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Transcript of P. Morgan Pattison, Ph.D.

Date: July 25, 2025

Case: Samsung Display Co., Ltd. -v- Pictiva Displays International Ltd. (PTAB)

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1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 SAMSUNG DISPLAY CO., LTD.

6 Petitioner,

7 v.

8 PICTIVA DISPLAYS INTERNATIONAL LTD., LLC

9 Patent Owner.

10
11 IPR2024-01095

12 U.S. Patent No. 11,828,425

13
14
15 DEPOSITION OF

16 P. MORGAN PATTISON, Ph.D.

17 Friday, July 25, 2025

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21 Pages: 1 - 228

22 Reported by: APRIL REID, RPR, CRR (Stenographer)

A P P E A R A N C E S

ON BEHALF OF THE PETITIONER:

KEE YOUNG LEE, ESQ.

JEFF LERNER, ESQ.

JARED FRISCH, ESQ. (via realtime link)

COVINGTON & BURLING, LLP

850 Tenth Street, NW

OneCity Center

Washington, DC 20001

(202) 662-6000

ON BEHALF OF THE PATENT OWNER:

H. ANNITA ZHONG, ESQ.

IRELL & MANELLA, LLP

1800 Avenue of the Stars

Suite 900

Los Angeles, CA 90067

(310) 277-1010

ALSO PRESENT:

HARUT AKOPYAN, Remote Technician

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1 P R O C E E D I N G S

2 THE STENOGRAPHER: As we begin this
3 proceeding, I will ask our witness to please
4 raise your right hand.

5 THE WITNESS: (Complies).

6 THE STENOGRAPHER: Do you swear or
7 affirm that the testimony you're about to
8 give will be the truth, the whole truth, and
9 nothing but the truth?

10 THE WITNESS: I do.

11 THE STENOGRAPHER: Thank you.

12 THEREUPON:

13 P. MORGAN PATTISON, PH.D.

14 being first duly sworn or affirmed to
15 testify to the truth, the whole truth, and
16 nothing but the truth, was examined and
17 testified as follows:

18 THE STENOGRAPHER: We may begin.

19 EXAMINATION

20 BY MR. LEE:

21 Q. Good morning, Dr. Pattison.

22 A. Good morning.

1 Q. Can you please state your full name, for
2 the record.

3 A. Paul Morgan Pattison.

4 Q. And you've been deposed a couple of
5 times before; correct?

6 A. Yes.

7 Q. And how many times is that?

8 A. I'm not exactly sure, but over ten, I
9 would say.

10 Q. And when was the last time you were
11 deposed?

12 A. Oh. A few months ago. I'm not -- I'm
13 not exactly sure.

14 Q. Okay. So you're pretty familiar with
15 the process -- with the process, but just to go
16 over some of the -- some of the basics, during
17 this deposition I'll be asking you questions; and,
18 if you don't understand one of my questions, would
19 you please let me know; and, I'll try my best to
20 clarify?

21 A. Yes.

22 Q. And if you don't -- well, if you answer

1 a question, I will assume that you understood
2 and -- is that fair?

3 A. Yes.

4 Q. I'll try to take breaks once every hour
5 or so, but if for any reason you want to take a
6 break at any time, if you can just please let me
7 know; and, I would just ask that if a question is
8 pending, that you answer the question before you
9 take that break. That's okay?

10 A. Yes.

11 Q. Now, we're taking this deposition
12 remotely, but you understand that this deposition
13 will be treated the same as if it were an
14 in-person proceeding; right?

15 A. Yes.

16 Q. Where are you taking this deposition
17 from?

18 A. Santa Barbara, California.

19 Q. Okay. And is there anyone else in the
20 room with you?

21 A. No.

22 Q. Do you have any communication utilities

1 open on your computer aside from this, the Zoom
2 platform being used for the deposition?

3 A. No.

4 Q. Okay. And during today's deposition,
5 I'll just ask you not to engage in any
6 communications with anyone other than through the
7 Zoom session. For example, through some -- any
8 other chat applications. Is that okay?

9 A. Yes.

10 Q. And if anyone tries to contact you or
11 communicate with you during the deposition, will
12 you just let me know, for the record?

13 A. Sure.

14 Q. And on the computer that you're joining
15 us from, do you have any materials related to this
16 proceeding saved?

17 A. I do.

18 Q. Okay. What do you have saved?

19 A. The exhibits, all of the exhibits
20 related to this matter.

21 Q. Do you also have an electronic copy of
22 your declarations?

1 A. Yes.

2 Q. And are any of those files or documents
3 marked up or annotated in any way?

4 A. No.

5 Q. And do you have any hard-copy documents
6 with you for today's deposition?

7 A. No.

8 Q. Now, you understand that you're to
9 answer truthfully and fully, as if you were in
10 court or at an administrative hearing; correct?

11 A. Correct.

12 Q. And is there any reason that you can't
13 provide true and accurate testimony today?

14 A. No.

15 Q. What did you do to prepare for today's
16 deposition?

17 A. Read through my declarations and some of
18 the references.

19 Q. You reviewed both of the declarations
20 that you've submitted in this proceeding?

21 A. Yes.

22 Q. Did you speak or meet with anyone about

1 today's deposition?

2 A. Yeah. I had meetings with Anita.

3 Q. Okay. And without getting into the
4 details of the substance of what you talked about,
5 how many times did you have meetings with counsel?

6 A. Two. Two or three.

7 Q. Two or three times.

8 When were those meetings?

9 A. This week. Earlier this week and last
10 week.

11 Q. Approximately, how long were these
12 meetings?

13 A. A few hours.

14 Q. Did you speak with or meet with anyone
15 else other than counsel in preparation for your
16 deposition?

17 A. No.

18 Q. Did you review any documents to prepare
19 for this deposition?

20 A. Just the ones that I mentioned already.

21 Q. And is there anything else other than
22 reviewing those documents and speaking with

1 counsel that you did to prepare for today's
2 deposition?

3 A. No. Just thought -- thought about it.
4 Wrote notes. Yeah. That's it.

5 Q. I understand you've submitted two
6 declarations for this IPR proceeding. And I will
7 introduce the first one.

8 MR. LEE: If we could please have tab 1
9 sent to the chat and put up on the screen,
10 please. And that has been premarked Exhibit
11 2002.

12 REMOTE TECHNICIAN: Okay. Counsel, did
13 you want me to mark it, remark it in any way
14 or just leave it as is?

15 MR. LEE: We can have a marked --
16 remarked copy, that's fine.

17 REMOTE TECHNICIAN: 2002. Got it.
18 Thanks. Stand by, please.

19 (Exhibit 2002 was marked for
20 identification and is attached to the
21 transcript.)

22 REMOTE TECHNICIAN: Okay. It's in the

1 chat now. I'll also be sharing it.

2 Q. Dr. Pattison, do you recognize this as a
3 copy of your Declaration?

4 A. That's what it looks like, yes.

5 Q. And this is one of two declarations that
6 you've submitted in this proceeding; correct?

7 A. Yes.

8 Q. And this was the first declaration that
9 you submitted. Is it okay if I just refer to this
10 as your "first declaration" or "initial
11 declaration"?

12 A. Sure.

13 Q. And if we turn to the last page of the
14 main body of the Declaration, which I believe is
15 page 60 --

16 A. You want -- you want me --

17 Q. I think one page further down, please.
18 A couple pages. Yeah.

19 Now, is that your signature?

20 A. Yes.

21 Q. And was your declaration signed on
22 October 28th, 2004 [sic]?

1 A. 2024, yes.

2 Q. 2024.

3 And is that the day that you finished
4 working on this Declaration?

5 A. Yes.

6 Q. When did you start working on this
7 Declaration?

8 A. I don't -- I don't remember.

9 Q. And what were you asked to do in
10 preparing this Declaration?

11 MS. ZHONG: Dr. Pattison, I instruct you
12 not to reveal any confidential
13 attorney-client privileged infor- --
14 discussions. But if you can answer the
15 question without revealing privileged
16 discussions, you may answer.

17 A. Reviewed -- I mean, let me think.
18 Just -- just reviewed the -- the patent and the --
19 the -- I forget what it's called, but the --
20 the -- the material filed by Samsung about the
21 prior art and the obviousness and -- and see if I
22 agreed or disagreed with -- with the -- the

1 findings that came -- came from the Samsung side.

2 Q. Okay. Were -- were you asked to review
3 Samsung Display's petition for inter partes
4 review?

5 A. Yeah, I -- I -- I -- yes.

6 Q. And did you review the whole petition?

7 A. I have to recall.

8 I don't know if it was the whole
9 position -- petition, but I believe it was, yeah.

10 Q. Okay. Did you review anything else
11 other than the petition and the patent and the
12 prior art references?

13 A. I don't recall in this version.

14 I also referred Professor Holmes'
15 declaration, also. I believe I did as well.
16 Yeah. Professor Holmes' Declaration.

17 Q. And how much time did you spend working
18 on this Declaration?

19 A. I don't -- I don't know exactly.

20 Q. And do you know what this Declaration
21 was used for in this proceeding?

22 MS. ZHONG: Objection, form.

1 A. Is it -- I think it was filed as part of
2 a response for an inter partes review with the
3 patent board.

4 Q. And that response itself, did you have
5 any role in helping prepare the response?

6 A. I prepared this Declaration, this part
7 of the response.

8 Q. Okay. But did you -- you -- did you
9 draft any part of any other documents or papers as
10 part of the response?

11 MS. ZHONG: Objection. Objection.

12 Dr. Pattison, I instruct you not to
13 reveal any privileged communications or
14 discussions, but if you can answer the
15 question without revealing those privileged
16 discussions/communications, you may answer.

17 A. No, I didn't draft other parts of the
18 response.

19 Q. Did you review what was filed as the
20 Patent Owner's Response?

21 A. I had interactions with counsel.

22 Q. But did you review the Patent Owner's

1 Response as it was filed with the Board?

2 MS. ZHONG: Objection, form.

3 A. No, I don't -- I don't recall that I
4 did.

5 Q. And did you write this Declaration
6 yourself or did you have help drafting it?

7 MS. ZHONG: Objection, form.

8 A. I had help.

9 Q. And who helped you write this
10 Declaration?

11 A. This was a -- I'd say, a collaborative
12 process with counsel.

13 Q. Was there particular portions of the
14 Declaration that you recall the counsel drafting
15 on your behalf?

16 MS. ZHONG: Objection, form.

17 A. I wouldn't say they drafted it on my
18 behalf. It was a collaborative process. But,
19 like, the legal standard portion.

20 Q. Okay. So the legal standard portion was
21 provided for you by counsel?

22 A. It was a collaborative process. Yeah.

1 Q. Are there any other sections or parts of
2 the Declaration that were substantively provided
3 to you by counsel?

4 MS. ZHONG: Objection, form.

5 A. Yeah. There were a lot of discussions
6 with counsel about the content of this -- of this
7 document. But ultimately, you know, these are my
8 opinions. It's my Declaration.

9 Q. And do you -- are there any parts of
10 your Declaration that were written solely by you
11 without collaboration with counsel?

12 MS. ZHONG: Objection, form.

13 A. Yes.

14 Q. And which parts is that?

15 A. I -- I don't recall exactly which ones,
16 but there were parts written solely by me.

17 Q. Before you submitted this signed
18 Declaration, did you review it carefully for any
19 errors?

20 A. I did.

21 Q. And other than minor typographical
22 errors, are you aware of any errors in your

1 Declaration, sitting here today?

2 A. I'm not.

3 Q. If we could turn to Section III of the
4 Declaration, paragraph 16. And that's on PDF
5 page 8.

6 Dr. Pattison, this is the Legal
7 Standards section that was provided to you by
8 counsel?

9 A. Yeah. Yeah. They provided this. We
10 collaborated on it. I reviewed it. I -- I am not
11 an attorney.

12 Q. Understood.

13 So these are legal principles that
14 counsel provided to you for purposes of this
15 Declaration?

16 A. Correct.

17 Q. Not being an attorney, are you, by any
18 chance, familiar with the title and section of the
19 United States Code where the standard for
20 obviousness is codified?

21 MS. ZHONG: Object to form.

22 A. Let's see. I don't -- I'm familiar with

1 the obviousness principles. It's come up quite a
2 bit in my work. I don't recall the exact number
3 of the legal code that it's in.

4 Q. Are you familiar with something called
5 the Consolidated Trial Practice Guide?

6 A. No.

7 Q. Have you ever reviewed such a thing?

8 A. I mean, if I said I did in here, then I
9 did, but I don't recall having reviewed it.

10 Q. And are you familiar with the Code of
11 Federal Regulations?

12 A. I am. The document.

13 Q. Have you --

14 A. Not having gone through it like a lawyer
15 or anything.

16 Q. Okay. And -- and how have you become
17 familiar with the Code of Federal Regulations?

18 A. Just bits and pieces through my -- my
19 expert work. But -- yeah. It's a -- it kind of
20 comes and goes. I get -- I get -- I have
21 discussions with counsel about the standards or
22 the -- the -- the meaning of that, of that stuff

1 and -- and try to connect it with my technical
2 expertise and understanding.

3 So I don't -- don't try to be a lawyer
4 or, you know, do that work. I try to be an expert
5 on the technical side of things.

6 Q. Okay. So when you say that you became
7 familiar with the Code of Federal Regulations
8 through your expert work, you're referring to your
9 legal consulting expert work?

10 A. I don't -- it's not legal consulting. I
11 don't -- I don't consult on the law. I consult
12 on -- on technology, mostly lighting technologies,
13 in legal matters. If there's a -- you know, I
14 just want to be clear on that.

15 Q. Sure. Sure.

16 A. Just...

17 Q. I just mean, you know...

18 I just wanted to know if you were
19 familiar with the Code of Federal Regulations from
20 your -- from the work that you do as a technical
21 consultant, or if it's just in the context of
22 assisting counsel with these kinds of legal

1 proceedings.

2 MS. ZHONG: Objection, form.

3 A. When I assist counsel, it's also as a
4 technical consultant.

5 Q. Okay. So are you familiar with the
6 title and section of the code -- Code of Federal
7 Regulations governing trial proceedings before the
8 Patent Trial and Appeal Board?

9 A. I don't have it memorized, the number.
10 So, no. I -- I'm familiar with it, but I don't
11 have the numbers memorized.

12 Q. So you're -- you're familiar with the
13 Code of Federal Regulations governing trial
14 proceedings before the PTAB?

15 A. Umm.

16 Q. So if I were to ask you what's at
17 Title 37, Section 42.6, paragraph A, subparagraph
18 3 of the Code of Federal Regulations, you would
19 not be able to tell me what that is?

20 MS. ZHONG: Objection.

21 A. Is it -- is it in my report here?

22 Q. I don't believe it is.

1 A. Okay.

2 No. Like I said, I don't memorize the
3 numbers or the sections.

4 You know, my -- my role is to bring in
5 legal expertise or -- not legal, technical
6 expertise to these legal matters.

7 Q. So if a citation to the Code of Federal
8 Regulations was present in your Declaration, it
9 would mean that you were familiar with it and
10 understood it?

11 A. It would mean what I -- what I said in
12 the report.

13 And if you could point me to that
14 section, we could go through it.

15 MR. LEE: If we could pull up at tab 2
16 which is premarked Exhibit 2018.

17 REMOTE TECHNICIAN: One second.

18 (Exhibit 2018 was marked for
19 identification and is attached to the
20 transcript.)

21 Q. This document is titled Supplemental
22 Declaration of Dr. P. Morgan Pattison, Ph.D.

1 Dr. Pattison, do you recognize this as a
2 copy of the second declaration that you've
3 submitted in these proceedings?

4 A. I do.

5 Q. And if we turn to the last page of the
6 Declaration, which is page 43, is that your
7 signature?

8 A. It is.

9 Q. And was your Declaration signed on
10 May 5th, 2025?

11 A. Yes.

12 Q. Is that when you finished working on
13 this Declaration?

14 A. Yes.

15 Q. Okay. And so this was just over two
16 months ago.

17 Do you recall when you started working
18 on this Declaration?

19 A. Not -- not exactly, no.

20 Q. And what were you asked to do in this
21 Supplemental Declaration?

22 MS. ZHONG: Again, Dr. Pattison, I

1 caution you not to reveal any privileged
2 conversations and discussions.

3 A. I felt like it was pretty much the same
4 request as the first declaration. Maybe going
5 into a little more detail on some of the elements.

6 Q. Okay. So you were asked to review
7 Samsung Display's petition for -- and prepare this
8 Declaration in response?

9 A. And -- and Professor Holmes' Declaration
10 also and -- yeah, prepare -- prepare this
11 response, going into a little more detail on some
12 of the elements.

13 Q. And did you have an understanding of how
14 this Declaration would be used in this proceeding?

15 A. It would be submitted to the -- the
16 PTAB, I guess.

17 Q. Okay. Yeah.

18 And this Declaration was submitted to
19 the PTAB in support of the Patent Owner's
20 Response; is that right?

21 A. I'm not a hundred percent sure on all
22 this, the legal processes, how that works. Yeah.

1 But that sounds right.

2 Q. Okay. But -- so did you ever review the
3 Patent Owner's Response?

4 A. Yes, I believe I did.

5 Q. Okay. And was that before or after you
6 prepared this Declaration?

7 A. I don't recall exactly. Maybe in
8 parallel. I don't -- I don't know.

9 Q. Okay. Is what you reviewed a -- the
10 final Patent Owner's Response as it was submitted
11 to the Board or was it a draft?

12 A. I -- I don't recall.

13 Q. Okay. Did you have a role in drafting
14 any part of the Patent Owner's Response?

15 A. Drafting, no.

16 Q. Did you have any role in how the Patent
17 Owner's Response was prepared?

18 A. They may have used some of my expertise
19 through some of the discussions that we had. You
20 know, talking about the technical aspects
21 involved. Put that into there, into the document.

22 Q. So you would have provided your

1 substantive technical expertise, but you're not
2 the one drafting any part of the Patent Owner's
3 Response; is that correct?

4 A. Yeah. That -- that sounds about right.

5 There's back-and-forth discussions about
6 the elements. That's -- that's what I'm there
7 for, consultation. And -- and some of that -- you
8 know, some of that, I guess, would go into that
9 document, I suppose.

10 Q. Do you know how much time you spent
11 working on this Supplemental Declaration?

12 A. No, I don't recall.

13 Q. And did you write the Supplemental
14 Declaration yourself?

15 A. I'd say pretty much the same answers as
16 with the Declaration. There was a collaborative
17 effort.

18 Q. If we could turn to page 1 of this
19 Supplemental Declaration.

20 So there is not a separate legal
21 standard section in the Supplemental Declaration;
22 is that correct?

1 A. Yeah. That sounds right.

2 Q. Okay. Instead, there's a
3 cross-reference to the same legal standards that
4 you described in your prior Declaration in
5 paragraph 8.

6 A. I see that.

7 Q. So are there any particular parts of
8 this Supplemental Declaration that you recall the
9 attorneys drafting on your behalf?

10 MS. ZHONG: Objection, form.

11 A. No.

12 Q. So you drafted everything in this
13 Declaration yourself?

14 A. Like -- like I said, it was a
15 collaborative process.

16 Q. What input did counsel have into the
17 collaborative drafting process, if you drafted
18 everything yourself?

19 MS. ZHONG: Objection.

20 A. I --

21 MS. ZHONG: Dr. Pattison, we caution
22 you -- I caution you not to reveal any

1 privileged conversation or discussion, but
2 you may answer the question to the extent
3 that you can -- to the extent that you can
4 answer it without revealing those privileged
5 conversations.

6 A. Yeah, I -- I don't think I said I
7 drafted everything myself.

8 I think it's a collaborative process
9 that we went through, having discussions and,
10 yeah, working together on this. Ultimately, these
11 are my opinions. I signed off on this.

