into those details in my report.

1 Q And what is a conventional radiation-based
2 resist?

3 A Well, presumably these are the ones that
4 were used prior to EUV coming into vogue. UV is
5 one of the latest technologies. So prior to that
6 you had regular UV resists, for example, argon
7 fluoride excimer laser.

8 (The reporter requested clarification.)

9 A Argon fluoride, A-r-F, excimer laser
10 operating at 193 nanometers. That's not for UV.
11 That's EUV. Before that you had 248 nanometer
12 krypton fluoride. Before that you had mercury lam
13 base high line resist at 365, and I've used all of
14 these in my research. So those would be examples
15 of conventional resists in this context.

16 Q Does the '564 patent explain what a
17 conventional radiation based resist is?

18 A Well, in the background in column 1, line
19 47, starts out by talking about organic
20 compositions can be used as radiation pattern
21 resists. So I think that's what they had in mind
22 in terms of conventional resist.

1 Q So a conventional resist, a conventional
2 radiation based resist as used in claim 7 of the
3 '564 patent is an organic composition? Is that
4 what you're saying?

5 A I think by the word conventional here they
6 mean longer UV wavelengths compared to EUV. I
7 believe that's what they had in mind, and most of
8 those, as far as I'm aware of, are organic
9 composition resists, but it could be -- there are
10 a few others I think that are inorganic.

11 Q What does "high" mean in claim 7?

12 MR. WOLFE: Objection. Scope.

13 A I haven't analyzed that aspect in my
14 report.

15 Q Do you have an understanding of what
16 "high" means in claim 7?

17 A Without raising a can of worms, it's like
18 "about," like you were talking about earlier,
19 right. So I mean it will depend on the context,
20 right.

21 So when I'm processing the resist, you
22 want to make sure that you can process things in a

1 manufacturable way which means in a fast
2 throughput, some things like that, and convention
3 resists did not work with UV radiation
4 effectively. In fact, the resists in '564 absorb
5 UV radiation faster; therefore, the develop -- the
6 exposure times will be much shorter.

7 Q So a coating material would have high
8 absorption of EUV radiation compared to
9 conventional radiation based resists if it absorbs
10 UV radiation faster? Is that your opinion?

11 A Not so much faster. You know, I mean
12 light travels at the speed of light, right,
13 divided by the refractive index. So it has to do
14 more with the concept called sensitivity which is
15 defined as a number of these photochemical
16 reactions divided by the number of photons that
17 are passing through that material. So it's going
18 to be more sensitive.

19 Q So the coating material has high UV
20 absorption -- absorption of EUV radiation relative
21 to conventional radiation based resists if it is
22 more sensitive?

1 A It would absorb more of the EUV photons
2 compared to conventional resists.

3 Q How many more photons would the coating
4 material need to absorb to be high relative to a
5 conventional radiation based resist?

6 MR. WOLFE: Objection. Scope.

7 A I wasn't asked to analyze any of that in
8 my report. I don't think there's a hard number.

9 Q Would a coating have high absorption of
10 EUV radiation relative to conventional radiation
11 based resists if it had 10 percent more photons
12 absorbed?

13 MR. WOLFE: Objection. Scope.

14 A I haven't thought about, you know,
15 specific details like that in preparing my report,
16 so I cannot comment how much more qualified as
17 high.

18 Q But you did review claim 7 in preparing
19 your report; right?

20 A Yes.

21 Q And did you have an understanding of claim
22 7 when you prepared your declaration?

1 A Yes.

2 Q So what was your understanding of the word
3 "high" in claim 7 when you prepared your
4 declaration?

5 MR. WOLFE: Objection. Asked and
6 answered.

7 A I wasn't asked to specifically analyze
8 claim 7, and I only opined on the matters that are
9 discussed in my report, but in writing section,
10 section 10 of my report here, one has to have an
11 idea of, you know, what high compared to
12 conventional resists would be, but once again,
13 it's not an absolute metric. It depends on,
14 depends on the context. You know, higher the
15 better.

16 Q So how high -- or strike that.

17 Would a coating have high absorption of
18 EUV radiation relative to conventional radiation
19 based resists if it had 15 percent more photons
20 absorbed?

21 MR. WOLFE: Objection. Scope.

22 A I did not analyze the degree of highness,

1 so to speak, in this context, but once again, in a
2 general sense the more photons that this new
3 resist would absorb compared to conventional
4 resists the better it is. So if it absorbed 15
5 percent more photons, it will take 15 percent less
6 exposure time than conventional resists, and if
7 you could have a metric for how much better, I
8 guess it would be up to 15 percent better; if it
9 was 50 percent more absorbing, it would have the
10 exposure time maybe twice as better. It's a
11 matter of degree.