12 So, yeah, I don't -- I don't recall the
13 exact sections. Some of it may have been cut and
14 paste from other -- from other -- previous
15 document. I don't recall. But it was a
16 collaborative process.

17 Q. Okay. So other than counsel, did anyone
18 else help draft your Declaration?

19 MS. ZHONG: Objection, form.

20 A. Yeah, I wouldn't -- we had discussions
21 with counsel and -- yeah. But no, no one else
22 helped, or no one else was part of the

1 collaborative discussions and process.

2 Q. Are you able to identify any parts of
3 this Declaration that were written solely by you
4 without assistance from counsel?

5 MS. ZHONG: Objection, form.

6 A. I don't recall.

7 Q. Did you review this Supplemental
8 Declaration carefully for any errors?

9 A. Yes.

10 Q. And other than minor typographical
11 errors, are you aware of any errors in your
12 Declaration, sitting here today?

13 A. I am not aware of any.

14 Q. If you could scroll up a page and look
15 at paragraph 4, please.

16 In this -- in this paragraph, you state
17 that you incorporate Exhibit 2002 herein.

18 Exhibit 2002 is your first Declaration;
19 is that right?

20 A. Yes.

21 Q. So when you submitted this Declaration,
22 you were adopting all of your statements and

1 opinions that you made in your first Declaration?

2 A. Yes.

3 Q. Without change or modification?

4 A. Yes.

5 It's attached to this one, to this
6 document. It's appended to the -- to the back of
7 it.

8 Q. So none of the opinions that you had in
9 your first Declaration have changed; is that
10 right?

11 A. Not -- no, not -- not that I -- not that
12 I -- I don't think so.

13 Q. Now, in paragraph 9 of this declaration
14 you mention the knowledge of a POSITA in the
15 relevant time frame.

16 Do you see that?

17 A. I see that.

18 Q. And "POSITA" is a -- is referring to a
19 person of ordinary skill in the art?

20 A. Yes.

21 Q. And what's the relevant time frame that
22 you're applying here?

1 A. Just at the time and -- of the patent,
2 around the time of the -- of the patent -- of the
3 prior art date of the patent. I'd have to look
4 that up exactly, but I think it's like 2008-ish.

5 Q. I think I can help you out.

6 If we can turn back to the first
7 exhibit, Exhibit 2002, which was the first
8 Declaration. And if we scroll up to paragraph 21,
9 please.

10 And here you state, "For purposes of
11 this inter partes review, I have assumed that the
12 priority date for the '425 patent is December 11,
13 2008."

14 Is that correct?

15 A. Correct.

16 Q. And that's what you meant by the
17 "relevant time frame" in your second Declaration;
18 correct?

19 A. Correct.

20 Q. You also say -- you also continue in
21 this paragraph that, "My analysis, however, does
22 not change if that date was December 9th, 2009."

1 Do you see that?

2 A. I do.

3 Q. Okay. Why did you provide an alternate
4 date?

5 A. I guess, it's some sort of legal issue,
6 as to the -- the specific priority date.

7 Q. But your opinion is that -- that the
8 level of ordinary skill in the art would not
9 change between December 11, 2008 and December 9th,
10 2009?

11 A. The analysis, the level of -- my
12 analysis doesn't change.

13 Q. Did you apply a different level of
14 ordinary skill for the December 9th, 2009 date?

15 MS. ZHONG: Objection, form.

16 A. That -- no. I -- I applied the -- the
17 level of skill that was offered by Professor
18 Holmes.

19 Q. And we can get to that.

20 If we can scroll down to paragraph 30.
21 States that, "For the purposes of this
22 Declaration, I have been instructed to apply

1 Samsung's proposed level of skill in the art."

2 Correct?

3 A. Correct.

4 Q. So for purposes of the first
5 Declaration, you were to apply Samsung's proposed
6 level of skill in the art and assuming the time of
7 the alleged invention as December 11, 2008; is
8 that right?

9 A. Yes.

10 Q. And for purposes of the second
11 Declaration, you're applying the same level of
12 skill and assuming the same time of the alleged
13 invention?

14 A. Yes.

15 Q. If we could scroll down further to
16 Section III.A, paragraph 71. Oh. Sorry. Not in
17 this.

18 If we could turn back to Exhibit 2018,
19 please.

20 A. What paragraph again?

21 Q. And if we turn to paragraph 71, which is
22 on page 36. Do you see a footnote at the bottom

1 of this page, footnote 4?

2 A. I do.

3 Q. And this footnote reads, "Petitioner
4 refers broadly to the entire eight-page of
5 analysis for claim 4 in the Diekmann ground.
6 This, too, is an improper incorporation by
7 reference and woefully non-specific, 37 C.F.R.,
8 Sections 42.6(a)(3), 42.104(b)(5), CTPG at 35-36."

9 Do you see that?

10 A. I do.

11 Q. What do you mean by "an improper
12 incorporation by reference"?

13 A. I'd have to look back at the -- I'm
14 not -- I, honestly, don't recall. I'd have to
15 look back at the -- at the C.F.R. numbers and
16 the -- the other reference document here.

17 Q. In your legal standard section that was
18 part of your first Declaration, there was no
19 discussion of whether an incorporation by
20 reference in a petition is proper or improper; is
21 that right?

22 A. That's right.

1 Q. Do you know what it means for something
2 to be an improper incorporation by reference?

3 A. I don't recall. I believe we had a
4 discussion with counsel, but I don't recall the
5 specifics.

6 Q. In this sentence, you also say, "This
7 too is an improper incorporation by reference."
8 Right?

9 A. Yes.

10 Q. So is there another instance in your
11 Declaration where you point out another instance
12 of an improper incorporation by reference?

13 A. I don't think so.

14 Q. So why did you say "This too"?

15 A. I don't -- I don't recall.

16 Q. So you don't allege an improper
17 incorporation by reference anywhere else in this
18 Declaration; is that right?

19 MS. ZHONG: Objection, form.

20 A. Well, I don't know.

21 If you read the footnote, it kind of
22 says -- well, it says that "petitioner refers

1 broadly to the eight-page" -- "eight-page analysis
2 for claim 4 in the Diekmann ground."

3 And so I don't -- I don't necessarily
4 recall that it's another improper incorporation,
5 but that the second sentence is just referring to
6 the first sentence.

7 Q. When you say "this too" is an improper
8 incorporation by reference in the second sentence
9 of footnote 4, that's a reference to the first
10 sentence of footnote 4?

11 That's your testimony?

12 MS. ZHONG: Objection, form.

13 A. I -- I -- I just don't recall. But
14 that -- that could be a way of reading that
15 sentence.

16 Q. At the end of this footnote 4, you cite,
17 37 C.F.R., 42.6(a)(3) and 42.104(b)(5).

18 Do you see that?

19 A. I do.

20 Q. And what is that?

21 A. Those are some legal standard
22 references.

1 Q. Okay. Do you know what they say?

2 A. I don't. I don't recall.

3 Q. There's also a citation to CTPG.

4 Do you see that?

5 A. I do.

6 Q. And what is CTPG?

7 A. I don't recall.

8 I think you -- you referenced it at the
9 beginning previously, but, yeah, I don't recall.

10 Q. Does that -- referring to the
11 Consolidated Trial Practice Guide?

12 A. Probably.

13 Q. You don't know for sure?

14 A. I don't. I don't recall.

15 Q. You don't recall or did you ever know?

16 A. I don't recall.

17 MS. ZHONG: Objection, form,
18 argumentative.

19 Q. It says, "CTPG at 35-36."

20 Do you see that?

21 A. Yes.

22 Q. What is "35-36" a reference to?

1 A. Like I said, I don't really recall the
2 document. I would assume it would be paragraphs
3 or pages.

4 Q. Do you know what's found on pages 35 to
5 36 of the Consolidated Trial Practice Guide?

6 A. I still don't recall.

7 Q. Have you ever reviewed the Consolidated
8 Trial Practice Guide?

9 A. We reviewed this in discussions with
10 counsel, reviewed sections.

11 Q. But if you're not sure what the
12 citations mean, why do you have them in your
13 Declaration?

14 MS. ZHONG: Objection, form.

15 A. I think -- yeah. This was a discussion
16 that we had with counsel, to make a point about
17 the appropriateness of an analysis from the
18 petitioner. I just -- just don't recall the
19 specifics of the -- of some of the portions of it.

20 Q. So citations came from counsel?

21 A. It came from discussions with counsel.

22 MR. LEE: If we could pull up tab 4,

1 which does not -- has not been previously
2 marked. We can mark it Exhibit 204 -- or
3 1041.

4 REMOTE TECHNICIAN: Okay. Stand by.
5 (Exhibit 1041 was marked for
6 identification and is attached to the
7 transcript.)

8 MS. ZHONG: Hold on a minute. Let me
9 have a chance to review it and lodge my
10 objections, if any.

11 Q. So Exhibit 1041 is entitled Patent
12 Owner's Response.

13 MR. LEE: Which, I assume, counsel is
14 very familiar with.

15 Q. Dr. Pattison, have you reviewed the
16 Patent Owner's Response?

17 MS. ZHONG: Hold on.
18 Objection, irrelevant.

19 Q. Dr. Pattison, have you reviewed the
20 Patent Owner's Response?

21 A. If it's a new exhibit here, I'm not --
22 and I'd have to look at my -- at the references in

1 my report to see if that was one of the -- one of
2 the things that was reviewed.

3 If it's listed in my report, then, yes.
4 I'd have to -- I'd have to double-check.

5 Q. If we could turn to page 48 of
6 Exhibit 1041.

7 A. I'm sorry. What page?

8 Q. 48.

9 And if we could go down to the bottom of
10 page 48, where there is a footnote 3.

11 Do you see footnote 3?

12 A. I see it.

13 Q. And footnote 3 reads, "Petitioner refers
14 broadly to the entire eight-page of analysis for
15 claim 4 in the Diekmann ground. This too is an
16 improper incorporation by reference and woefully
17 non-specific. 37 C.F.R., Sections 42.6(a)(3),
18 42.104 (b)(5), CTPG at 35-36."

19 Do you see that?

20 A. I do.

21 Q. That's verbatim, the same language as
22 footnote 4 that was found in your second

1 Declaration; isn't it?

2 A. It looks like it, yes.

3 Q. So that footnote of your Declaration was
4 just copied over from the Patent Owner Response?

5 MS. ZHONG: Objection, form.

6 A. I -- like I said, I don't recall.

7 Q. Do you recall how that footnote in your
8 Declaration was drafted?

9 A. Like I said earlier, there was
10 discussions and collaborations with me and counsel
11 on my report. And I don't recall exactly how that
12 footnote was drafted.

13 Q. Now, this footnote 3 in the Patent Owner
14 Response and corresponding footnote 4 in your
15 Declaration, both of them are part of a section
16 dealing with a reference called Lee; is that
17 correct?

18 A. I'm not familiar with this doc- -- this
19 document right offhand.

20 It looks like -- yeah, it looks like
21 this document is related to -- to Lee.

22 Q. Okay. Scroll up to page 47 of this

1 document, which is just one page up.

2 The footnote in the paragraph we were
3 just looking at is -- is under Section V, titled
4 Diekmann and Suzuki Have No Need for Lee's
5 Encapsulation (Claim 4).

6 Do you see that?

7 A. Yes.

8 Q. Now, if we look at the first -- the
9 second paragraph, which is the bottom paragraph on
10 page 47, it starts, "Petitioner points to..."

11 Do you see that?

12 A. I see it.

13 Q. It says, "Petitioner points to Lee's
14 statements," so on and so forth.

15 If we could turn back to Exhibit -- if
16 you could -- if you could read this paragraph to
17 yourself. And let me know when you have read it.

18 A. Yes.

19 Q. Have you finished reading the paragraph
20 at the bottom of page 47?

21 A. Uh-hmm. Yes.

22 Q. If we could turn back to Exhibit 2018,

1 your second Declaration, and go to paragraph 71.
2 It starts with, "Samsung cites Lee's
3 statements..."

4 A. Yes. Uh-hmm. Yes.

5 Q. Okay. So this paragraph in your
6 Declaration, paragraph 71 of your second
7 Declaration, is identical to the paragraph you
8 just read at the bottom of page 47 of the Patent
9 Owner Response, except the phrase "Petitioner
10 points to" was changed to "Samsung cites."

11 Correct?

12 A. That's what it looks like, yes.

13 Q. If we could go back to the Patent Owner
14 Response, Exhibit 1041, down to page 48.

15 In the first full paragraph on page 48,
16 with starts with, "Yet Diekmann and Suzuki already
17 encapsulate their OLED devices..."

18 Do you see that paragraph?

19 A. Yes.

20 Q. If you could read that paragraph to
21 yourself and let me know when you have finished.

22 A. Yes.

1 Q. Now, if we could go back to
2 Exhibit 2018, your second Declaration. Go down to
3 paragraph 72, which is at the top of page 37.
4 There's a paragraph that begins with, "Diekmann
5 and Suzuki already encapsulate their OLED
6 devices..."

7 Do you see that paragraph?

8 A. I do.

9 Q. If you could read this paragraph to
10 yourself and let me know when you're finished.

11 A. I see that.

12 Q. This paragraph of your second
13 Declaration is nearly identical to the
14 corresponding paragraph you just read from page 48
15 of the Patent Owner Response, except that the case
16 law citation was deleted in the version in your
17 Declaration; correct?

18 MS. ZHONG: Objection, form.

19 A. That -- okay. It's hard to memorize all
20 that, but --

21 Q. You can -- you can flip back to the
22 Patent Owner Response, if you'd like.

1 A. No. It looks -- they look pretty
2 similar.

3 Q. More than "pretty similar." They're
4 nearly identical, aren't they?

5 MS. ZHONG: Objection, form.

6 A. Yeah, nearly identical. Pretty similar.

7 Q. And the only substantive difference is
8 the case law citation was deleted from the version
9 in your Declaration; correct?

10 A. Okay.

11 Q. Is that a yes?

12 A. I -- yeah, if -- I can flip back. Let's
13 see.

14 Yeah. There's -- there's not a case law
15 citation in my Declaration.

16 Q. So the paragraph in your Declaration is
17 identical to the paragraph in the Patent Owner
18 Response, except for the case law citation that
19 has been deleted; correct?

20 A. Correct.

21 Q. If we could go back to the Patent Owner
22 Response, Exhibit 1041, now at page 49.

1 If you look at the second full paragraph
2 on page 49 of the Patent Owner Response, which
3 starts with "As for Lee's claim of improved
4 lifetime..."

5 Do you see this paragraph?

6 A. Yes.

7 Q. If you could read this paragraph to
8 yourself.

9 A. All right.

10 Q. And if we turn back to Exhibit 2018, the
11 second Declaration, down in paragraph 74, there's
12 a paragraph that starts with, "As for Lee's claim
13 of improved lifetime..."

14 Do you see that paragraph?

15 A. Yes.

16 Q. If you could read that paragraph to
17 yourself, and let me know when you have finished.

18 A. Yes. I've finished.

19 Q. This paragraph in your Declaration is
20 nearly identical to the paragraph you just read
21 from the Patent Owner Response, except it adds the
22 phrase "Lee's clear of that" in the middle of the

1 first sentence; correct?

2 A. Correct.

3 Q. And if we go back to the Patent Owner
4 Response at page 49, the paragraph after the
5 paragraph that you just read from this response
6 that starts with, "To illustrate, petitioner
7 points to Diekmann's 'intermediate polymer
8 layers' "...

9 Do you see that paragraph?

10 A. I see it.

11 Q. If you could read that paragraph to
12 yourself and let me know when you have finished.

13 A. Okay. I finished.

14 Q. Okay. Four lines down in this
15 paragraph, at the end of the fourth line, do you
16 see where it says "sandwiched"?

17 A. I do.

18 Q. It says, continuing on to the next line,
19 "Sandwiched between the Diekmann's two barrier
20 layers..."

21 Do you see that?

22 A. I do.

1 Q. That's a -- that's a typo; right?

2 The "the" before Diekmann's, should it
3 be there?

4 A. Yeah.

5 Q. If we turn back to your second
6 Declaration, Exhibit 2018. If we turn to
7 paragraph 76 which starts, "To illustrate, Samsung
8 points to Diekmann's 'intermediate polymer
9 layers'..."

10 Do you see that?

11 A. I do.

12 Q. And if you could read this paragraph to
13 yourself and let me know when you have finished.

14 A. Okay. I have, I've finished.

15 Q. And this paragraph in your Declaration
16 is identical to the paragraph you just read from
17 the Patent Owner Response, except instances of the
18 word "petitioner" was changed to "Samsung" and the
19 phrase "petitioner has provided no explanation"
20 was changed to "neither Samsung nor Dr. Holmes
21 provides any explanation."

22 Is that right?

1 A. That's what it looks like.

2 Q. And in paragraph 76 of your Declaration,
3 you go five lines down, you see a phrase,
4 "sandwiched between the Diekmann's two barrier
5 layers."

6 A. I see it.

7 Q. Do you see the same typo that adds "the"
8 before Diekmann's here?

9 A. I see -- yeah, same phrasing. Same kind
10 of -- it's not exactly a typo, but, yeah, it's a
11 grammatical kind of error, I guess.

12 Q. Okay. So the same grammatical error is
13 present in both versions; correct?

14 A. Yes.

15 Q. Dr. Pattison, we just looked at four
16 paragraphs and a footnote in your second
17 Declaration that were identical or nearly
18 identical to four paragraphs and a footnote in the
19 Patent Owner Response; right?

20 A. Yes.

21 Q. How do you explain that?

22 MS. ZHONG: Objection, form.

1 A. Collaborative. We -- we -- we
2 collaborated on -- on -- and discussed this
3 material. I gave them my technical expertise.

4 So this isn't surprising.

5 Q. It's not surprising to you that large
6 swaths of your Declaration are verbatim/identical
7 to large swaths of the Patent Owner's Response?

8 MS. ZHONG: Objection, form,
9 argumentative.

10 A. I mean, I don't know if they're large
11 swaths or not, but they are sections that we agree
12 upon and -- and it make sense that -- that, you
13 know, they took my inputs.

14 Q. Are you saying that you drafted these
15 sections and that petitioner's counsel -- patent
16 owner's counsel copied them into the Patent Owner
17 Response?

18 MS. ZHONG: Objection to form, misstate
19 the testimony.

20 A. I don't recall who drafted the sections
21 exactly. I -- but they're based on technical
22 discussions that we had.

1 Q. Dr. Pattison, do you recall looking at
2 footnote 4 of your second Declaration a few
3 moments ago?

4 A. I do.

5 Q. And that had references to what you said
6 were legal standards in the Code of Federal
7 Regulations and a reference to the CTPG; right?

8 A. Yes.

9 Q. And you did not know what those
10 citations were referring to; correct?

11 MS. ZHONG: Objection, form, misstates
12 the testimony.

13 A. I -- I don't recall.

14 Q. Did you ever know?

15 MS. ZHONG: Objection, asked and
16 answered and misstated testimony.

17 A. I...

18 Q. You can answer.

19 A. Yeah. I reviewed that with counsel.

20 Q. When you say "that," you reviewed the
21 footnote or the document that you cite?

22 A. Both.

1 Q. But sitting here today, you do not have
2 an understanding of what content is in those pages
3 of the C.F.R.s or the Consolidated Trial Practice
4 Guide that you are citing; correct?

5 MS. ZHONG: Objection, form.

6 Counsel, if you would like the witness
7 to discuss the contents of those, you may
8 want to provide the exact citations to him so
9 he can review it, rather than do a memory
10 test.

11 A. Yeah, I just -- I just don't recall.
12 It's in my report. We reviewed them.

13 Q. Dr. Pattison, what -- your first
14 Declaration -- and we can turn to it, Exhibit
15 2002. Your first Declaration is limited to
16 discussing the petitioner's ground challenge in
17 claims 2 and 17; correct?

18 A. Yeah. That's my recollection.

19 Q. Okay. You don't discuss any other
20 grounds or any other claims?

21 A. That's my recollection, yeah.

22 Q. And your second Declaration,

1 Exhibit 2018, is limited to discussing those same
2 grounds and, additionally, claim 4; correct?

3 A. Yes.

4 Q. Were you asked to limit your analysis to
5 just these grounds by counsel?

6 A. Yes.

7 Q. Did you review any other grounds in
8 preparation -- in preparing your two declarations
9 that you submitted in this proceeding?

10 A. Yeah. I -- I reviewed the whole
11 documents from -- from Samsung and -- and
12 Professor Holmes.

13 I didn't spend a lot of time on a deep
14 analysis of those other grounds and other claims.
15 I was instructed to -- to focus.

16 Q. Between these two declarations, you
17 discuss four primary references that formed the
18 basis of these grounds, Diekmann, Suzuki, Ma, and
19 Lee; is that right?

20 A. Yeah.

21 Q. Did you review each of these references
22 carefully?

1 A. Yes.

2 Q. And you reviewed carefully each of the
3 parts of the petition in Dr. Holmes' Declaration
4 that relate to the grounds asserting these
5 references as prior art; correct?

6 MS. ZHONG: Objection, form.

7 A. Yes.

8 Q. Now, those parts of the petition and
9 Dr. Holmes' Declaration also cite other documents;
10 right?

11 A. Yeah. I believe so.

12 Q. And --

13 A. Like I said, these are the primary
14 references.

15 Q. Right.

16 And whenever other documents were cited
17 in the discussions and the petition and
18 Dr. Holmes' Declaration, you would have carefully
19 reviewed each of those documents as part of your
20 analysis?

21 A. I would have reviewed them, yes.

22 Q. You also cite to some additional

1 publications in your declarations that are not
2 present in the petition or Dr. Holmes'
3 Declaration; is that right?

4 A. Yes.

5 Q. Now, were those publications provided to
6 you by counsel or did you look them up yourself?

7 A. I recall that is a mix.

8 Q. So you performed a search of the
9 literature to identify references that might be
10 relevant to your opinions?

11 A. I did.

12 Q. How did you go about performing that
13 search?

14 A. I mean, at a highest level, keywords on
15 Google.

16 Q. Other than Google, did you use any
17 particular search tools for scientific literature?

18 A. Google Scholar, and then some -- some
19 other references that I -- I have, textbooks and
20 stuff that I have myself.

21 Q. Are you familiar with Science Direct?

22 MS. ZHONG: Objection, form.

1 A. It sounds familiar, but -- but not
2 really, no.

3 Q. Are you familiar with the Whale of
4 Science?

5 A. I've heard that before, but I don't
6 think I've ever used it.

7 Q. Have you ever used Science Direct?

8 A. Not that -- not that I can recall.

9 Q. You mentioned you reviewed Dr. Holmes'
10 Declaration in this proceeding; is that right?

11 A. Yes.

12 Q. Did you know Dr. Holmes prior to your
13 involvement with this proceeding?

14 A. Yes.

15 Q. How did you know him?

16 A. Well, a lot of my career has been spent
17 working for the Department of Energy, managing R&D
18 and lighting technologies, including OLEDs and
19 LEDs. And one of my -- one of my jobs there was
20 to find the reviewers, expert reviewers and hire
21 them for reviewing proposals.

22 And so I had seen that Russ Holmes had

1 just -- just graduated from -- I think it was from
2 Princeton, and might have been available to be a
3 reviewer. So I connected with him then. That
4 would have been, I don't know, maybe 2008 or
5 something.

6 And then also, I believe he submitted a
7 proposal to the DoE lighting R&D program that was
8 accepted for funding, I think. If I recall right.

9 So I -- you know, we -- we kind of,
10 yeah, worked in the same circles, I guess, and --
11 yeah, I knew he was a -- you know, had an
12 education in this -- in this topic, in -- in OLED
13 materials and devices.

14 Q. Understood.

15 So you mentioned Dr. Holmes had an
16 education in OLED materials and devices.

17 Did -- when you say that you worked in
18 the same circles, did you -- were you involved in
19 OLED material or device research with Dr. Holmes?

20 A. Yes. To -- yes.

21 So I believe that he had a funded DoE
22 R&D project. And I don't recall the exact --

1 exact topic. Could have been that he just had a
2 proposal in.

3 But for -- for -- my job at DoE is, and
4 was, to oversee the scientific work on OLED
5 materials and devices and to make sure that it was
6 progressing well and achieving the goals of the
7 contracts.

8 And so, like I said, I'm pretty sure
9 Russ had a -- Professor Holmes had a project with
10 DoE that I was involved in reviewing the progress
11 and holding that contract, project reviews, and --
12 and reviewing updates submitted to DoE as -- as
13 the funding agency.

14 Q. Okay. So your role in this process
15 would have been to review the research and
16 development results being performed by Dr. Holmes.

17 But were you engaging in that research
18 or development work, that technical research and
19 development work, alongside Dr. Holmes?

20 A. No. I was not working alongside
21 Dr. Holmes.

22 There -- you know, that -- that --

1 hundreds of projects that I was -- over the years,
2 that I've managed on behalf of DoE, but not -- I
3 didn't go into the lab with Dr. Holmes, no.

4 Q. Now, you mentioned one of your jobs was
5 to find expert reviewers and hire them for
6 reviewing proposals. Should -- tell me what that
7 process looks like.

8 How do you find these expert reviewers?

9 A. Sure.

10 So the DoE program has internal experts
11 like -- like myself, and internal consultants like
12 myself that they -- they hire. But I think it is
13 a good practice to get external inputs for
14 reviews, to evaluate reviews.

15 And so when I started at DoE, you know,
16 we were transitioning from, you know, conventional
17 lighting technologies, to LED and OLED lighting
18 technologies for their energy savings prospects.
19 And so I needed to update the -- the reviewers for
20 proposals to folks who had background and
21 expertise in LED and OLED technologies.

22 And so I would kind of opportunistically

1 reach out to folks that I came across or found
2 through various searches or whatever, and see if
3 they might be interested in being a paid reviewer
4 for the DoE.

5 Q. So the kinds of external consultants
6 that you would seek out would be subject matter
7 experts that are knowledgeable about their field?

8 A. Yeah. Of course. That's -- that's what
9 we'd be looking for at DoE.

10 Q. Okay. And you just mentioned that when
11 you started your -- DoE was transitioning from
12 conventional lighting technologies to LED and
13 OLED. When -- when did that transition start?

14 A. DoE really started to take an interest
15 in solid state lighting around 2002, but it was
16 just getting going.

17 I started at DoE first as an employee in
18 2006. And there was still a lot of legacy, more
19 conventional lighting experts that were being used
20 to do proposal review.

21 2008, I -- I spun out and became a
22 consultant for the DoE. So it was all during that

1 time period. It was ongoing, as the technologies
2 evolve and change. And as you have kind of new --
3 more specific needs for expertise, you just keep
4 finding new -- new reviewers.

5 And the number of reviewers changes that
6 DoE expects and the availability of reviewers
7 changes. So, yeah, it's kind of an ongoing
8 process.

9 But when I started at DoE, it was 2006.
10 And that was an early activity of mine, was to --
11 was to recruit new reviewers.

12 Q. What was the first OLED-related project
13 that you managed at DoE?

14 A. I don't recall.

15 There had been hundreds of projects
16 OLED-related with Universal Display Corporation,
17 Michigan State, I believe Princeton, University of
18 North Texas, OLED Works, Pacific Northwest
19 National Lab. Just -- University of Southern
20 California. Private -- other private companies.
21 There had just really been hundreds of R&D
22 projects over the years. I don't recall the first

1 one -- the first OLED project that I -- that I
2 took charge of.

3 Q. Do you recall the approximate time when
4 you took on your first OLED project?

5 A. 2006.

6 Q. 2006.

7 MR. LEE: Okay. Why don't we take a
8 ten-minute break.

9 THE STENOGRAPHER: Yes, sir. We're off
10 the record.

11 (Recess in proceedings.)

12 THE STENOGRAPHER: We are back on the
13 record.

14 BY MR. LEE:

15 Q. Welcome back, Dr. Pattison.

16 A. Thanks.

17 Q. So in both the declarations that you've
18 submitted in this proceeding, you address
19 grounds 2 and 7 of the petition, involving claims
20 2 and 17 of the '425 patent; is that right?

21 A. Yes.

22 Q. And in your second Declaration you

1 officially address claim 4; correct?

2 A. Correct.

3 Q. But you -- and you have not provided any
4 opinions about any other claims of the '425
5 patent; is that right?

6 A. Correct.

7 Q. So I just want to take a look at these
8 claims.

9 MR. LEE: If we could have Exhibit --
10 tab 7, which has been premarked Exhibit 1001.

11 (Exhibit 1001 was marked for
12 identification and is attached to the
13 transcript.)

14 Q. This is the U.S. Patent No. 11,828,425.

15 MR. LEE: And if I could have that put
16 up on the screen. Great.

17 And if we could go to page 107 and look
18 at column 87.

19 Q. At the bottom of column 87, starting at
20 line 60, you see claim 1, which reads, "A device
21 comprising: an organic light-emitting diode
22 comprising: an organic layer sequence, a radiation

1 exit area, and an encapsulation," followed by
2 several other limitations?

3 Do you see that?

4 A. I do.

5 Q. And if you read further down, which
6 continues on column 88, claim 2, which is at
7 column 88, line 10, further limits claim 1 and
8 further limits the electron transport layer;
9 correct?

10 A. Correct.

11 Q. And the same is true for claim 17, which
12 is at column 89, line 8; is that right?

13 A. Yes.

14 Q. And column 4, going back to -- or
15 claim 4, going back to column 88, line 19, that
16 is -- that claim is further limiting just the
17 encapsulation which is claimed in claim 1;
18 correct?

19 A. Correct.

20 Q. So nothing in these claims requires the
21 claimed organic light-emitting diode to have a
22 particular level of efficiency; is that right?

1 MS. ZHONG: Objection, form.

2 A. A particular level of efficiency?

3 Q. Yeah.

4 A. Well, efficiency would be a motivating
5 factor for trying to improve -- improve LED. That
6 and lifetime.

7 I would say that -- let me check
8 claim 1. Yeah. So there's a -- the -- it does,
9 actually. 'Cause there's a -- there's a limit in
10 claim 1 that says it has an iridium-containing
11 compound. And within the context of OLEDs,
12 that's -- that's the only type of compound that
13 can get you close to 100 percent IQE.

14 So if you're -- if you're pursuing that
15 type of compound, you're -- you're automatically
16 pursuing high -- higher efficiency than a
17 fluorescent compound.

18 That's a phosphorous-emitting material.
19 So it -- there's not a quantitative number on the
20 efficiency, but if you're using that material, you
21 care about efficiency.

22 Q. Okay. But you do not need to meet any

1 particular level of efficiency to meet this claim;
2 correct?

3 MS. ZHONG: Objection, form.

4 A. Yeah, but you wouldn't -- if you didn't
5 care about efficiency, you'd just use fluorescent
6 materials.

7 Q. So the answer to my question was "yes"?

8 MS. ZHONG: Objection, form, misstated
9 his testimony.

10 A. There's not a quantitative limit on
11 efficiency in the claim 1.

12 There's an implied -- an implied desire
13 to have high efficiency, though, by -- you know,
14 by the limit- -- limitation of using an
15 iridium-containing compound.

16 Q. And that's -- the same is true for
17 claims 2, 4, and 17; correct?

18 A. Yeah.

19 To the extent they're using claim 1,
20 they, obviously, still care about efficiency, and
21 that would be a motivating factor to -- to improve
22 the OLED devices.

1 Q. But nothing in claims 1, 2, 4, or 17 has
2 a limit on efficiency; is that correct?

3 A. No quantitative limit.

4 But there's an implied desire for high
5 efficiency based on the -- the limitation of using
6 an iridium-containing material. It's a more
7 expensive material. You wouldn't -- you wouldn't
8 do that if you didn't care about efficiency.

9 Q. Nothing in claims 1, 2, 4, or 17
10 requires the claimed organic light-emitting diode
11 to have a particular level of reliability;
12 correct?

13 MS. ZHONG: Objection, form.

14 A. The only reason you pursue an
15 encapsulant is to have better reliability. So,
16 again, it's an implied consideration or more than
17 implied consideration.

18 And same with that -- even with the
19 iridium material, you -- yeah, there's no reason
20 to pursue an expensive device structure with
21 encapsulation if you didn't care about efficiency
22 and reliability.

1 Q. You did not need to make any showing of
2 what -- how reliable an organic light-emitting
3 diode device is to meet any claim; correct?

4 MS. ZHONG: Objection, form.

5 A. It's not an explicit claim limitation,
6 but it would speak to the motivation for even
7 pursuing this type of device.

8 Q. So back at the time of the patent, in
9 2008, what were the ranges of efficiencies of
10 iridium-containing OLED materials?

11 A. There's a reference from Holmes and
12 Samsung, the Novald device performance reference
13 shows -- it's, like -- I think it's -- I think
14 it's, like, from 2004, and it shows, for green
15 devices, maybe -- maybe 80 lumens per watt.

16 We could -- if we could pull that up,
17 that would be good. I think it's Exhibit 1019,
18 Gross.

19 Q. But nothing in claims 1, 2, 4, or 17 has
20 an explicit limitation on the level of efficiency
21 that the claim for organic light-emitting diode
22 must achieve; correct?

1 MS. ZHONG: Objection, form, asked and
2 answered.

3 A. Yeah. As answered before, there's not a
4 quantitative explicit limitation. But the only
5 reason you'd be pursuing an expensive device with
6 encapsulation was if you cared about efficiency
7 and lifetime.

8 Q. Likewise, there's nothing in claims 1,
9 2, 4, or 17 that is an explicit limitation on the
10 level of reliability that must be shown by the
11 claimed organic light-emitting diode; correct?

12 MS. ZHONG: Objection, form, asked and
13 answered.

14 A. It's like I said before, a person would
15 not be pursuing an iridium -- an expensive
16 iridium-containing OLED with encapsulation, that's
17 also expensive and complicated, unless they cared
18 about lifetime, efficiency, and reliability.

19 But, yeah, there are not explicit
20 limitations in those claims.

21 Q. There are no explicit limitations in
22 claims 1, 2, 4, or 17 that require the claimed

1 organic light-emitting diode to have a particular
2 lifetime; correct?

3 MS. ZHONG: Objection, form, asked and
4 answered.

5 A. Yeah. I would just say the only
6 reason -- correct.

7 And the only reason you would be making
8 this type of device with expensive iridium
9 materials and expensive encapsulation is if you
10 cared about efficiency and reliability and
11 lifetime.

12 Q. I'm just re- -- I'm just asking about
13 lifetime at the moment.

14 Do you think phosphorescent --
15 iridium-based phosphorescent OLED has better
16 lifetime than fluorescent?

17 A. It depends.

18 Q. There are no explicit limitations in
19 claims 1, 2, 4, or 17 that require the claimed
20 organic light-emitting diode to have -- to achieve
21 a particular amount of luminance; correct?

22 MS. ZHONG: Objection, form.

1 A. That is correct.

2 But, again, the only reason someone
3 would pursue this device structure is if they
4 cared about achieving good luminance, high levels
5 of luminance.

6 Q. There are no explicit limitations in
7 claim 1, 2, 4, or 17 that require a claimed
8 organic light-emitting diode to have a particular
9 level of quality; right?

10 MS. ZHONG: Objection, form.

11 A. I don't understand what you mean by
12 "quality."

13 Q. How do you measure how good an OLED
14 device is?

15 A. By its spectrum, its F -- luminance
16 efficacy or general efficiency, and by its
17 reliability, lifetime, and cost.

18 Q. Anything else?

19 A. Yeah. How -- how well it stands up in
20 shelf life, operating life; how well it stands up
21 to various environments; ease of manufacturing.
22 There's -- I'm sure there's more considerations.

1 Q. Okay. But those are the only ones that
2 you can think of at the moment?

3 A. Let's see. Total output. Total light
4 output. Yeah.

5 That's -- that's what I can think of
6 right now.

7 Q. Okay. And there are no limitations on
8 any claim of the '425 patent that explicitly
9 require any level of any of the factors that
10 you've just enumerated; correct?

11 MS. ZHONG: Objection, form.

12 A. There's no quantitative limits, but you
13 would not use this type of expensive and
14 complicated encapsulation unless you cared about
15 lightbulb. Right? And you would not use an
16 iridium-containing compound unless you cared about
17 efficiency and total light output.

18 Q. Nothing in this -- nothing in the claims
19 of the '425 patent require the claimed organic
20 light-emitting diode to emit a particular amount
21 of light either; correct?

22 MS. ZHONG: Objection, form.

1 A. I would say in the context of the
2 specification, you would -- certain applications
3 require meaningful light outputs.

4 And, again, you wouldn't -- even though
5 that's not an explicit limitation, you wouldn't
6 pursue a phosphorescent device to have a very low
7 light output. It just doesn't make sense. It's
8 not a tradeoff that any -- anybody would make,
9 to -- to make an expensive device -- a very
10 expensive device comparatively with low light
11 output.

12 Q. You can try, but you can -- you can make
13 a OLED device based on a phosphorescent emissive
14 layer that would have low light output, couldn't
15 you?

16 MS. ZHONG: Objection to form.

17 A. You absolutely could. The reason -- the
18 question would be why, why -- what would be the
19 motivating factor.

20 Q. Does the "why" of how a device -- does
21 the "why" of why you make a device matter for
22 determining whether the claim limitations are met?

1 MS. ZHONG: Objection, form,
2 argumentative.

3 A. I'm not sure legally.

4 I think it would be a motivating factor
5 for -- for why you would combine prior art.

6 But, yeah, I do think the "why" matters
7 practically. You know, you -- you -- there's all
8 sorts of things you could do. Do they make sense
9 and are they -- are they logical tradeoffs is --
10 is a question that -- that I would ask as a
11 technical expert.

12 Q. Okay. Well, as an explicit limitation
13 of the claims, nothing in claims 1, 2, 4, or 17
14 requires the claimed organic light-emitting diode
15 to emit a particular amount of light; correct?

16 MS. ZHONG: Objection to form, asked and
17 answered.

18 A. Again, I think it's implicit, that --

19 Q. Dr. Pattison, my question was limited to
20 what is explicit, so.

21 A. Yeah.

22 Q. Let me try again.

1 A. Yeah. No, no, I'll --

2 Q. Specific limitation of the claims,
3 nothing in claims 1, 2, 4, or 17 requires the
4 claimed organic light-emitting diode to emit a
5 particular amount of light; correct?

6 MS. ZHONG: Objection, form.

7 And, Counsel, please do not shout at the
8 witness. And control your temper, please.

9 A. Correct.

10 There could even be unmeasurable amounts
11 of light being emitted or undetectable by human
12 amounts of light being emitted. So what you're
13 saying is correct, but the -- you know, the
14 context here is that these are high performing.

15 MR. LEE: Counsel, just for the record,
16 I did not shout.

17 And, please, limit your objections to
18 proper nonspeaking objections.

19 MS. ZHONG: Well, I'm just pointing out
20 that you are shouting at the witness and you
21 raised your voice. So, please, control your
22 temper and be courteous to the witness.

1 Q. Dr. Pattison, claim 1 also requires a
2 limitation -- claim 1 has a limitation on the
3 spectral range in which the organic layer sequence
4 must generate electromagnetic radiation; is that
5 correct?