12 Q And you were asked to apply the plain and
13 ordinary meaning of the claim terms in your -- in
14 drafting your declaration; right?

15 A Yes.

16 Q And you've done that in drafting your
17 declaration; correct?

18 A Yes.

19 Q So what is the plain and ordinary meaning
20 of "high" in claim 7?

21 MR. WOLFE: Objection. Scope.

22 A Here I interpreted the word "high" as

1 being high relative to conventional resists which
2 operate at longer wavelengths, but I don't have a
3 specific percentage increase in mind when I
4 interpreted the claim language in writing my
5 report.

6 Q So you don't know what high relative to
7 conventional radiation based resists means in the
8 context of claim 7?

9 MR. WOLFE: Objection. Mischaracterizes.

10 A It says high compared to conventional
11 resists. So you could also say, instead of high,
12 one could say higher than conventional resists.

13 Q So does "high" mean "higher" in claim 7?

14 A I did not -- I was not asked to think of a
15 specific percentage increase in mind when I
16 analyzed the patent or wrote my declaration.

17 Q But you were asked to consider claim 7 in
18 drafting your declaration; correct?

19 A Yes.

20 Q But you didn't consider the words in claim
21 7 when drafting your declaration?

22 A Yes, of course I did.

1 Q And so what did you consider high relative
2 to conventional radiation based resists to mean?

3 MR. WOLFE: Objection. Asked and
4 answered.

5 A So if you look at paragraph 48 of my
6 report, I say, "For claim 7," Lam's expert,
7 "Dr. Holland, proposes a theory that EUV
8 absorption -- absorbance for Stowers is higher
9 than conventional resists." That's kind of
10 consistent with what I just told you that in claim
11 7 when it says high compared to conventional
12 resists, high and compared, if you can kind of
13 combine the two, it's kind of going to higher, and
14 I don't believe Dr. Holland had a specific
15 percentage increase in mind also, but I could be
16 wrong.

17 Q Does claim 7 require that the coating
18 material be high relative to all conventional
19 radiation based resists?

20 A I think it's silent about that, whether
21 it's most or -- I mean there are many brands of
22 conventional resists that have been used, and I've

1 used many of them in my own lab. So I don't know
2 if it's talking about all conventional resists in
3 the universe of resists.

4 Q Would a coating material that has high
5 absorption of EUV relative to a single
6 conventional radiation based resist meet claim 7?

7 MR. WOLFE: Objection. Scope.

8 A No, I don't think it would, because it
9 uses the word, plural, resists. So I think it has
10 to be more than one.

11 Q Does a coating material need to have high
12 radiation relative to more than two conventional
13 radiation based resists to meet the limitations of
14 claim 7?

15 MR. WOLFE: Objection. Scope.

16 A I think it's silent as to the number of
17 conventional resists, but it's definitely in the
18 plural, and I have not analyzed those aspects in
19 my report.

20 Q So if we could turn to Exhibit 1025. Do
21 you have that?

22 A Yeah.

1 Q Okay. Let's look at figure 3 which is on
2 page 4.

3 A Yes.

4 Q Do you know what the density of a hafnium
5 oxide coating material would be?

6 A It's cited in one of the exhibits, and I
7 cite that in my report 9.-- 9.68, but I haven't
8 verified that.

9 Q Where would the density of HafSOx be in
10 figure 3 of Exhibit 1025?

11 MR. WOLFE: Objection. Form. Objection.
12 Scope.

13 A That's an interesting point that you raise
14 because the exhibit that Dr. Holland cited
15 actually talks about hafnium oxide, not HafSOx.
16 So the composition is slightly different, but for
17 argument's sake let's assume it's comparable.
18 That will put it on the right-hand side of this
19 graph.

20 Q Do you have Exhibit 1008 in front of you?

21 A Yes.

22 Q If you could turn to page 90, and that's

1 90 of the exhibit, not 90 of the pages at the top.

2 A Oh.

3 Q Sorry. It's page 74, at the top.

4 A Yes.

5 Q Okay. About two-thirds of the way down it
6 says, "If a reasonable density of 4 grams per
7 centimeter cubed for ZircSOx and 5 grams per
8 centimeter cubed for HafSOx were assumed."

9 Do you see that?

10 A Yes.

11 Q And this Exhibit 1008 is the dissertation
12 of Jason Stowers; correct?

13 A Yes.

14 Q And Jason Stowers is an inventor of the
15 '564 patent; is that right?

16 A Yes.

17 Q So if we assumed that Dr. Stowers is
18 correct that the density for HafSOx is
19 approximately 5 grams percent centimeter cubed,
20 where in figure 3 of Exhibit 1025 would HafSOx
21 appear?