6 MS. ZHONG: Objection, form.

7 A. I see that. That's correct.

8 Q. Okay. And the spectral range is, quote,
9 "from infrared radiation to UV radiation."

10 Do you see that?

11 A. I do.

12 Q. Is white light in that claimed spectral
13 range?

14 A. Yes.

15 Q. Claim 1 also recites an organic
16 light-emitting diode comprising an organic layer
17 sequence. And, then, further down in the claim --

18 A. Can we --

19 Q. -- it cites --

20 A. Can we go back to that previous question
21 so I can provide a little clarification?

22 Q. Let me finish this -- my questions.

1 Claim 1 recites an organic
2 light-emitting diode comprising an organic layer
3 sequence; right?

4 MS. ZHONG: Objection, form.

5 And, for the record, counsel did not
6 allow the witness to go back and clarify his
7 answers.

8 A. Yes, I see that.

9 Q. And further down in the claim, it
10 recites: "The organic layer sequence comprises an
11 electronic transport layer that is n-doped."

12 Do you see that?

13 A. I do.

14 Q. Do you have an understanding of what the
15 word "comprising" means in the claim?

16 A. Including.

17 Q. Is it your understanding that the word
18 "comprising" is open-ended and allows for
19 additional unrecited elements?

20 A. I don't know if I'd say it's open-ended,
21 but I do think that there can be additional
22 elements.

1 Q. Now, claim 2 depends from claim 1 and
2 recites, "Wherein the electron transport layer
3 comprises 8-hydroxy-quinolinolato-lithium."

4 Correct?

5 A. I can see that.

6 Q. And claim 17, which also depends from
7 claim 1, similarly recites, "Wherein the electron
8 transport layer comprises at least
9 8-hydroxy-quinolinolato-lithium."

10 Correct?

11 A. So just the fact that they made that
12 distinction there kind of makes me think that
13 "comprises" in claim 2 might be "only" and
14 claim 17 might be, you know, more open-ended to
15 other materials as well.

16 Q. Now, 8-hydroxy-quinolinolato-lithium is
17 also known as lithium quinolate; right?

18 A. Right.

19 Q. And that's often just called Liq; right?

20 A. Yes.

21 Q. So if we refer to it as "Liq" for
22 today's purposes, you'll understand what I mean?

1 A. Yes.

2 Q. Now, Liq --

3 A. Go back to that other clarification that
4 I wanted to make.

5 Q. Let me -- let me finish this line of
6 questions --

7 MS. ZHONG: Counsel, let the witness
8 finish his clarification before you move on.

9 MR. LEE: I'm -- I'm in the -- I'm in
10 the middle of a line of questions, so let me
11 just finish that, and we can revisit.

12 Q. So Liq, is it a molecule?

13 A. Yes.

14 Q. Would you say it's an alkaline metal
15 complex?

16 A. Lithium is an alkaline metal, so, yeah,
17 that sounds right.

18 Q. Yeah.

19 And specifically, it's a organometallic
20 complex that contains lithium which, as you said,
21 is an alkaline metal?

22 A. Yeah, I believe so.

1 Q. In one -- Exhibit 2002, your -- this is
2 your initial Declaration, if we could turn to that
3 and go to paragraph 82.

4 Do you see this paragraph?

5 A. I do.

6 Q. Now, in the middle of this paragraph,
7 you state that "... there is no explanation why
8 the small Li⁺ cation in Liq would not dissociate
9 from the hydroquinolate anion and diffuse through
10 the organic layers."

11 Correct?

12 A. In 84?

13 Q. 82.

14 A. I'm sorry.

15 Q. If we look at paragraph 82 of your first
16 Declaration, in the middle of that paragraph, you
17 say, "... there is no explanation why the small
18 Li⁺ cation in Liq would not dissociate from the
19 hydroquinolate anion."

20 Do you see that?

21 A. I see that.

22 Q. In your opinion, would the lithium

1 dissociate when Liq is used in place of Diekmann's
2 n-dopants?

3 A. In place of n-dopants? There's no --
4 there's no data on -- on that. There's no -- no
5 reference to that.

6 What -- what Diekmann's talking about
7 are electron-donating dopants. And there's no
8 reference in the prior art for Liq acting as an
9 electron-donating dopant. So I don't know.
10 There's just no -- there's no explanation.

11 Q. So what I'm asking is if you -- you
12 know, if you were to modify Diekmann to replace
13 Diekmann n-dopants with Liq, is it your
14 understanding that the lithium and Liq would
15 dissociate?

16 A. But -- but Liq is not an
17 electron-donating dopant, as described in
18 Diekmann. So I don't -- I just don't think you
19 can make that change like that.

20 Q. Is it possible to make that change?

21 A. I mean, it's not explained in the prior
22 art. There are some subsequent references that

1 show that it could be possible, but that's -- you
2 know, that's not what Diekmann suggests or
3 teaches, and it's not what Ma teaches.

4 So it's -- it's apples and oranges,
5 really, what you're -- you're trying to say here.

6 Q. So you don't have an opinion on whether
7 Liq would dissociate if it is incorporated into
8 the electron trans- -- into the electron transport
9 layer in Diekmann's OLED stack?

10 MS. ZHONG: Objection, form.

11 A. Well, that -- you're saying something
12 different now. You're saying -- you just changed
13 what you asked.

14 So you said an n-dopant, now you're
15 saying it's just an electron transport layer
16 material. So, to me, can you -- can you just
17 stick with the same question, please.

18 Q. So you've reviewed the petition grounds
19 addressing claims 2 and 17 of the '425 patent;
20 right?

21 A. Yes.

22 Q. And the proposal is that in Diekmann's

1 OLED structure, instead of having Diekmann's
2 n-dopant, you use Liq. Now, do you understand
3 that -- that?

4 A. I understand that.

5 But you said -- I think you were saying
6 before that you were using the Liq as an n-dopant,
7 and it's not an n-dopant.

8 Q. Okay. We won't dispute --

9 A. Now --

10 Q. -- whether Liq is an n-dopant for now.

11 But you understand -- you understand the
12 structure that -- that I'm asking about; right?

13 In OLED -- in Diekmann's OLED structure,
14 instead of using its n-dopant you use Liq?

15 A. Yeah. Okay. So --

16 Q. So in that -- in that structure, right,
17 would -- that Liq, you know, would the lithium
18 dissociate?

19 A. It depends. It could.

20 In that structure also, the
21 phosphorescent material would be much more
22 sensitive to any -- any -- any dissociation or any

1 products that -- that come -- that would tend to
2 quench the phosphorescent emission. It's a
3 phosphorescent emission. Yeah. The
4 phosphorescent emission is much more sensitive to
5 quenching than fluorescent emission.

6 So any -- any level of dissociation or
7 diffusion of any of these materials would be a
8 problem.

9 Q. I'm not asking about the effects of
10 dissociation.

11 I'm just asking, you know, would you --

12 A. Well, you said this structure --
13 Diekmann structure as a phosphorescent material,
14 so.

15 Q. All right. That's not my question.

16 So my question was, you know --

17 A. It was in your question. You said
18 Diekmann's structure.

19 Q. My question was: Would the Liq
20 dissociate when used in Diekmann's structure?

21 Right?

22 A. Yes.

1 Q. And I'm not interested -- I'm not asking
2 about the -- you know, the resulting effects,
3 other than whether Liq does dissociate or not.

4 And your answer was that "it depends."

5 A. Yes.

6 Q. So I just want to know what it depends
7 on.

8 A. How it's deposited, any subsequent
9 temperature processing or fabrication processes,
10 any material's compatibility with the other
11 layers.

12 Q. How what is deposited?

13 A. How the material is deposited.

14 Q. Which material? The Liq?

15 A. That's what -- yeah, that's what we're
16 talking about.

17 Q. So you do not have an opinion on
18 whether -- in the structure of Diekmann's
19 structure with the n-dopants replaced by Liq,
20 whether that Liq -- whether the lithium would
21 dissociate?

22 MS. ZHONG: Objection, form, misstates

1 past testimony.

2 A. You're going back -- you just said that
3 the n-dopants are replaced by Liq, which is,
4 again -- I think that phrasing is wrong.

5 And I just told you that, really, what I
6 say here in this paragraph is that there's not an
7 explanation provided by Samsung or Professor
8 Holmes, so.

9 And I told you reasons why you might be
10 concerned about dissociation, that it's -- you
11 know, you're talking about a device structure
12 that's much more sensitive to quenching, and --
13 and you have these processing steps.

14 So, really, let me just go back to the
15 paragraph here, it's not an explanation.

16 Q. I'm not interested -- I'm not asking
17 about the -- the explanation that was inefficient
18 or not in Dr. Holmes' testimony. I'm just asking
19 for your opinion as an expert.

20 You, at this point, do not have enough
21 information to know whether Liq would dissociate
22 if it were used in place of the n-dopants in

1 Diekmann's stack?

2 MS. ZHONG: Objection, form.

3 A. It's -- I'm telling you, it's not --
4 it's not a replacer for n-dopant. It's not a
5 dopant. And given the understanding at the time,
6 there's not enough information.

7 But what I would be concerned about,
8 based on my expertise, would be higher temperature
9 processing, materials compatibility, and -- and
10 the deposition process. And none of that
11 information is provided in -- in your -- in your
12 question.

13 Q. So let's turn to claim 2.

14 And claim 2 requires the electron
15 transport layer to be n-doped, and also requires
16 the electron transport layer to comprise Liq;
17 right?

18 A. Yes.

19 Can we -- I'll -- is that 101?

20 Q. Yeah.

21 A. I see that.

22 Q. So claim 2 does not require, though,

1 that the electron transport layer is n-doped by
2 Liq; correct?

3 A. No. But that's just what you -- you
4 were asking.

5 Q. Right. Right. I understand.

6 So claim 2 doesn't require that the
7 electron transport layer is n-doped by Liq; right?

8 A. Correct.

9 Q. And same for claim 17, claim 17 does not
10 require that the electron transport layer is
11 n-doped by Liq?

12 MS. ZHONG: Objection, form.

13 A. It just says that the electron transport
14 layer comprises at least Liq.

15 Q. So claim 17 doesn't require Liq to be
16 the n-dopant?

17 A. That -- yeah. It's just what I said,
18 it's not required. It's just that -- that the Liq
19 is, I guess, in the layer.

20 Q. So what exactly does it mean for an
21 electron transport layer to be n-doped?

22 A. I think it means that you have a

1 material in there that provides an excess of
2 electrons, that donates -- that's an electron
3 donor material.

4 Q. And how would a person of skill
5 determine whether a given electron transport layer
6 is n-doped or not?

7 A. Various tests. I -- I -- but you --
8 ultimately, by the device performance. You
9 need -- you need electrons to be available to
10 recombine with holes to -- to emit -- efficiently
11 emit light.

12 Q. Nothing in claims 2 or 17 requires a
13 particular concentration of n-dopants in the
14 electron transport layer; correct?

15 MS. ZHONG: Objection, form.

16 A. Yeah. Using the word "dopants" has --
17 has, I guess, a connotation within semiconductors,
18 that it's kind of a minority material. So it -- I
19 guess, by the plain and ordinary meaning of
20 "dopant" within semiconductor understanding, it
21 would be -- you know, it would be kind of a
22 relatively small amount. But -- but, no, that's

1 not -- the explicit level's not in those claims.

2 Q. And nothing in claims 2 or 17 requires a
3 particular distribution of n-dopants within the
4 electron transport layer?

5 MS. ZHONG: Objection, form.

6 A. Can you -- can you clarify what you mean
7 by "distribution"?

8 Q. So the electron transport layer has a
9 certain thickness; right?

10 A. Yes.

11 Q. And so when you have an n-doped electron
12 transport layer, you know, the dist- -- the
13 distribution of where the n-dopants exist as part
14 of the electron transport layer, it could vary.

15 And so my question is: You know, in
16 terms of the distribution of the n-dopants, the
17 dopants themselves that are part of the electron
18 transport layer, nothing in claims 2 or 17
19 requires a particular distribution of the
20 n-dopants throughout the electron transport;
21 right?

22 MS. ZHONG: Objection, form.

1 A. A single layer?

2 Q. Yeah. Just an electron transport layer.

3 A. That's an interesting question.

4 What you're talking about is, like,
5 radiant doping, I suppose.

6 I'm not sure why you'd want to do that
7 or how it could be achieved on this thin of
8 deposition of -- of layers. But there is nothing
9 in -- in the -- in the claim limitations about
10 that.

11 Q. But could an electron transport layer be
12 n-doped even if the n-dopants exist only, say, in
13 the part of the electron transport layer that's
14 closest to the cathode and not elsewhere in the
15 ETL?

16 MS. ZHONG: Objection, form.

17 A. Well, first of all, in my mind, doping,
18 to me, would mean an intentional process. Right?
19 Not -- not just diffusion of dopants from other
20 layers, you know, as you -- as you put down a
21 material, in this context.

22 I don't know how that would -- would be

1 achieved. Like I said, practically speaking, in a
2 single layer -- and I don't know what the benefit
3 would be, but, sure, you could gradient dope --
4 dope the electron donors.

5 Q. So I don't think I quite got an answer
6 to the last question.

7 Would -- would the electron transport
8 layer be considered n-doped even if the dopants
9 only exist in one part of the transport layer?

10 MS. ZHONG: Objection, form.

11 A. That's a -- that's an interesting
12 question. Fundamentally, from a semi-physics
13 perspective.

14 Normally, when you -- when you -- yeah,
15 when you evaluate doping, it's on a layer, not in
16 a gradient way. I guess, it would be -- it would
17 be probably more characterized by the -- the
18 average doping level. I think that would be more
19 physically meaningful than -- than the radiant
20 level because what you are doing is putting in
21 electrons that do move.

22 So I'm not -- I'm not sure why -- why

1 you would want that unless you're looking for some
2 sort of surface injection benefit or something
3 like that.

4 Q. But you could have such a structure?

5 A. If --

6 MS. ZHONG: Objection, form.

7 A. If you -- yeah. I'm not aware of it,
8 of -- of that. And if you could make it, and if
9 there's motivation, sure.

10 Q. So, I mean -- so the electron transport
11 layer itself can be multilayered; right?

12 A. Well...

13 MS. ZHONG: Objection, form.

14 A. I don't -- no, I don't think so.

15 I think it would be -- you would maybe
16 call it electron transport layers, if you're doing
17 distinct deposition processes, or you might break
18 it up into the functionality of the layers and
19 call it an injection layer and a transport layer
20 and a blocking layer or something like that. And
21 maybe there's two electron transport layers that
22 are deposited distinctively, explicitly.

1 So, yeah, I wouldn't -- I wouldn't
2 characterize it like that.

3 If you're done, we can go back to my
4 clarification.

5 Q. Yeah. Just give me a second to find
6 something here, but we will get to that.

7 Okay. So the claim language in claims 2
8 and 17, which we've been looking at, requires the
9 electron transport layer to be n-doped; right?

10 Does the n-dopant have to exist within
11 the electron transport layer for the electron
12 transport layer to be considered n-doped?

13 MS. ZHONG: Objection, form.

14 A. Does it -- hold on. Can you repeat
15 this -- that?

16 Q. Yeah.

17 So does the n-dopant have to be inside
18 the electron transport layer in order for the
19 electron transport layer to be considered n-doped?

20 A. I think by -- it would be -- that's
21 another interesting question.

22 So, I guess, there could be, like, a

1 diffusion doping in there that comes from other
2 layers that's intentional, or it could be, you
3 know, related to: Is the n-dopant explicitly
4 being deposited as part of the -- so -- so as part
5 of the layer.

6 So -- so in semiconductor processing,
7 you can deposit a layer and then subsequently
8 n-dope it through exposure to a dopant material.
9 So, I guess...

10 You know, it's kind of a definitional
11 question.

12 And you could -- you could process a
13 layer that's -- like, let's say, an electron
14 transport layer that is subsequently n-doped
15 somehow. I guess, that's possible.

16 Q. Now if we go back to the spectral range.
17 I believe the question was whether white lights
18 would be in the claimed spectral range of claim 1.

19 A. Yeah. So -- and the answer was yes, and
20 it's -- it's still yes.

21 But, you know, just keeping in mind that
22 to generate white, you have to generate multiple

1 distinct colors. Right? You don't really
2 generate light from a single-emission process. So
3 you'd need multiple materials emitting. And
4 emitting in a balanced way to -- to be able to
5 combine to make white light.

6 Q. If we could turn to Exhibit 2002, your
7 first Declaration. And starting after page 60 is
8 an Exhibit A, which is attached to your
9 Declaration.

10 A. Okay.

11 Q. Exhibit A, is that a copy of your CV?

12 A. Yes.

13 Q. And was it an accurate copy of your CV
14 at the time that you signed your first
15 Declaration?

16 A. Yes.

17 Q. And the CV lists your education and
18 professional experience; correct?

19 A. Correct.

20 Q. Are there any errors in your CV that you
21 would like to correct?

22 A. Not -- not that I know of.

1 Q. And since you've submitted the CV -- are
2 there any additions to your CV since you've
3 submitted it in connection with the first
4 Declaration?

5 A. Not in connection to the first
6 Declaration. Not, I don't think, meaningfully
7 changed it for this matter. I do have some -- an
8 additional publication. I think I've given a
9 couple talks. So those would be changes since
10 submitting it for this matter.

11 Q. All right. So nothing significant has
12 happened since you submitted your Declaration that
13 you would like to add?

14 A. I have updated my -- my ongoing CV. I
15 would say my talk and my paper are significant,
16 but not relatable to this -- this topic right now.

17 Q. Okay. So you're currently the Founder
18 and President at Solid State Lighting Services,
19 Inc; is that right?

20 A. Correct.

21 Q. And you've been in that same position
22 since late 2007?

1 A. That's correct.

2 Q. How many employees work at Solid State
3 Lighting Service?

4 A. Including me, four.

5 Q. And how many employees did it have in
6 late 2007?

7 A. One.

8 Q. Just you?

9 A. Yes.

10 Q. What was the work of Solid State
11 Lighting Services in late 2007?

12 A. It's really almost nothing until early
13 2008, when I was brought on by the U.S. Department
14 of Energy as a technical advisor for solid state
15 lighting, including LED and OLED technologies.

16 Q. And would that engagement with DoE have
17 been something similar to what you were doing with
18 the Department of Energy when you were there
19 previously or something different?

20 A. It was -- it was similar.

21 Without -- it was more on the technical
22 expertise side and less on the, you know, explicit

1 departmental authority side, no longer being an
2 employee.

3 And really, as an employee of the DoE,
4 while I was working on managing LED and OLED
5 lighting-related topics, that -- the role I was in
6 was really as a professional project manager. So
7 there is a chance I could be managing clean, cool
8 technology or carbon sequestration more as a -- as
9 a project manager.

10 So given my -- my expertise and
11 background as an expert in optoelectronic
12 materials, I didn't want to get caught up and be
13 in a -- some -- managing other types of projects,
14 so I decided to leave federal service and -- and
15 start consulting.

16 Q. So this consulting work with DoE that
17 occurred some -- starting some time in early 2008,
18 you would say that the nature of the work was more
19 technical consulting?

20 A. Yes.

21 Q. Okay. About the technical consulting
22 work, was it still just you still at that time?

1 A. Yes.

2 Q. And in 2008, what types of technologies
3 did you perform the technical consulting work in?

4 A. LEDs, OLED, lighting, general
5 illumination. That was product development,
6 general optoelectronic materials and devices,
7 power supplies for lighting, light extraction.
8 Yeah. Deposition manufacturing of LEDs and OLEDs.
9 All that.

10 Q. All of that was just in 2008?

11 A. Yeah.

12 Q. What would you say was the primary
13 technical field?

14 A. LED and OLED device performance and
15 manufacturing.

16 Q. And what were the applications for those
17 LEDs and OLEDs?

18 A. Mostly general illumination, but a lot
19 of the OLED work -- well, LED and OLED work
20 crossed over into display technology.

21 Q. Did your technical consulting work
22 entail designing or manufacturing devices?

1 MS. ZHONG: Objection, form.

2 A. It has.

3 But, really, I was mostly providing
4 technical oversight to projects at universities,
5 national labs, and industries; reviewing their
6 results, evaluating their processes, evaluating
7 their project management, evaluating their
8 technology and, you know, taking into account my
9 perspective, my broad perspective of seeing
10 research globally and -- and nationwide, having
11 access to that, as in reviewing it as my full-time
12 job.

13 Just -- just monitoring -- monitoring
14 the research and being a resource to DoE to make
15 sure they're getting the best value for their R&D
16 funding.

17 Q. Has the nature of the technical -- has
18 the nature of the work done by Solid State
19 Lighting Services changed since 2008?

20 A. It's -- I would say it's continuously
21 evolving.

22 Q. Has the types of technologies that you

1 work on changed over time?

2 A. I'd say that all are related to the same
3 foundational understanding of optoelectronic
4 materials and devices, but, yeah, the blend of
5 projects has changed, the blend of clients has
6 changed. Funding levels go up and down, even
7 within the government. Interest levels in certain
8 aspects and applications of optoelectronic
9 materials changes over time.

10 So it's been, you know, almost -- almost
11 20 years working in this field and six years
12 before that, you know, as a -- as a researcher at
13 UCSB as a grad student.

14 Yeah, the -- the -- there are -- I
15 guess, I would say there's trends that happen.
16 But my work has, you know, pretty much entirely
17 been related to -- to solid state lighting and,
18 within that, LEDs and OLEDs.

19 Q. So in the early days of around 2008,
20 among the OLED projects that you have worked on at
21 that time, have you -- did you work on any
22 projects that involve designing or selecting any

1 of the different layers within the OLED device
2 stack?

3 MS. ZHONG: Objection, form.

4 A. I would -- I would extend that to 2006
5 and even into my grad school research experience.

6 In 2006, I was involved in reviewing,
7 selecting, evaluating progress on numerous OLED
8 projects that all had distinctive stacks and
9 materials that they were exploring and trying to
10 develop for lighting applications and -- and for
11 display applications.

12 So, yeah, I would say I've had a lot of
13 exposure to OLED designs, device designs, and
14 stacks and, you know, different, you know,
15 exposure into numerous research institutions,
16 including Universal Display Corporation.

17 You know, I forget the exact timing, but
18 maybe Princeton, Pacific Northwest National Lab,
19 University of Southern California, University of
20 Michigan that, really, the top folks working on --
21 on OLED device performance and materials in the
22 U.S.

1 Q. Did you -- in any of these engagements,
2 did you ever personally design or select any of
3 the layers that would go into the OLED organic
4 stack?

5 A. No. That was -- that wasn't my role.

6 My role was to review and evaluate the
7 performance and the R&D that was being performed
8 on these stacks.

9 So I could compare a stack, say, at
10 Princeton or Universal Display Corporation to a
11 stack that was being developed at University of
12 Michigan and, you know, provide my expertise as to
13 whether I thought that was a good -- well -- and
14 I -- I didn't mention, reviewing hundreds and
15 hundreds of proposals for proposed stacks and
16 proposed device structures on behalf of the DoE.

17 So I would -- I was -- you know, like,
18 they train us a little bit when you get your
19 Ph.D., is you're -- you're meant to be an R&D
20 manager, not -- not necessarily do all the work
21 yourself. And that's specifically the exposure I
22 got at DoE, was to manage R&D, to evaluate R&D, to

1 provide guidance to the principal investigators at
2 these places.

3 But I wasn't the one in the lab making
4 the devices or I wasn't in a position to tell
5 researchers like Steve Forest or Mark Thompson or,
6 you know, Ching Tang, the inventor of the OLED,
7 what they should be doing. I just was reviewing
8 their results within the -- within the mission of
9 the DoE, whether it was moving forward the DoE
10 mission and whether it was -- whether it was a
11 good investment for the DoE.

12 Q. Got it.

13 And when you're talking about DoE here,
14 you're encompassing both the time when you were at
15 DoE and the time when you were at your Solid State
16 Lighting Services consulting company but working
17 on behalf DoE?

18 A. That's right.

19 So I had similar exposure levels to
20 these projects, and ultimately did provide some
21 kind of commonality of subject matter expertise to
22 these projects. So it definitely crossed over.

1 Q. The DoE work that you did in 2008 while
2 you were at Solid State Lighting Services was the
3 first thing you did.

4 What -- what was the first project not
5 related to DoE that you worked on as a consultant
6 at Solid State Lighting Services?

7 A. Well, that's a good question.

8 I think in 2008 I was starting to get
9 clients, other clients and inquiries. I don't
10 recall exactly. But there were investors who
11 wanted me to perform a similar role as what I was
12 doing at DoE, to evaluate optoelectronic
13 technologies, exitcel technologies, LEDs and OLEDs
14 for -- for investment. I think that started in
15 2008. But I'm not a hundred percent sure exactly
16 when it started.

17 And, then, there -- I don't know if this
18 is 2008, but there were some product development
19 projects around that time that started to
20 percolate. There was a -- yeah, timing gets a
21 little mixed up because we're talking almost
22 20 years ago.

1 There's a project out at a materials
2 chemical supply company where I was kind of an
3 interim CTO, so.

4 So, yeah, I just -- I don't recall the
5 exact timing of -- of all this stuff. But -- but,
6 yeah, the client makes, like I said -- and the
7 work has evolved over time, but the DoE has been
8 consistent since -- well, since 2006. And then,
9 changing my specific role since 2008, I've been
10 technical adviser and then senior technical
11 adviser to DoE. So that work thread has been
12 maintained.

13 Q. During your time when you were inside
14 the DoE and working on DoE projects at Solid State
15 Lighting Services, you weren't the one in the lab
16 doing the research correctly?

17 MS. ZHONG: Objection, form.

18 A. No. I was project managing. Just like
19 I said, reviewing projects, you know, safeguarding
20 or optimizing Department of Energy funding to R&D
21 projects within the U.S. that were dedicated to
22 improving efficiency and performance of LED and

1 OLED lighting technologies with overlap into
2 display technologies.

3 And so I would -- I would oversee or --
4 or engage with -- with research teams at places
5 like Universal Display Corporation, University of
6 Southern California. I think you -- we had one at
7 UCLA, Princeton. I'm sure I'm forgetting some.
8 OLED Works. Pacific Northwest National Lab, Oak
9 Ridge National Lab, Argonne National Lab. So I
10 would -- I would go in and evaluate their work
11 review their findings, review their progress in
12 light of the DoE mission to save energy.

13 Q. Before you worked at the Department of
14 Energy, you were at Cymer Laser?

15 A. That's correct.

16 Q. And did you do any work relating to OLED
17 devices while you were at Cymer?

18 A. I would say I was -- I was working on
19 excimer lasers as a light source for
20 photolithography. And photolithography is a
21 general semiconductor manufacturing process that
22 could be applied to OLED manufacturing.

1 So it was a semiconductor
2 manufacturing-related job.

3 Q. Okay. So nothing directly relating to
4 the characteristics of the OLED device stack, for
5 example?

6 A. It can influence the device stack
7 choices, knowing the limitations of that
8 manufacturing process and choosing which
9 manufacturing process you want to use.

10 But it was -- yeah, I would agree that
11 it's indirect.

12 Q. Did you do any work directly with any
13 types of organic light-emitting materials while
14 you were at Cymer?

15 A. No.

16 MR. LEE: Why don't we take a quick
17 break.

18 THE STENOGRAPHER: Yes, sir. We're off
19 the record.

20 (Recess in proceedings.)

21 THE STENOGRAPHER: We are back on the
22 record.

1 BY MR. LEE:

2 Q. Just before the break we were talking a
3 little bit about your background, and you
4 mentioned that you had worked at the Department of
5 Energy and Cymer Laser.

6 Now, between working at Cymer Laser and
7 working at the Department of Energy you went to
8 grad school; right?

9 A. That's correct.

10 Q. And while you were there, you worked as
11 a graduate student researcher?

12 A. Yes.

13 I took classes in material science and,
14 more specifically, optoelectronic material
15 science, and worked as a graduate student
16 researcher.

17 Q. Did you design or manufacture any OLED
18 devices?

19 A. I participated in some OLED research,
20 but my main goal was on LED device design and
21 fabrication.

22 Q. What kind of OLED research did you

1 participate in?

2 A. Organic electronic materials properties.

3 Q. Was that related at all to the layers of
4 the OLED -- OLED device stack?

5 A. Yeah, I think so.

6 Q. In what way?

7 A. It's a -- well, the layers of an OLED
8 device stack are organic conductive materials.
9 And this research was on an organic conductive
10 material.

11 Q. What were the applications of this
12 organic conductive material?

13 A. Organic electronics, generally.

14 Q. So these materials could apply as
15 organic -- apply to any kind of organic
16 electronics?

17 MS. ZHONG: Objection, form.

18 A. Potentially.

19 Q. What was the application and the
20 research that you were working on?

21 A. It was just a side project. The
22 application was any organic electronic

1 application. So it was a general materials
2 development.

3 Q. Okay. It was a side project owned by
4 you?

5 A. Participated by me.

6 Q. Were there others?

7 A. Yeah. I was not the lead. I was just a
8 minor participant.

9 Q. Who were the major participants?

10 A. Other graduate students.

11 Q. Do you know any of them off the top of
12 your head?

13 A. Yes.

14 Q. Who were they?

15 A. Well, one of them was my future wife.
16 That would be the main one.

17 Q. Were any of the others involved in OLED
18 research, generally?

19 A. They -- they all were.

20 Q. Got it.

21 Do you remember what material exactly
22 you were working with?

1 A. No.

2 Q. And what exactly was -- what exactly
3 was -- did you do with these materials?

4 A. Like I said, I had a minor role. Just
5 kind of helping out with some materials processing
6 and -- and discussing the results, the testing
7 results that came in.

8 Q. Did you get published based on your role
9 in this work?

10 A. No.

11 Q. Did this work get published anywhere?

12 A. I'm not sure the part that I was working
13 on got published.

14 In grad school, you work on a lot of
15 stuff that -- that doesn't get published.

16 Q. You said that your wife was a graduate
17 student at the time when you worked on this
18 project with her.

19 A. Wasn't my wife at the time, but she was
20 a graduate student at the time.

21 Q. Okay. And what was her -- what was her
22 background?

1 A. Organic electronic materials.

2 Q. And how many years out of undergraduate
3 was she?

4 A. I don't know. She -- yeah. She had a
5 master's at Stanford at the time, from Stanford,
6 and her undergraduate at MIT, and then she -- I
7 think she -- I don't remember the exact time frame
8 when I did this, but it was -- I don't -- I
9 believe it was before we were married in 2004.

10 Maybe 2002. So a couple years -- two or
11 three years at UCSB, a couple years at -- a year
12 or two at Stanford, some -- some years at a
13 national lab in between, so. Yeah.

14 Q. And around what time frame was your
15 involvement with this work?

16 A. I don't recall exactly. Like I said, it
17 was just a minor part of my graduate school
18 experience. Be somewhere between 2002 to 2004.

19 Q. Given your wife's educational background
20 and experience at the time, do you think she would
21 have qualified as a person of skill in the art?

22 A. In 2004?

1 Q. As of the time of the '425 patent.

2 A. As of the time of the '425 patent,
3 absolutely. We both would have.

4 Q. And what about at the time that the two
5 of you were working on this project?

6 A. 2004, yeah, I think she would have. She
7 had an advanced technical degree already from --
8 from Stanford and a couple years, two or three
9 years, of experience working on OLED devices.

10 Q. Did you -- have you published any
11 articles in any journals relating to OLED diodes
12 during your time as a graduate student?

13 A. No.

14 Q. Does your wife have any publications
15 from her work during her time as a graduate
16 student?

17 A. I believe so.

18 Q. Do you know what kinds of journals she
19 would have been published in?

20 A. Organic electronic types materials or
21 journals.

22 Q. And would those journals be relevant to

1 a person of skill?

2 MS. ZHONG: Objection, form.

3 Q. For the subject matter of the '425
4 patent.

5 MS. ZHONG: Objection, form.

6 A. I'd say it'd be more a question of the
7 relevancy, would be more a question of the
8 specific article than the journal.

9 Q. And were the organic electronics type
10 journals that your wife would have published in
11 reputable or well-known journals?

12 A. Yeah.

13 MS. ZHONG: Objection, form.

14 A. I mean, I think any peer-reviewed
15 journal automatically gets a level of
16 reputability. And, then, I know there's
17 additional -- additional metrics, like the impact
18 factors and stuff like that.

19 So, yeah, I think that would be a -- the
20 first step. But, really, the -- the relevancy
21 depends on the specific article.

22 Q. Have you written any articles or book

1 chapters about the OLED stack and the different
2 physics to the layers in the stack?

3 A. Not -- not peer-reviewed.

4 You know, since I've been a consultant
5 to DoE -- you know, in the earlier years of my
6 working on that, there were annual R&D roadmaps
7 that eventually I became the -- I was an author --
8 always an author for, co-author for, and then
9 became lead author for, and that touched on the
10 OLED stacks in a more general -- general sense,
11 describing the different layers and the roles of
12 the different layers.

13 That document was -- was annual
14 updated -- was annually updated for awhile, and I
15 was the lead -- well, I'm still the lead author,
16 if it ever comes out again and gets updated again.

17 But, yeah, that -- that was known as the
18 DoE Multiyear Program Plan for the solid-state
19 lighting program. And, then, it was changed to
20 the R&D Opportunities document. I don't know what
21 the exact name is now, but -- but over the years,
22 it has had -- it reflects the progress of OLED

1 materials and devices.

2 So that's a pretty -- even though it's
3 not peer-reviewed, it's a pretty high-impact
4 document that's used globally to guide investment
5 in R&D, in OLEDs and LEDs and lighting.

6 Q. Have you ever worked as part of a
7 research group or a lab that directly designed or
8 fabricated OLEDs?

9 A. In my role at DoE, I worked and reviewed
10 the results of groups like that, research groups
11 across numerous institutions, national labs,
12 multiple national labs, universities, private
13 companies; was able to evaluate their progress and
14 their -- their designs against other institutions,
15 progress and designs, had a very unique
16 perspective, a very high-level perspective that --
17 that I was very fortunate to get.

18 Almost no one else has access to see all
19 of that research across the board, and apply it to
20 also all the proposals that I reviewed over the
21 years.

22 So I -- I was an active evaluator,

1 leader, manager of R&D at numerous institutions
2 related to OLED device structures, device -- OLED
3 materials, development of new materials.

4 So I -- I'd say, generally, yes. But
5 not -- not on a day-to-day basis. More like as
6 a -- as a leader or -- or manager of the R&D.

7 Q. To be clear, you were not part of any
8 research group or lab that directly designed or
9 fabricated OLEDs; correct?

10 A. I would -- I would --

11 MS. ZHONG: Objection, form.

12 A. I wouldn't -- I was part of it. I would
13 sit in on meetings, review -- design review
14 meetings, project progress meetings at labs across
15 the U.S. I'd review their -- their status of
16 their progress.

17 Like I told you before, I didn't go in
18 there and say use this material, not that
19 material. But I would see how it -- how is the
20 progress -- you know, how is the project
21 progressing in light of DoE -- of the DoE mission
22 to save energy through advancing OLED technology.

1 I would be in meetings with them and
2 they would be talking about their stack. And they
3 would be talking about specifics of their stack
4 and the progress they're making, the lifetime, the
5 reliability, the efficiency, the compatibility.

6 And furthermore, at DoE we had to set up
7 a -- a process or a -- even a distinct project to
8 help all of these groups work on materials
9 compatibility because we were getting a lot of
10 issues with projects that would make progress on
11 one element, like efficiency of blue emitters, but
12 degrade other elements or have elements that
13 weren't commercializable or manufacturable.

14 So we wanted to get these projects on
15 the same page. So we spun up a testing facility
16 or testing kind of opportunity to allow -- allow
17 the projects to use a third-party to evaluate
18 their progress.

19 Because there are a lot of compatibility
20 issues with -- with these materials, a lot of
21 materials that wouldn't work in practice, even
22 though they might make an advancement in one

1 aspect of performance.

2 So -- so, yeah.

3 Long story short, I would be at
4 meetings. I would not design things myself. I
5 would manage R&D funds on OLEDs.

6 Q. You would not make the decisions on
7 which materials to use for each layer in an OLED
8 design stack in your work with these research
9 groups or labs; right?

10 A. Let me -- let me say it like this. I
11 would review proposals sometimes with different
12 stacks being proposed and different materials
13 being explored and I would -- I would review them.
14 And that would be part of the decision-making
15 process, as to which -- which funds, which --
16 which projects got funded, which projects moved
17 forward. And so there -- there would be that
18 element.

19 Q. So your input would be in terms of
20 deciding which of the proposed OLED device stacks
21 would be funded.

22 But in terms of making a technical

1 design choice or design decision to use particular
2 materials in your OLED stacks, you were not
3 involved in the technical decision-making there;
4 correct?

5 A. Not -- not at the individual
6 institutions.

7 I would use my expertise and my
8 experience and my perspective to evaluate numerous
9 proposed OLED stacks and materials developments
10 and decide which were most promising for funding.

11 Q. So the '425 patent describes OLED diodes
12 having a stack of layers; right?

13 And if I refer to a "stack," you'll
14 know -- you'll understand generally what I'm
15 talking about?

16 A. I do.

17 Q. And one such stack -- an example of one
18 such stack is described and illustrated in
19 paragraph 41 of your first Declaration; is that
20 right?

21 A. Let me -- let me pull it up.

22 Yeah. This is taken from the '425

1 patent.

2 Q. So this is showing a snippet of Fig. 1
3 from the '425 patent. And you -- OLED structure
4 showing this figure, there's an anode 101, a hole
5 transport layer 102, an electron barrier layer
6 103, radiation-emitting region 104, a hole barrier
7 layer 105, an electron transport layer 106, and a
8 cathode 107.

9 Is that right?

10 A. Yes.

11 Q. And the '425 patent specification
12 provides examples of the materials that could form
13 each of these layers; correct?

14 A. Yes.

15 Q. So let's take a look at a couple of
16 examples.

17 If we could pull up tab 7, Exhibit 1001,
18 which is a copy of the '425 patent. If we could
19 go to column 25, please.

20 A. Okay.

21 Q. Now, you see in column 25, starting in
22 line 11, the '425 patent states that "For a charge

1 carrier transport layer embodied as hole transport
2 layer 102, the following matrix materials, in
3 particular, are suitable"?

4 Correct?

5 A. Yes.

6 Q. And, then, it lists 18 different
7 materials that could perform the function of the
8 hole transport layer 102.

9 Do you see that?

10 A. I do.

11 Q. Further down in column 25, starting in
12 line 50, it starts describing the dopant for hole
13 transport layer, which is a p-type dopant; right?

14 A. Yes.

15 Q. And starting on this line and continuing
16 through top of column 26 through line 31, it's
17 describing a number of different p-type dopants
18 that could be used as a dopant for a hole
19 transport layer; correct?

20 A. Yes.

21 Q. Now, as for the electron transport layer
22 106, that starts at column 26, line 32, which

1 states that "For a charge carrier transport layer
2 embodied as electron transport layer 106, the
3 following matrix materials, in particular, are
4 also suitable."

5 And that proceeds to list 13 different
6 materials; correct?

7 A. Yes.

8 Q. And, likewise, for -- starting in
9 column 58 [sic] of this column and continuing on
10 through column 27, line 21, it describes a -- a
11 number of different n-dopants that could be used
12 to n-dope the electron transport layer; correct?

13 A. Yes.

14 Q. So we just looked at the materials that
15 would comprise the hole transport layer 102 and
16 electron transport layer 106, and if we just count
17 up the number of different materials that could be
18 used for the matrix material in the hole transport
19 layer 102 and the electron transport layer 106,
20 that's 234 different OLED stack designs, based on
21 combinations of those materials; right?

22 MS. ZHONG: Objection, form.

1 A. Not having done that math, I'll take
2 your word for it.

3 Q. So just 18 times 13; right?

4 A. Does that include all the different
5 options for dopants?

6 Q. No, it doesn't.

7 But if you include all the different
8 options for the dopants, I mean, you would -- the
9 number would increase multiplicatively; right?