22 A It would be to the right-hand side of the

1 figure. That's not shown on the scale.

2 Q Is this -- the scale's too small?

3 A Because this only goes up to 1.5 grams per
4 centimeters cubed; right?

5 Q So you would have to extend the scale
6 threefold, about?

7 A Approximately, yes.

8 Q Could you draw on figure 3 in Exhibit 1025
9 where HafSOx would fall?

10 MR. WOLFE: Objection. Scope.

11 A It would be somewhere over here maybe
12 (indicating).

13 Q So off, off the page?

14 A Off the page, yes.

15 Q On both the x and y-axis is what you
16 showed; correct?

17 A Right, but one should not conflate the
18 absorption properties of an inorganic material
19 like HafSOx with these materials which are all
20 organic.

21 Q But to be clear, when asked to point where
22 HafSOx would show up on figure 3, you pointed

1 above the y-axis and to very far to the right on
2 the x-axis?

3 MR. WOLFE: Objection. Scope.

4 Q That's correct; right?

5 A I didn't analyze that, but yes, it is
6 true.

7 Q If you could turn to Exhibit 1027.

8 A Okay.

9 Q And you cite Exhibit 1027 in your
10 declaration; correct?

11 A Yes.

12 Q Did you review Exhibit 1027 in preparation
13 for your deposition today?

14 A Yes.

15 Q Figure 1 shows an inorganic metal oxide
16 core; is that right?

17 A Yes.

18 Q And that can be a zirconium oxide or
19 hafnium oxide core; correct?

20 A Yes.

21 Q And figure 1 also shows an organic ligand
22 shell; is that correct?

1 A Yes.

2 Q And it says "photochemical reaction under
3 organic ligand shell." Is that true?

4 A I see the words "photochemical reaction"
5 in that box.

6 Q And below that it also shows a photoactive
7 compound in the blue dot; correct?

8 A Yes.

9 Q What is a photoactive compound?

10 A That's a compound that will undergo a
11 change in chemistry upon interacting with the
12 radiation, and that's the part that's radiation
13 sensitive.

14 Q So if we look at figure 2, the caption
15 says "Schematic of the ligand displacement
16 patterning mechanism for negative tone patterning
17 formation"; correct?

18 A Yes.

19 Q What is ligand displacement?

20 A That's shown on this cartoon view on the
21 right-hand green rectangle. So the inorganic
22 shells are surrounded with the ligand shown in, I

1 guess I'll call it pink. That's not what where
2 the photochemistry is happening; it's happening in
3 the blue, molecule in the blue box in the middle,
4 and then the byproducts of that photochemical
5 reaction in blue are displacing some of these
6 attached pink ligands attached to the inorganic
7 core, and that's the lower half of that figure.

8 Q So the blue ligands replace the pink
9 ligands; is that right?

10 A The blue photoactive compound byproducts
11 displace the pink ligand.

12 Q And how does that work? How -- strike
13 that. Let me be more clear.

14 How does the blue photoactive compound
15 displace the pink ligand?

16 MR. WOLFE: Objection. Mischaracterizes.

17 A The Ober article -- let me read that
18 quickly.

19 So in the Ober article on the second page,
20 right-hand column, gives an example where the
21 byproduct of the photoactive compound absorbing
22 the photons is this organic molecule called BPAP,

1 I believe, in short. That's the acronym.

2 Q Can you point me to where you're --

3 A I'm looking at 9 -- one, two, three, four,
4 five, six -- line 8 of the second column on page 2
5 of the Ober article.

6 Q Okay.

7 A So that BPAP is displacing the pink
8 ligands. That's the lower half of figure 2, lower
9 half of the green box in figure 2.

10 Q Okay. So it says "There is a strong
11 correlation between resist sensitivity and the
12 difference in ligand strength between the starting
13 ligand and the displacing ligand; right?

14 A Yes.

15 Q And so the starting ligand is the one in
16 pink?

17 A Yes.

18 Q And the displacing ligand is the one in
19 blue; is that right?

20 A That's correct.

21 Q If you could turn back to Exhibit 1008.

22 MR. WOLFE: Counsel, we've been going

1 about an hour.

2 MS. PATITUCCI: I probably only have like
3 a few minutes left.

4 THE WITNESS: Yeah, let's keep going.

5 Q And if we could turn to page 79 of the
6 Exhibit 1008 which is page 63 of the paginated.

7 A Yes. I see that.

8 Q This is figure 3-6, and it says in the
9 legend at the bottom says, "A sensitivity of D 0.8
10 equals 194 millijoules per centimeter squared."