10 A. Yeah.

11 OLEDs are complicated. The materials
12 are very complicated. And there's a lot of
13 options and a lot of compatibility issues.

14 Q. So given this disclosure of the '425
15 patent, do you think a person of skill in the art
16 would be able to make all 234, and more, different
17 OLED devices operational by appropriately
18 selecting the dopants, the amount of doping, the
19 layer of thicknesses, and the manufacturing
20 processes all without significant experimentation?

21 MS. ZHONG: Objection, form, relevancy.

22 A. Can you -- can you repeat the question?

1 Q. Sure.

2 So we -- we -- we just said there's --
3 you know, if you're just counting the hole
4 transport layer materials and the electron
5 transport layer materials, that's 234 stack
6 designs. And there would be more if you
7 considered the potential options for n-dopants and
8 p-dopants.

9 A. Uh-hmm.

10 Q. So among that universe of potential OLED
11 device stack designs, is a POSITA able to, based
12 on this disclosure, make operational OLED devices
13 for each of those designs without significant
14 experimentation?

15 MS. ZHONG: Objection, form.

16 Enablement is not part of the IPR
17 proceeding.

18 A. I think -- I mean, I think they would
19 be -- not all of these materials will be
20 compatible with all of the other ones. So
21 there's -- there could be an issue there.

22 But I think, yeah, you could make --

1 make an OLED of poor quality with -- with these
2 materials. And I don't -- you know, I can't
3 guarantee -- guarantee or -- I don't think it's
4 guaranteed that each one of them -- each
5 combination will work, but that these materials
6 are potential combinations.

7 So, yeah, I don't -- I don't think it's
8 super hard. Making an OLED is generally pretty
9 hard and you have to have the right equipment.
10 You know, I'm not -- most of my exposure to people
11 working on OLEDs is more Ph.D level and beyond.
12 That's -- that's almost entirely what I witnessed
13 as -- in my role at DoE.

14 So, you know, there might be an issue
15 with the -- the skill level that's being used. I
16 don't think that -- I'm not sure that reflects
17 the -- you know, how things are actually being
18 done. But -- but, yeah, I don't -- I don't see
19 why not.

20 Q. Okay. So, I mean, part of the design
21 consideration when you're trying to make an OLED
22 device is you need to select the materials for

1 each of the layers in the stack; right?

2 A. Yes.

3 Q. Okay. And you also need to choose the
4 thicknesses of each layer; right?

5 A. Yes.

6 Q. And if you have dopants, like we have
7 here as described in the '425 patent, you need to
8 select the appropriate dopants; correct?

9 A. Yes.

10 Q. And you need to choose the appropriate
11 concentration of dopants?

12 A. That's right.

13 Q. And you need to choose the appropriate
14 manufacturing process to deposit each of these
15 layers; right?

16 A. Yeah.

17 Q. So all of those considerations are
18 relevant to making an operational OLED display
19 device; right?

20 A. Yes.

21 Q. And so given this disclosure in the '425
22 patent, a POSITA can make those appropriate design

1 decisions once they know which materials they want
2 to use in an OLED device stack; right?

3 MS. ZHONG: Objection, form.

4 A. Let's -- let's say it like this. Giving
5 the benefit of the doubt to the POSITA level that
6 we're working with here, that they have existing
7 tools and capabilities to make -- to make OLEDs,
8 and they have existing experience and expertise of
9 the general range of layers and levels, yeah, I
10 think they could.

11 You know, not -- maybe not every
12 material, maybe not every dopant works with every
13 transport layer. I don't think that's the
14 implication of this list. And maybe not every
15 transport layer works with every -- emissive layer
16 host material and emitter materials. I don't
17 think that's the implication there either.

18 So, you know, given the -- like I said,
19 giving the benefit of the doubt to the POSITA
20 level to be able to down select, you know,
21 which -- which layers work with which and make
22 marginally -- marginal performance OLEDs and maybe

1 even better OLEDs with this material -- with these
2 material combinations.

3 Q. So a POSITA, as a matter of capability,
4 wouldn't have any difficulty swapping out one
5 known material for a layer in the stack in
6 exchange for another known material that could be
7 used for that layer in an OLED stack; right?

8 MS. ZHONG: Objection, form.

9 A. It would depend on if the layer's doing
10 the same job and the level of maturity of the
11 material in terms of its -- of its known
12 performance.

13 I'm assuming all of these materials
14 listed here are -- are relatively mature,
15 commercially-available materials for this
16 application, and there's some background and
17 literature. Background for their use, that a
18 person could -- could rely on.

19 So, yeah, it's not any material all the
20 time that the -- the known properties of the
21 material and the actual role of the material would
22 really -- would really be important.

1 Q. So independent of the disclosure that we
2 were looking at in the patent, just based on a
3 knowledge that a POSITA at the time of the '425
4 patent would have, assuming that we're talking
5 about the layer performing the same function,
6 would that POSITA have any difficulty swapping --
7 swapping out known materials for that layer in
8 exchange for other known materials for that layer
9 to design a different OLED device stack?

10 MS. ZHONG: Objection, form.

11 A. It depends on the level of mature -- you
12 said "known material." I mean, that --

13 Q. Yeah.

14 A. -- really would depend on the level of
15 how well the material's known and if the materials
16 that you're talking is actually operating by the
17 same physical mechanism.

18 You know, if you change physical
19 mechanisms, there -- there will always be
20 compatibility issues that will need to get
21 resolved and figured out and can't -- you can't be
22 sure that they're not going to be there with a new

1 material.

2 And that goes back to the tradeoff space
3 that's involved. You might try a new material,
4 let's say, of this same -- that's operating, has
5 the same physical mechanism, and it's unknown,
6 there's not a lot of literature on it, and that,
7 you know -- and it works, but there's a
8 compatibility issue. Or you might expect that
9 there's a compatibility issue, so you don't -- you
10 don't go try something.

11 So it -- it depends on the maturity of
12 the -- or what -- how -- what exactly you mean by
13 "known" and how much literature is available or --
14 or product specifications, if you're buying the
15 material, is available on that material.

16 And it depends on the tradeoffs you're
17 willing to accept and how hard you want to work at
18 it and if you need to include other layers. It
19 depends on your deposition processes.

20 So a person could -- could explore, but
21 you really need -- you know, you need some
22 guidance, especially if the researcher, you know,

1 is -- well, it depends a lot on the level of the
2 researcher and the capabilities of the research
3 organization as well.

4 For example, switching one kind of
5 similar electron dopant or hole dopant for another
6 is simpler than -- than changing a layer mix.
7 Right? That's -- that would be an example.

8 So it depends on the specifics and
9 how -- how big of a jump you're trying to make
10 with different materials.

11 Q. So is that from the perspective of could
12 they make a -- could they make a device or -- or
13 would they be able to make a functioning device?

14 A. It's --

15 Q. Strike that.

16 I'll ask a clearer question.

17 Just as a matter of being able to make
18 the new stack by replacing one type of material
19 for another, I mean, the capability exists for a
20 POSITA to do that, not thinking about, you know,
21 motivations for doing so?

22 MS. ZHONG: Objection, form.

1 A. You could make a stack. I'm not sure if
2 you would make an OLED.

3 Q. We look at column 30, back to the '425
4 patent, and go down to line 25. The patent says
5 that "For all of the layers, of course, other
6 matrix materials, dopants or emitter materials are
7 possible, as are other compositions of the mixed
8 matrix materials. Further materials for emitter
9 materials, transfer materials and dopants are
10 possible and can be exchanged at any time."

11 Did I read that correctly?

12 A. Yes.

13 Q. So, I mean, do you agree?

14 MS. ZHONG: Objection, form.

15 A. Well, I'd say other materials are
16 possible and can be exchanged, but the -- the
17 implications -- you'd need to have some motivation
18 to pursue them and to understand the -- the
19 implications of OLED performance. Right? So this
20 is a -- kind of a vague statement.

21 But, yeah, I -- you could -- you could
22 try anything. The question would be why.

1 Q. But the POSITA would know how; right?

2 MS. ZHONG: Objection, form.

3 A. The -- how much they would know would
4 depend on their specific skill in the art.

5 Q. Well, assuming the skill in the art is
6 the defined level of ordinary skill that we're
7 assuming in this proceeding.

8 A. Yeah. I think they would know how to do
9 a basic substitution of well -- one well-known
10 material for another well-known material that's
11 performing the same -- same function with the same
12 physical mechanism.

13 Q. So let's -- and the example you gave
14 was -- earlier was n-doping. A POSITA wouldn't
15 have difficulties swiping out -- swapping out one
16 known n-dopant for the electron transport layer
17 for another known n-dopant for the electron
18 transport layer, as long as the physical mechanism
19 was the same.

20 A. Yeah. It's like, let's say, it's an
21 electron donor, and you already know that, you
22 know, the compatibility is going to be okay with

1 your -- your electron transport layer. So it
2 would still take some work to -- to do it, but you
3 could -- you could swap out one electron donor for
4 another electron donor. You know, similar
5 material that's kind of adjacent on the -- on the
6 elemental table. And, you know, knowing --
7 knowing -- having some background compatibility
8 information that might be available in the
9 literature.

10 Q. Right.

11 And the POSITA could do that without
12 significant experimentation; right?

13 MS. ZHONG: Objection, form.

14 A. They could be -- they could make the
15 swap, but the optimization and understanding the
16 tradeoff space would take experimentation.

17 Q. The experimentation needed for the
18 optimization, though, would be kind of the routine
19 amounts and not something undue; correct?

20 A. Depends on the --

21 MS. ZHONG: Objection, form.

22 A. -- on the level of what's known about

1 the material and how much guidance exists for it.

2 Q. If we already know that the two
3 materials operate similarly as a -- as we've
4 assumed, then you would not need substantial
5 experimentation to swap those materials; right?

6 A. Well, it just goes back -- like you
7 said, if you know -- and what do you mean by
8 "know"?

9 So there's literature that shows you
10 how -- you know, the previous performance even
11 better than academic literature, there's
12 commercial literature that says this is possible
13 using commercial products.

14 So, yeah, if you know that based on
15 information that's provided and the caliber of
16 that information is good, you know, it could be a
17 pretty routine swap. Yeah.

18 Q. I just want to clarify what you -- what
19 you meant in this response.

20 Are you saying that you necessarily need
21 to show a better performance in order to be able
22 to swap different materials for a layer? Because

1 I'm just asking about capability at this point.

2 A. And I'm not -- not necessarily better
3 performance.

4 Of course, you would -- you'd be making
5 some performance tradeoffs. Right? That's -- or
6 cost tradeoff, when you make a swap. And I'm
7 talking about the swap -- the materials you're
8 swapping, you'd have a pretty good level of
9 understanding of what's going to happen when you
10 swap them.

11 You know, you have, let's say, a
12 specification sheet, you're buying materials from
13 an organic materials provider and they give you a
14 specification sheet that says here's a dopant and
15 here's what it's compatible with and you buy it.
16 And, then, here's another material, here's another
17 dopant and here's what it's compatible with; and,
18 here are the recommended concentration levels.
19 Then, yeah, you could -- you could do that.

20 Q. So one n-dopant and you understand the
21 mechanism by which it acts as an n-dopant, you can
22 swap out for another n-dopant that has -- that

1 operates as an n-dopant in the same manner
2 without -- without substantial experimentation?

3 MS. ZHONG: Objection, form.

4 A. Yeah. I would say particularly if it's,
5 like, an electron donor. And if you understand
6 the material's compatibility with your -- with
7 your host or matrix and with the neighboring layer
8 stack.

9 Q. And the POSITA would have a reasonable
10 expectation that they could successfully make that
11 combination and resolve -- and it would resolve in
12 an operational, functional OLED device?

13 A. If -- if they have all of that
14 background information.

15 MR. LEE: Let's take a quick, ten-minute
16 break.

17 MS. ZHONG: It's -- let's go off the
18 record, then. We can discuss.

19 MR. LEE: Oh. Sure.

20 THE STENOGRAPHER: We're off the record.

21 (Recess in proceedings.)

22 THE STENOGRAPHER: And we are going back

1 on the record.

2 BY MR. LEE:

3 Q. Welcome back, Dr. Pattison.

4 MR. LEE: Could we please have tab 12
5 pulled up.

6 REMOTE TECHNICIAN: Sure. Stand by.

7 MR. LEE: This is a yet unmarked
8 exhibit, so we will mark it 1042.

9 (Exhibit 1042 was marked for
10 identification and is attached to the
11 transcript.)

12 Q. It is a 2007 publication titled Solution
13 Processed Polycrystalline Copper
14 Tetrabenzoporphyrin Thin-Film Transistors.

15 MS. ZHONG: You know what? Can we lodge
16 my objections.

17 REMOTE TECHNICIAN: And, Dr. Pattison,
18 you can look at it. If you click on it
19 again, you should have control.

20 THE WITNESS: All right. Thanks.

21 MS. ZHONG: I will object to the
22 reference for at least being irrelevant, as

1 well as hearsay.

2 Q. Dr. Pattison, are you familiar with
3 this -- with this paper?

4 A. I've seen it, yes.

5 Q. You've seen it.

6 The first sentence of the abstract says,
7 "The demonstration of organic thin-film
8 field-effect transistors, OFETs, using a
9 solution-processable form of the organometallic
10 molecule copper tetrabenzoporphyrin (CuTBP) is
11 reported."

12 Did I read that correctly?

13 A. I think so.

14 Q. So this is about organic thin-film
15 transistors. And if you look at the second-named
16 author, it's a researcher by the name of Lisa R.
17 Pattison.

18 Do you see that?

19 A. I do.

20 Q. And is that -- is that your wife?

21 A. Yes.

22 Q. And she lists the -- under the Author

1 Affiliations, she lists the Department of Material
2 Science and Engineering at the University of
3 California Santa Barbara as her affiliated
4 institution.

5 Right?

6 A. Yes.

7 Q. So this would have been work that she
8 did as a graduate student at UCSB?

9 A. Yes.

10 Q. Okay. Is this paper related at all to
11 your wife's graduate school project that you
12 assisted with?

13 A. I don't think so.

14 Q. It's not related?

15 A. I don't think so.

16 Q. Do you think that the contents of this
17 article, which describes organic materials for
18 forming thin-film transistors, is relevant to the
19 subject matter of the '425 patent?

20 A. I think it's adjacent.

21 I mean, the -- first of all, these
22 transistors would be used to drive OLED displays.

1 And, generally, the -- the -- some of the layers
2 would need to be conductive organic materials,
3 which, at the time, was not a -- not a normal
4 thing, to have conductive organic materials.

5 Like, there was a Nobel prize awarded, I
6 think in 2000, for figuring out conductive organic
7 materials. I think it was Alan Heeger. And so it
8 was all a relatively new topic to make potentially
9 plastic or organic materials conductive.

10 So, you know, it just is relatable,
11 let's say, in the kind of general understanding of
12 the potential material set that could be applied
13 to -- to OLEDs.

14 Q. And if you look below the Author
15 Affiliations, it's -- there's a notation that the
16 article was available online 7 March 2007.

17 Do you see that?

18 A. I do.

19 Q. So that's when it would have been made
20 available to the public?

21 MS. ZHONG: Objection, form, calls for
22 legal conclusion.

1 A. I don't know.

2 Q. There's a notation just above that on
3 the first page that the article was received in
4 revised form on January 2nd, 2007.

5 Do you see that?

6 A. I see it.

7 Q. So that's an indication that a different
8 version of the manuscript was received by a
9 journal?

10 MS. ZHONG: Objection, calls for
11 speculation.

12 A. There's -- there's -- it looks like four
13 dates involved.

14 So, yeah, maybe it was sent for review
15 on June 19th, 2006.

16 Q. Okay. And, then -- and, then, another
17 version would have been sent on January 2nd, 2007?

18 A. That's normally how these journal things
19 work. Maybe there were -- some reviewer-suggested
20 edits or changes or required edits. I don't -- I
21 don't know.

22 But, yeah, I would -- I would assume

1 that a revised version was -- was submitted on
2 that date.

3 Q. I see.

4 And in your experience, Science Direct
5 journals typically include such indicia, when
6 revised versions on manuscripts are received or
7 published, like we see here?

8 MS. ZHONG: Objection, form, calls for
9 speculation.

10 A. Yeah. Some do; some don't, I think.

11 Q. So this is a journal article that
12 appears on the Journal of Synthetic Metals. You
13 can see that on the top right.

14 Are you familiar with Synthetic Metals?

15 A. Mainly through this submission. So,
16 yes.

17 Q. When you were in graduate school, did
18 you typically review -- when you were doing
19 research in graduate school, would you typically
20 review scientific articles in print or online?

21 A. Both.

22 MS. ZHONG: Objection, form.

1 Q. Dr. Pattison, could you explain to me
2 what an electron injection layer is?

3 A. Electron injection layer, it's something
4 to manage the interface between the -- the
5 electrode and the -- the electron transport layer,
6 and improve -- improve the injection of -- of
7 current from -- from the -- the electrode through
8 the transport layer to the ultimate device, to
9 the -- yeah.

10 Q. Great.

11 So is -- an electron injection layer is
12 not a necessary component of an organic
13 light-emitting diode; correct?

14 MS. ZHONG: Objection, form.

15 A. It's -- it's not required at all.

16 I mean, you're always going to have an
17 interface between your electrode and -- and the
18 transport layer, or some form of layer. So -- so,
19 yeah. It's -- some of this -- yeah.

20 It's -- you can get away -- if you have
21 a good energetic match between your -- your
22 electrode and your transport layer, you can get

1 away without having one.

2 If you're trying to make an optimized
3 device, you're probably going to have one.

4 Q. So you can have an electron transport
5 layer directly adjacent to the cathode without a
6 separate electron injection layer, and that
7 electron injection layer adjacent to the cathode
8 would serve both functions of electron transport
9 and electron injection; correct?

10 MS. ZHONG: Objection, form.

11 A. It might not help with injection, so I'm
12 not -- I wouldn't say it serves that purpose.

13 Q. What about an n-doped electronic
14 transport layer, would such a layer adjacent to
15 the cathode serve an electron injection function?

16 MS. ZHONG: Objection, form.

17 A. It would be -- it would be that
18 interface. Right? It would define that
19 interface, but it might not serve the function of
20 improving electron injection.

21 Q. What's necessary to improve electron
22 injection?

1 A. To just improve the energy match between
2 the -- the -- the -- the electrode and the -- the
3 next layer. So to basically reduce the -- any
4 kind of potential barrier for the charges to get
5 injected.

6 So, you know, you could put in an
7 electron transport layer right up against the
8 electrode and not have a big impact on that --
9 that potential barrier layer and then incur an
10 increased turn-on voltage for your device.

11 Q. So if an electron transport layer is
12 directly adjacent to the cathode with no
13 intervening electron injection layer, what serves
14 to get the electrons into such a device?

15 A. Electrode.

16 Q. Diekmann has an n-doped electron
17 transport layer; correct?

18 MS. ZHONG: Objection, form.

19 A. I think that's debatable.

20 Q. Why do you say that?

21 A. I don't think he ever explicitly defines
22 that layer, and it's not clear whether it's an

1 electron injection layer or an electron transport
2 layer.

3 And there's kind of this mystery layer
4 that's unlabeled and undefined in this figure
5 that's relied upon by -- as an embodiment by
6 Holmes and Samsung. So I think it's -- it's
7 really not clear.

8 Q. Let me pull up Exhibit 2002. It's the
9 first Declaration. Go to paragraph 45.

10 Is this the figure and embodiment that
11 you were just referring to?

12 A. Yes.

13 Q. So this figure shows a doped layer 402
14 with dopant 410; correct?

15 A. Yes.

16 Q. In your opinion, what is doped layer 402
17 if not an electron transport layer?

18 A. Like I said, it's debatable what it's.

19 There's -- some of the language used in
20 Diekmann, if I recall, makes it seem like more of
21 an electron injection layer.

22 Q. Okay. Do you recall what language that

1 is in Diekmann?

2 A. No, not -- not specifically.

3 Q. Okay. Are you aware of any example of
4 an n-doped electron injection layer?

5 A. Yeah.

6 It bends in firmy state, so it
7 improves -- it can improve electron injection.
8 So, yeah.

9 Q. Are there any examples of such layers in
10 Diekmann?

11 A. He describes as the dopant-improving
12 injection.

13 Q. Well, the dopant-improving injection
14 doesn't mean that the dopant is part of an
15 electron injection layer, does it?

16 MS. ZHONG: Objection, form.

17 A. I mean, it could be.

18 Q. If you could scroll down in your
19 Declaration to paragraph 48.

20 So here you're describing what Diekmann
21 identifies as potential electron injection layers;
22 correct?

1 A. Yeah.

2 Q. And you identify NET-5 with NDN-1,
3 cesium carbonate, lithium or sodium fluoride and
4 barium; correct?

5 A. Yes.

6 Q. So in paragraph 49 you say, "NET-5 with
7 NDN-1 is referring to a doped injection layer."

8 Do you see that?

9 A. I see that.

10 Q. But NET-5 is an electron transport
11 layer, isn't it?

12 A. A lot of these layers can serve
13 different functions.

14 So it can be -- just like ALK3 can be
15 used as a transport layer or as an emitter, you
16 know, that's -- other materials can play different
17 roles in a device structure.

18 Q. So it's your opinion that NET-5 with
19 NDN-1 is both a transport layer and a dopant
20 lap -- injection layer?

21 MS. ZHONG: Objection, form.

22 A. It can be either/or.

1 Q. Does it matter what the rest of the step
2 looks like?

3 A. Yes.

4 Q. In which instances would it act as an
5 electron -- a doped electron transport layer?

6 A. I don't under- -- can you rephrase that
7 question? I need more context.

8 Q. Sure.

9 Let me -- let me -- let's try it this
10 way. You said NET-5 with NDN-1 could be either an
11 electron transport layer or an electron injection
12 layer; right?

13 A. Yes.

14 Q. Is it mutually exclusive or can it be
15 both?

16 A. It could -- it could serve both
17 functions. It could also -- yeah. Depending on
18 the -- the -- the device structure. It could be
19 an explicit electron injection layer with another
20 electron transport layer or it could be a electron
21 transport layer with an electron injection layer.

22 Q. Okay. So what characteristic of the

1 stack that this material is used in de- -- defines
2 whether this becomes an electron transport layer
3 or an electron injection layer or both?

4 A. There's context. Like the other layers
5 of the stack, I mean.

6 And -- and, you know, I'm working off
7 the context in Diekmann also, where he
8 describes -- spends a lot more time describing its
9 injection property. I don't think he describes
10 its transport property.

11 Q. Diekmann also talks about electronic
12 conducting layers, though; correct?

13 A. Yeah.

14 Q. So this NET-5, absent doping with NDN-1,
15 is it -- is alone an electron transfer material;
16 correct?

17 MS. ZHONG: Objection, form.

18 A. Yeah, it could be, I believe. I would
19 have to read up on it.

20 This is, you know, material or context
21 I'm using from Diekmann, but I would assume that
22 it's a conductive material that's electron

1 conductive.

2 Also, it could be used as an injection
3 layer without -- without doping, I would -- I
4 would assume. And I -- but I don't know how good
5 it would be in either of those roles, if it's
6 undoped.

7 Q. Okay. And NDN-1 is a molecular
8 n-dopant; correct?

9 MS. ZHONG: Objection, form.

10 A. I believe so. I -- I mean, in the
11 context of Diekmann, he only ever discusses
12 dopants as -- as electron donor dopants. So,
13 yeah, that would be my -- my assumption there.

14 Q. But Diekmann uses NET-5 with NDN-1 and
15 you're calling that a doped electron injection
16 layer; right?

17 So NDN-1 is a type of n-dopant?

18 MS. ZHONG: Objection.

19 A. I believe so, given the context. I
20 don't -- I don't know specifically. And the
21 context of it being provided by Diekmann and
22 labeled as such. And -- and the fact that he

1 talks about dopants in terms of electron donors.

2 Q. Diekmann's other examples of electron
3 injection layer materials are lithium fluoride,
4 sodium fluoride, cesium carbonate, and barium;
5 right?

6 A. I -- that sounds right.

7 Q. And each of these materials could, by
8 themselves, be examples of n-dopants?

9 A. Yeah. Just to be clear, electron donor
10 dopants, yeah.

11 Q. Electron donor dopants.

12 Is -- is it possible to n-dope any of
13 these materials when they're used as electron
14 injection layers?

15 A. N-dope any of which materials?

16 Q. Cesium carbonate, lithium chloride,
17 sodium chloride, or barium.

18 A. They -- they are the dopants.

19 Q. They are the dopants. So you would
20 n-dope them; right?

21 A. It doesn't make -- yeah, I don't think
22 that they operate -- those materials especially

1 need -- are not necessarily conductive materials.

2 Q. So a POSITA wouldn't have any reason to
3 n-dope any of these materials?

4 A. N-dope, I don't even know if it's
5 possible. I don't think it's possible. And what
6 you're talking about is -- is a film, having a
7 film, a sodium fluoride film. I don't think
8 that's conductive.

9 I don't think you'd want a lithium --
10 flat lithium film involved for a lot of reasons.
11 And -- and I don't think, also, you'd want a
12 barium film.

13 So I don't -- I don't -- I'm not sure
14 it's even possible to dope -- dope these
15 materials.

16 Q. So lithium fluoride is an insulator;
17 right?

18 A. Yes, but it could be made -- it -- well,
19 insulator is a little bit relative. But, yeah, it
20 doesn't have the conductive properties you'd be
21 looking for. And, you know, it depends on the
22 thickness, too.

1 But generally, yes, it's -- it's an
2 insulator. But it can be made into a film.

3 Q. If we could turn to Exhibit 2018. This
4 is your Supplemental Declaration. And I would
5 like to take you to paragraphs 40 -- 43 and 44.

6 Are you there?

7 A. I am.

8 Q. Okay. So these paragraphs you're citing
9 to on Exhibit 1029, and that's a Novaled
10 presentation; correct?

11 A. That -- that sounds right.

12 Q. And in paragraph 44, the last three
13 lines of that paragraph, you say that, "A skilled
14 artisan, if concerned with diffusion and OLED
15 device performance, would have started with
16 Novaled's material set."

17 Do you see?

18 A. I do.

19 Q. Now, Novaled's material set, that's a --
20 that's a reference to the NET-5 with NDN-1 that we
21 were just looking at; correct?

22 A. You would have to pull up the -- the --

1 Q. Sure.

2 MR. LEE: If we could pull up tab 13,
3 which is Exhibit 1029. Please make that
4 available for the witness.

5 REMOTE TECHNICIAN: Tab 13, you said,
6 Counsel?

7 MR. LEE: Yes. It should be
8 Exhibit 1029.

9 REMOTE TECHNICIAN: Okay. Stand by.
10 (Exhibit 1029 was marked for
11 identification and is attached to the
12 transcript.)

13 A. Okay.

14 Q. You can feel free to flip through this.
15 But my question was: When you refer to
16 Novald's material set in paragraph 44, you were
17 referring to the NET-5 with NDN-1 material that's
18 described in this paper; right?

19 A. I'm not -- I'd have to re-read my
20 Declaration. I'm not sure -- I said material set.
21 So any of the materials offered by Novald as
22 being state-of-the-art and having, you know, good

1 performance as commercial materials with spec
2 sheets, with compatibility defined, you know,
3 as -- as kind of known quantities. So I don't
4 know if I was -- I would have to re-read it.

5 Explicitly referring to singular
6 material or the material set demonstrated in this
7 presentation which, in 2005, were effectively
8 commercially available, state-of-the-art
9 materials.

10 Q. So if you go to page 7 of this exhibit,
11 Exhibit 1029.

12 A. Okay.

13 Q. This slide is titled "Novaled's Material
14 Overview."

15 Right?

16 A. I see that.

17 Q. Now, on the left side of this -- on the
18 left-hand side of this slide, it says -- there's a
19 heading Hole Side, and on the right-hand side
20 there's a heading for Electron Side; correct?

21 A. I see that, yes.

22 Q. And for the Hole Side, it describes a

1 hole transport matrix material called NHT-5 and a
2 molecular p-dopant NDP-2; right?

3 A. Yes.

4 Q. And on the electron side, it describes
5 an electron transport matrix material NET-5, and a
6 molecular n-dopant NDN-1; correct?

7 A. Yes, I see that. It says it's "superior
8 Bphen" and has "glass transition temperature"
9 information.

10 So this is kind of what I was talking
11 about with known -- known materials in general.
12 You know, a person of skill in the art being able
13 to apply known -- known materials with spec sheets
14 and -- and known compatibility issues and -- and
15 reliability considerations.

16 But, yeah, I -- I see what you just
17 said.

18 Q. Okay. And if we go back to your
19 Declaration on paragraph 44, that part that we
20 were discussing, "A skilled artisan, if concerned
21 with diffusion and OLED device performance, would
22 have started with Novaled's material set that used

1 a non-Liq-doped ETL."

2 So you are referring to the ETL side --
3 the electron side materials in this presentation;
4 right?

5 A. Yeah. Yeah. I'm -- I would say it's
6 inclusive of the NET and NDN material set.

7 Q. Okay. So NET-5 and NDN-1, those are
8 proprietary Novaled materials; right?

9 A. Correct.

10 Q. But in your opinion, the information
11 that's provided in Exhibit 1029 would have
12 motivated a person of skill in the art to build an
13 OLED device incorporating NET-5 with NDN-1 as an
14 n-doped electron transport layer; correct?

15 A. If they -- well, there's a couple of
16 points there.

17 That would set your baseline expectation
18 of what you're trying to achieve. So you'd try to
19 make something that has the -- the prospects of
20 that performance. Otherwise, you know, in a
21 commercial setting, why -- why are you really
22 bothering.

1 And then, you know, that would be
2 predicated, of course, on the availability of
3 these materials, but you wouldn't think -- you
4 wouldn't go around trying to move the
5 state-of-the-art with much worse materials, is
6 kind of what I was getting at here.

7 Q. Okay. So I'm trying -- just trying to
8 understand the reason for why a person of skill
9 would have looked at this material set.

10 And the information in this
11 Exhibit 1029, that is sufficient for a POSITA to
12 look to NET-5 and NDN-1 material as potentially a
13 good n-doped electron transport layer material for
14 his OLED device structure?

15 A. The -- you'd be trying -- I guess, in my
16 world, you'd be trying to make improvements to
17 state-of-the-art or achieve the state-of-the-art,
18 not -- not regress from the state of the art. So
19 that -- this was available in 2005. I would not
20 be satisfied or motivated to explore materials
21 that, you know, based on the literature, are a
22 step back from the state-of-the-art.

1 Q. I know -- I'm not asking about other
2 electron transport layers that are stepping away
3 from this.

4 I'm asking, you know, is the information
5 in this paper sufficient for a person of skill to
6 say, yes, I want to use NET-5 with NDN-1 as my
7 n-doped electron transport layer in my OLED
8 device?

9 MS. ZHONG: Objection, form.

10 A. With the context that it's a commercial
11 material, and as part of the structure, as part of
12 the total structure with that good performance,
13 yeah.

14 Q. Okay. So because it's a commercial
15 structure and combined with the information
16 provided in Exhibit 1029, a POSITA would be
17 motivated to start with NET-5 with NDN-1 as
18 n-doped electron transport layer?

19 A. I don't think you start, ever, with the
20 transport layer. You start with all the other
21 parts of the OLED or you start with the
22 application and you find a transport layer that --

1 that gets you to your objective.

2 So you don't build the whole OLED around
3 the transport layer. That's -- that's not how
4 this goes. And they're not just a commercial
5 operation, but they're a reputable commercial
6 operation. So, yeah.

7 Q. All right. So I didn't mean to start in
8 that sense. I just mean, you know, you're a
9 person of ordinary skill in the art trying to
10 build a OLED device, the fact that they're a
11 reputable commercial operation, combined with the
12 information provided in this Exhibit 1029, is
13 sufficient to motivate the person of skill to
14 incorporate NET-5 with NDN-1 as an n-dopant --
15 n-doped electron transport layer into their
16 device?

17 Did I get that right?

18 A. Yeah. The main --

19 MS. ZHONG: Objection.

20 THE WITNESS: Sorry.

21 A. The main factors for an electron
22 transport layer would be device efficacy or

1 efficiency and the voltage, and -- and the --
2 the -- the need of the turn-on voltage, how --
3 well -- and the resistance, operating resistance
4 would all be how you would -- how you would -- the
5 evidence you would find of a good transport layer
6 and -- and total injection scheme.

7 And, then, you'd also want to work with
8 a material where you have confidence in its
9 electron reliability, which goes back to the --
10 this information being provided by a commercial
11 entity.

12 Q. So just to be clear, was the answer to
13 my last question a "yes"?

14 MS. ZHONG: Objection, form.

15 A. Yeah. I mean, it was -- I was just
16 adding some -- some context of the process, of the
17 full process, of how you would evaluate material.

18 So this would be a good starting
19 material, a good -- a good material to start with,
20 if you could access it. And based on, you know,
21 the -- yeah, the information provided.

22 Q. Are you aware of any commercial OLED

1 devices that used NET-5 with NDN-1?

2 A. I would assume Novaled's devices did.

3 Q. Did Novaled produce any user end
4 products?

5 A. Let me think. I believe they did.

6 Q. What about -- you don't know for sure if
7 they did?

8 A. No, I don't know for sure. And also, I
9 really wouldn't know the ultimate device structure
10 of -- of a proprietary commercial device and --
11 and the materials involved.

12 Q. So what is the molecular structure of
13 NET-5?

14 A. I don't know.

15 Q. Would it have been known to a POSITA at
16 the time of the '425 patent?

17 A. If there were subsequent publications
18 about it, maybe. Just based on this, this
19 document, it's not -- not given out.

20 Q. Do you know the HOMO and LUMO levels of
21 NET-5 material?

22 A. No.

1 It may be in that document. I don't
2 recall.

3 Q. Well, you can -- you can feel free to
4 flip through that document, if you need to
5 confirm.

6 A. Yeah, I don't recall.

7 You want me to flip through it?

8 Q. Yes, please.

9 A. Yeah.

10 And may I just add real quick, though,
11 that they're showing full device structures. So
12 this is a commercial company and they made full
13 device structures.

14 It looks like they're giving some
15 relative HOMO/LUMO levels here. Can't really get
16 too much out of that, though.

17 Q. So that's just -- so this is slide --
18 page 6 of Exhibit 1029 --

19 A. Yeah.

20 Q. -- that you're looking at?

21 And is this just an illustration of how
22 transport works or do you understand this to be

1 representative of the actual HOMO/LUMO levels of
2 Novald materials?

3 A. I would take this, just based on the
4 level of detail, that this is some level of
5 representation -- of actual representation of the
6 relative HOMO and LUMO levels in their device
7 structure.

8 Q. Is there any other indication of the
9 HOMO and LUMO levels of the NET-5?

10 A. Hold on. Let me get through this.

11 I don't see anything else.

12 I would say, though, that given the
13 performance of the relatively low voltage and
14 the -- which indicates, you know, optimized
15 reduction of potential barriers for charge
16 injection, and the -- the lifetime measurements,
17 which indicates blockage, energetic blockage of
18 carriers getting past the active region, that, you
19 know, there is an optimization of the HOMO and
20 LUMO levels, but I don't know the exact material
21 and I don't know the exact levels.

22 Q. And from this slide, page 6 of

1 Exhibit 1029, it's just relative levels?

2 A. Yes. But that -- that is what you care
3 about in a full device structure.

4 Q. But this doesn't have -- this just --
5 this doesn't have the electrodes?

6 A. Does not have the electrodes. But you
7 can infer from the -- the low voltage that there
8 is -- there's more function matching between the
9 electrode and the next layer and the next layer,
10 and ultimate injection into the active region.

11 Q. Do you know what the thickness of the
12 NET-5 material was in the full OLED devices that
13 are measured in this presentation?

14 A. I don't recall that it's given in this
15 presentation.

16 Q. So this presentation does not provide
17 the thicknesses of each of the layers of the OLED
18 stack for the complete device that this
19 presentation is showing measurements for; correct?

20 A. This presentation.

21 But I would assume, as a commercial
22 entity, they're trying to sell either full devices

1 or materials and they would provide guidance in
2 the use of their materials. And if they're just
3 selling full integrated devices, then that gives
4 you -- that gives someone working in this field a
5 state-of-the-art to work -- try to compete with.

6 Q. Do you know the molecular structure of
7 NDN-1?

8 A. I do not.

9 Q. How about its HOMO and LUMO levels?

10 A. No.

11 Q. And, by the way, the Slide 6 that we
12 have been looking at, this would be a rotation of
13 the HOMO/LUMO levels of the electron transport
14 layer that includes both NET-5 and NDN-1; right?

15 A. That's what it says.

16 Q. Okay. And so even this would not be
17 representative of what the levels would look like,
18 relatively speaking, in the stack for NET-5;
19 correct?

20 A. It -- it would -- it's just showing
21 the -- the injection into the active region from
22 the transport layers into the active region. But,

1 like I said, you can infer that there's good work
2 function, matching between the -- the electrodes
3 and whatever the next layer is/are and the full
4 stack by the -- the relatively good voltage
5 levels.

6 Q. Do you know what the concentration of
7 what the NDN-1 dopant was in the OLED devices that
8 were measured in this paper?

9 A. I don't think that that information is
10 given in this -- in this slide deck, but I
11 would -- I guess, I would assume that if you're
12 buying their material, they would give you
13 guidance for that.

14 Q. Do you know the process by which NET-5
15 would have been doped with NDN-1?

16 A. Probably an evaporative process, but I
17 don't know for sure.

18 Q. So other than what's described in this
19 presentation, you don't have any knowledge of the
20 physical or electrical characteristics of NET-5;
21 correct?

22 A. That -- that demonstrates -- the

1 information in this presentation shows good
2 voltage performance, good lifetime, and good
3 efficacy. That -- that's the context of the usage
4 of -- of those materials, that they're
5 contributing to that, which means that they have
6 good conductivity, good work function matching,
7 and good performance overall, good lifetime.

8 So, you know, that's -- as a -- as a,
9 you know, basic maker of OLEDs, that would be a
10 lot of information and a -- a very promising start
11 to using this material.

12 And, like I said, I would assume, as a
13 customer, maybe I would have to sign an NDA, but
14 that there would be more information forthcoming.

15 Q. So I want to focus on what -- your
16 knowledge of NET-5. And other than what has been
17 described in this paper, you do not have other
18 information about the physical or electrical
19 characteristics of NET-5 when you rendered your
20 opinions in the case; right?

21 A. Yes.

22 Q. The same is true with -- for NDN-1

1 material; correct?

2 A. Yes.

3 And I would assume, Novaled has other
4 materials that they're offering to sell, but
5 that's -- but -- yeah. I don't know the specifics
6 of the material. I know -- I -- I take it at face
7 value that they work pretty well.

8 Q. And is it your understanding that
9 materials such -- like the Novaled NET-5 with
10 NET -- with NDN-1, the expectation would be that
11 that could be used as an electron transport layer,
12 along with -- in different OLED stacks that are
13 not necessarily comprised of all the same layers
14 as what would be provided as one complete, you
15 know, OLED device from Novaled's own material
16 sets?

17 A. It would really depend on the totality
18 of the device structure.

19 Q. Would you see this as -- would --
20 scratch that.

21 So going back to your Declaration -- if
22 we could go to Exhibit 2002 at paragraph 50. And

1 this is a raw quote from portions of Diekmann.