11 MR. WOLFE: Objection. Scope.

12 Q Is that correct?

13 A Yes, that's right.

14 Q Do you have an understanding of what D 0.8
15 is?

16 MR. WOLFE: Objection. Scope.

17 A I've not analyzed that in my report, and
18 we had discussions with counsel. I've not seen
19 that specific term, and I believe your expert was
20 also confused by that term. One uses the concept
21 of dose in the context of contrast where you go
22 from D zero to D 100, zero percent to 100 percent,

1 but I'm not sure what -- I was trying to interpret
2 this, okay. Really it makes no sense. I mean
3 this graph doesn't go up to .8. I'm not sure what
4 they're talking about, and I don't believe
5 Dr. Holland did either. Very confusing.

6 MR. WOLFE: One second. If I could
7 counsel the witness that please do not divulge the
8 substance of any conversations between counsel and
9 yourself.

10 Q Would you understand D 0.8 to be the dose
11 required to remove 80 percent of the photoresist
12 thickness?

13 MR. WOLFE: Objection. Scope.

14 A I don't know. I couldn't answer that. It
15 doesn't match up with this figure.

16 Q I have no further questions for you.

17 MR. WOLFE: We'll take a short break. We
18 might have some.

19 (A recess was taken.)

20 EXAMINATION BY COUNSEL FOR THE PATENT OWNER

21 BY MR. WOLFE:

22 Q Dr. Banerjee, do you recall earlier that

1 -- before I start there.

2 During the break did we discuss any of the
3 substance of your testimony today?

4 A No.

5 Q During this last break did we discuss the
6 substance of your testimony?

7 A No.

8 Q Do you remember earlier, Dr. Banerjee,
9 that you were asked about your review of Exhibit
10 1025? Do you remember that?

11 A Yes.

12 Q I'd like to direct your attention to your
13 declaration, paragraph 49.

14 A Okay.

15 Q And there do you see the part you said,
16 "But this is merely a trend. It is not
17 necessarily the case that higher density
18 necessarily means higher EUV absorption."

19 Do you see that?

20 A Yes.

21 Q Let's turn to Exhibit 1025, figure 3. Do
22 you see on the left-hand side the y-axis, it says

1 "calculated near absorption coefficient"?

2 A Yes.

3 MS. PATITUCCI: Objection. Leading.

4 Q Do you know what the calculated linear
5 absorption coefficient of HafSO_x and ZircSO_x are?

6 A No, not offhand.

7 Q So you don't know whether it is higher or
8 lower than the dots on this graph then; is that
9 correct?

10 MS. PATITUCCI: Objection. Leading.

11 A That's correct.

12 Q Okay. That's all we have.

13 MS. PATITUCCI: Nothing further from me.

14 Thank you.

15 THE WITNESS: Thank you.

16 THE REPORTER: And transcript orders.

17 MR. WOLFE: Can we get the regular like
18 one to three days, or three days?

19 MS. PATITUCCI: Three business days is
20 fine for us. Is concluded at 3:55.

21 (Off the record at 3:55 p.m.)

22

1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

2 I, JANET A. HAMILTON, Registered Diplomate
3 Reporter and Notary Public within and for the
4 District of Columbia, do hereby certify:

5 That SANJAY K. BANERJEE, Ph.D., the witness
6 whose deposition is hereinbefore set forth, was
7 duly sworn by me before the commencement of such
8 deposition and that such deposition was taken
9 before me and is a true record of the testimony
10 given by such witness.

11 I further certify that the adverse party,
12 INPRIA CORP., was represented by counsel at the
13 deposition.

14 I further certify that the deposition of SANJAY
15 K. BANERJEE, Ph.D., occurred at the offices of
16 Paul Hastings, LLP, 2050 M Street, NW, Washington,
17 DC 20036, on Friday, September 27, 2024,
18 commencing at 9:07 a.m. to 3:55 p.m.

19 I further certify that I am not related to any
20 of the parties to this action by blood or
21 marriage, I am not employed by or an attorney to
22 any of the parties to this action, and that I am

1 in no way interested, financially or otherwise, in
2 the outcome of this matter.

3

4 IN WITNESS WHEREOF, I have hereunto set my hand
5 this 28th day of September, 2024.

6

7 My commission expires:

8 March 31, 2028.

9

10

11


Janet A. Stojan

12 Notary Public in and for the
13 District of Columbia

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A			
a-1	187:1, 187:5	37:15, 37:22,	address
79:3, 79:9	absorption"	38:16, 38:18,	5:11
a-2	167:4	38:20, 39:1,	adjacent
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