2 Now, Diekmann discloses that cesium,
3 barium, and lithium fluoride are n-dopants;
4 correct?

5 A. Yes.

6 Q. And if we refer back to Figure 2A, in
7 Diekmann, the organic layer of 402 that's adjacent
8 to the cathode is the layer that -- that would be
9 n-doped with dopants 410; right?

10 A. Yes.

11 Q. And so the role of cesium, barium and
12 lithium fluoride in Diekmann's OLED stack is that
13 of an n-dopant?

14 A. It is -- yeah, an electron donor dopant,
15 that's right.

16 Q. So your opinion is that Diekmann's
17 understanding of cesium, barium, and lithium
18 fluoride as n-dopants is consistent with a
19 POSITA's understanding, in your view, of what
20 makes something an n-dopant; right?

21 A. I think an n-dopant -- there's two
22 things there, n and dopant; n is electron and

1 dopant is, you know, a small kind of added
2 material.

3 So, yes, that -- that would be the
4 general understanding of -- of a POSITA trained in
5 this and working in this field.

6 Q. Okay. So my question was: Is -- is the
7 way Diekmann understands cesium, barium, and
8 lithium fluoride as n-dopants consistent with that
9 understanding?

10 A. Yes.

11 Q. In looking at LIF, when LIF is used as
12 the dopant in Diekmann's doped layer of 402, does
13 the -- how does the LIF work as an electron donor?

14 A. I believe Diekmann describes it as
15 donating an electron.

16 Q. And where, in Diekmann, does that
17 appear?

18 A. I don't -- I don't know offhand.

19 That -- that is the context that I
20 recall from Diekmann in all of its discussions of
21 n-dopant.

22 Q. You can -- you can take some time to

1 scroll through, and let me know if you can find
2 where Diekmann states that lithium fluoride acts
3 as an electron donor.

4 A. It's -- I don't have that tab.

5 Q. Oh.

6 MR. LEE: All right. Can we pull up,
7 please, tab 8 which is Exhibit 1004.

8 REMOTE TECHNICIAN: Stand by.

9 (Exhibit 1004 was marked for
10 identification and is attached to the
11 transcript.)

12 A. So at least here it's listed alongside
13 the other electron donors. But, I mean, let me
14 see if I can get more clarity.

15 Q. That's listing it as an electron
16 injecting layer material?

17 A. Yes.

18 Q. Are electron injecting materials
19 necessarily electron donors?

20 A. Not necessarily.

21 And -- and I will say, lithium fluoride
22 is known to be an electron injecting material.

1 Q. And which page were you referring to
2 just now that listed LIF?

3 A. Well, it's on page 5.

4 Q. Got it. Thank you.

5 A. Okay. Yeah. It's just showing it
6 there, in that -- in that context.

7 But I -- I believe, in general, lithium
8 fluoride can -- can also be an electron dopant,
9 and that's why I made that assumption, that it was
10 being used that way. But I -- I'd have to take a
11 longer review of this document to -- to make sure.

12 Q. Okay. So, sitting here today, is there
13 any other passage in Diekmann that, in your
14 opinion, discloses that LIF is an electron donor?

15 A. No. I'm just -- I don't think so.

16 I'm just doing a search on Diekmann
17 here. And I don't recall. So I think I'll --
18 yeah, I'll have to -- have to -- have to take a
19 longer time to review. But -- yeah. Today,
20 that's -- that's my understanding.

21 Q. So you just said that, in general,
22 lithium fluoride can be an electron donor. How

1 does lithium fluoride work as an electron donor?

2 A. That's -- that's just my recollection.

3 But it would -- it would work the same way as any
4 other electron donor. It would donate an electron
5 when it's put into this matrix, put into another
6 matrix.

7 Q. What is the precise mechanism by which
8 that occurs?

9 A. Usually, electron donors have chemical
10 properties that -- meaning that there's a -- kind
11 of an extra available electron to be contributed
12 to the matrix.

13 Q. So LIF is a molecule?

14 A. It's two -- two elements. So, yeah.

15 Q. And it's an insulating material;
16 correct?

17 A. Yeah, it is an insulating material.

18 Q. And it's -- you would expect that it
19 will have a wide band gap?

20 A. Yeah.

21 Q. Do you know lithium fluoride's HOMO/LUMO
22 levels?

1 A. I don't.

2 Q. So you don't know, one way or the other,
3 whether the energy gap between the HOMO of lithium
4 fluoride and the LUMO of electron transport
5 materials in Diekmann would be too much for
6 electron transfer to occur from n-doping with LIF;
7 correct?

8 A. When you use a material as a dopant,
9 it's -- it's just sprinkled in. It is a very
10 small concentration. So it doesn't dominate the
11 electron transport properties. It's -- really,
12 you're talking about whether -- whether an
13 electron will become available within the matrix
14 that you're using or the host material to
15 contribute to the total number of electrons.

16 Definitely, people use lithium fluoride
17 as an electron injection material or layer, even
18 though it's -- it's insulating. It can improve
19 the transfer of charge from -- from the electrode
20 into the device structure. If you kind of manage
21 the -- the thickness of it.

22 But, yeah, I don't -- I don't have the

1 HOMO/LUMO levels memorized for lithium fluoride.

2 Q. In a stack like Diekmann's 302A, lithium
3 fluoride as an n-dopant would be -- so lithium
4 fluoride would be present as the dopants 410 that
5 are present in doped layer 402 in Diekmann's
6 stack; correct?

7 MS. ZHONG: Objection, form.

8 A. Yeah. It's possible. It's one -- one
9 option.

10 Q. Right.

11 Now, there's a cathode 3 that sits right
12 on top of doped layer 402; correct?

13 A. Yes.

14 Q. When the cathode material is deposited
15 on the doped layer 402 that contains LIF dopant,
16 would there be a dissociation of lithium?

17 A. Well, you'd want to avoid that.

18 So it would just depend on the specifics
19 of the deposition process and the concentration
20 of -- of both those -- of lithium fluoride.

21 So it would depend on the deposition
22 process for layer 402, the concentration and

1 deposition approach for the -- the dopant. And
2 it'd depend on the deposition process for the
3 cathode.

4 Q. If it were to dissociate, it would help
5 promote injection of electrons from the cathode to
6 the transport layer; correct?

7 A. So you're saying if there are elemental
8 lithium available, it would promote charge
9 injection? Is that the question?

10 Q. That's the question.

11 A. It depends on the --

12 Q. What does --

13 A. -- on the cathode.

14 Q. What does it depend on?

15 A. It depends on the cathode material.

16 Q. The cathode material.

17 What about, assume the cathode materials
18 that are shown in Diekmann.

19 A. I don't recall exactly what they were.
20 I don't know, offhand, the material's
21 compatibility of those materials with -- with the
22 lithium. Could be other problems with

1 dissociation. So, yeah, I'd need -- I'd need more
2 context, more performance results to -- to know
3 what's happening.

4 Q. If lithium were to dissociate due to
5 deposition of the cathode, would that mean lithium
6 fluoride is acting as an electron donor, by virtue
7 of that dissociation?

8 A. Possibly, if the lithium is -- the
9 lithium's not an electron. Right? So you
10 dissociated the lithium and the fluoride. And now
11 you might have some electrons available from the
12 lithium to donate. Yeah, could be possible.

13 Q. If you could turn to Diekmann,
14 Exhibit 1004, and go to the bottom of page 3, the
15 paragraph that starts at the bottom of page 3 and
16 continues on to page 4.

17 Have you found the paragraph?

18 A. I have.

19 Q. Now, this paragraph describes some
20 exemplary cathode materials for Diekmann; correct?

21 A. Yes.

22 Q. Okay. And now with the understanding of

1 what the cathode material is, would you know, one
2 way or the other, whether using LIF as an n-dopant
3 in Diekmann's Fig. 2A would result in dissociation
4 of lithium?

5 A. No. It depends on how you deposit the
6 cath- -- the materials also.

7 Q. Okay. Well, there are certain methods
8 of depositing the cathode in which it is your
9 opinion that it could result in dissociation of
10 lithium?

11 A. Yes.

12 Q. What are those deposition methods?

13 A. Some sort of plasma or high-temperature
14 deposition method might -- might do it. You know,
15 it depends on the -- the matrix also, the host
16 material.

17 So -- so, yeah, you know, there's --
18 there's some dependencies here.

19 Q. Okay. So plasma and high-temperature
20 deposition methods. Any others that you're aware
21 of?

22 A. Yeah. Those might do it. You know, I

1 don't know if -- if -- some sort of shadow masking
2 or something like that, I think, would be less --
3 less likely to do it, but -- yeah.

4 Those -- those might have the potential
5 to dissociate the lithium fluoride dopant,
6 possibly, if -- and, you know, that might be --
7 might donate electrons, but it might -- it might
8 also have negative consequences of generating
9 elemental lithium that could cause problems within
10 your stack or cause other problems or -- or make
11 some kind of high-current channels or things like
12 that, some nonuniformities in your material.
13 So -- so, yeah. It's pretty context-dependent.

14 But just like you said, I think those
15 two types of deposition processes would be more at
16 risk for generating lithium or dissociating the
17 lithium fluoride.

18 Q. It also mentions that it might depend on
19 the matrix. You're talking about the material
20 into which lithium fluoride is built?

21 A. Yes.

22 And also the doping amount, the doping

1 concentration.

2 Q. And anything else?

3 A. Potentially could be time exposed to air
4 in between the fabrication processes, if there is
5 exposure to air. Ambient -- ambient gases in the
6 deposition process. Could be a lot of factors.

7 Q. Now, Diekmann discloses a complete OLED
8 device in showing Fig. 2A; right?

9 A. I think that's how he describes it.
10 There's some -- it's a little weird because he
11 doesn't label or acknowledge one of the layers,
12 but I believe that's meant to show a full OLED
13 device, yes.

14 Q. And you don't have reason to believe
15 that the Diekmann device stack that used the
16 materials that Diekmann itself discloses as being
17 used in that stack would not result in a
18 functional OLED; right?

19 MS. ZHONG: Objection, form.

20 A. You know, I really can't say without
21 knowing what that layer is, between 402 and 401
22 is.

1 Q. But you have not provided -- you've not
2 provided -- you have not provided an opinion that
3 Diekmann does not disclose a functional OLED
4 device; correct?

5 MS. ZHONG: Objection, form.

6 A. I've not explicitly provided that
7 opinion in my Declaration. I'm stating it now,
8 though.

9 I don't know what that layer is. And
10 it's hard to know, you know, what's going on there
11 without more information.

12 MR. LEE: Let's take a ten-minute break.
13 This has been going on just over an hour.

14 MS. ZHONG: Sure.

15 THE STENOGRAPHER: We're off the record.
16 (Recess in proceedings.)

17 THE STENOGRAPHER: We're on the record.

18 BY MR. LEE:

19 Q. Dr. Pattison, in Ma, doping the electron
20 transport layer with Liq improved conductivity;
21 correct?

22 A. Correct.

1 Q. And Ma refers to Liq as an n-dopant;
2 correct?

3 A. Yes, he does.

4 Q. And it describes Liq as n-doping
5 specifically the electron transport layer;
6 correct?

7 A. That's correct.

8 Q. And Ma understands -- strike that.

9 Now, Ma has several experimental results
10 showing comparisons of Liq-doped detailed devices
11 against reference devices without doping; correct?

12 MS. ZHONG: Objection, form.

13 A. Well, different levels of doping and --
14 well, he calls it doping. That's kind of up for
15 interpretation. But, yeah, different levels of
16 concentration of Liq in the -- in the beef end.

17 Q. And he does this comparative analysis
18 for a complete device that has both hole transport
19 layers and electron transport layers, as well as
20 for electron-only devices and hole-only devices;
21 correct?

22 A. Correct.

1 Q. And in each of those three cases, he
2 compares several devices with doped transport
3 layers, doped at various concentrations against a
4 reference device without doping; right?

5 A. That is correct.

6 Q. And what Ma found was that devices that
7 were n-doped at the ETL with Liq resulted in an
8 improvement over baseline devices without doping;
9 right?

10 MS. ZHONG: Objection, form.

11 A. Yeah, that's -- that's the issue. It
12 shows an improvement, but it doesn't show anything
13 anywhere near the state-of-the-art voltage levels
14 as indicated by -- by Novaled.

15 So it's still a pretty crappy device.
16 And, you know, marginal voltage improvement
17 wouldn't -- you know, you wouldn't expect that
18 apply -- to apply to a state-of-the-art device.
19 So he did show that.

20 He showed a relative improvement on a
21 research-grade device of a -- with a fluorescent
22 emitter in a specific matrix material, if you

1 will. So -- so he did show that.

2 But the interpretability -- blah.

3 The interpretability or the -- the, you
4 know, broader motivation to explore that is -- is
5 really not demonstrated in that -- in that paper.

6 Q. Now, Ma was able to create all of these
7 different devices at various doping concentrations
8 and determine, experimentally, the optimal Liq
9 doping level for its stack; right?

10 A. Yeah. For the host matrix and for the
11 emitter, the fluorescent emitter, and for the --
12 the -- the p-side injection layers. He was able
13 to optimize that structure, which is essentially a
14 research-grade OLED structure.

15 And I don't think he reports the -- you
16 know, in terms of optimization. He's only
17 optimizing one parameter and not -- not reporting
18 anything about lifetime or stability of -- of
19 the -- of the device.

20 Q. Okay. And Ma was able to determine the
21 optimal doping level that ensures appropriate
22 charge balance forward stack; correct?

1 A. Yeah. Optimum for that baseline and
2 that stack, that's right.

3 Let me just add, though, it's only a
4 voltage and -- and to the extent a voltage
5 influences efficacy optimum.

6 It's not an optimum in terms of
7 reliability or stability. We don't -- we don't
8 have that information. You can't -- we can't
9 discern that.

10 Q. Now, Ma created its n-doped electron
11 transport layer by co-deposition of Bphen and Liq
12 on the emission layer; correct?

13 A. Yes. I believe that's correct.

14 Q. And Ma was able to vary the n-doping
15 concentration for the electron transport layer as
16 part of this process; correct?

17 A. Yes.

18 Q. And doing something like that is -- is
19 pretty routine to a person of ordinary skill in
20 the art at the time of the '425 patent; right?

21 A. If you had the -- the equipment, you
22 know, and kind of the baseline starting point

1 available and you're -- you're exposed to that, I
2 would say it would be routine for -- like we're
3 talking about, a bachelor's level person to
4 make -- make those changes in the lab. Probably
5 directed by a more Ph.D. or senior-level
6 scientist.

7 Q. Right.

8 So once you -- once you already have a
9 process for co-deposition, it's the matter of just
10 adjusting the dopant concentration, using the same
11 method. That's routine; correct?

12 A. Yeah.

13 Q. Likewise, you know, once you -- varying
14 the thickness of the layers of the OLED stack was
15 also within the skill of a person of skill; right?

16 A. Well, like -- I guess, I'm saying it's
17 routine to turn these knobs. Right? But the --
18 predicting the results would not be routine. That
19 would take more -- a higher level of understanding
20 to, you know, not just be kind of throwing stuff
21 against the wall.

22 You know, someone -- some lab person

1 could be in there making these adjustments, but
2 they -- you know, what -- what they mean or all of
3 the implications for performance, I'd say, go
4 beyond -- go beyond routine. And that's why this
5 is done at a research lab and, you know, directed
6 by -- by high-level researchers and professors.

7 Q. Once you have the process for depositing
8 a given layer of the OLED stack, varying the
9 thickness of that layer using the same deposition
10 process is well within the ability of a person of
11 skill; correct?

12 MS. ZHONG: Objection, form.

13 A. Correct.

14 But they wouldn't be able to predict the
15 results, like when -- when it rolls over, like 50
16 percent is too much, 33 percent is the optimum.
17 There would be no kind of predictive ability or
18 expectation of -- of performance from making those
19 changes.

20 MR. LEE: If we could have -- have
21 tab 11, which is premarked Exhibit 1010,
22 uploaded to the chat; shown on the screen for

1 the witness, please.

2 (Exhibit 1010 was marked for
3 identification and is attached to the
4 transcript.)

5 Q. Now, this is the Ma reference that we
6 have just been discussing; correct?

7 A. Correct.

8 Q. Now, looking at the first page of Ma, do
9 you see on the left a section called Article Info?

10 A. Yes.

11 Q. Under that, there's a smaller subsection
12 called Article History?

13 A. Yes.

14 Q. It says, "Received 11 March 2008,
15 accepted 14 May 2008, and available online 29
16 August 2008."

17 Correct?

18 A. I see that, yes.

19 Q. And this article history doesn't include
20 any indication that there were any revisions to
21 the article; correct?

22 MS. ZHONG: Objection, form.

1 A. It doesn't show that there in the
2 information.

3 Q. Now, we've talked about a couple of
4 n-type dopants earlier. Particularly with respect
5 to Diekmann. We talked about cesium, barium, and
6 lithium fluoride.

7 Do you recall that?

8 A. I do.

9 Q. If barium is used as an n-dopant in an
10 OLED stack, would it act -- would it act as a
11 luminance quencher?

12 A. If barium was used?

13 Q. Yes.

14 A. It -- it depends on the concentration,
15 the emitter material, the -- the emitter host
16 material. A lot -- a lot of factors.

17 Q. If cesium is used as an n-dopant in an
18 organic layer that is directly adjacent to the
19 cathode, could that cesium act as a luminance
20 quencher?

21 A. Potentially.

22 Q. Sorry. I think I said "cesium."

1 So if barium is used as an n-dopant in
2 an organic layer that's directly adjacent to the
3 cathode, could that barium act as a luminance
4 quencher?

5 MS. ZHONG: Objection, form.

6 A. Potentially.

7 Q. And would your answer be the same if
8 lithium fluoride were used as the n-dopant?

9 A. Yeah.

10 I think any -- given the context, any
11 dopant can ultimately quench emission. You know,
12 it depends entirely on the totality of the stack,
13 the deposition process, you know, the -- the
14 layer -- the layer structure, the thicknesses of
15 the layer that -- you know, it just depends.
16 But -- but, yeah, it could potentially act as a
17 quencher also.

18 Q. So keeping everything else in the OLED
19 device stack the same, if you were to create three
20 devices, one with cesium dopant, one with barium
21 dopant, and one with lithium fluoride dopant in a
22 stack that looks like Fig. 2A of Diekmann --

1 A. Yes.

2 Q. -- which -- do you have that?

3 A. Yeah.

4 Which would quench -- are -- are you
5 asking --

6 Q. So -- yeah. So -- let me -- let's -- to
7 be clear -- so let me just ask that question.

8 Do you have that -- do you have those
9 devices in mind?

10 A. I do.

11 I can -- let me just go ahead and pull
12 that up. Which exhibit is that? Or I can do it
13 from my -- my Declaration also. If you can just
14 also tell me where it is again.

15 Q. Your Declaration, it should be
16 paragraph 45.

17 A. Of the first one?

18 Q. Yes.

19 A. Oh. There it is. Yeah. I see it.

20 Q. Okay. So do you have in mind three
21 example device stacks, one with barium as a
22 dopant, one with cesium as a dopant, and one with

1 lithium fluoride as a dopant?

2 A. I do.

3 Q. What would be the expectation of a
4 POSITA in terms of which of those would quench --
5 would act more as a luminance quencher?

6 MS. ZHONG: Objection, form.

7 A. I think it still depends. There's not
8 detail or performance information on this stack,
9 like I don't -- still don't know what the mystery
10 layer is. And -- you know, so that -- the
11 blocking of quenchers, if that's what that role is
12 of that layer, I don't know.

13 The specific blend of emitters, I don't
14 know.

15 You know, I will say, in all -- yeah.
16 It just depends on -- on the whole context.

17 Q. Now, if those what you call "mystery
18 layers" are blocking layers, would that be able to
19 alleviate the quenching effects of n-dopants in
20 Diekmann's Fig. 2 stack?

21 A. Potentially.

22 Q. I want to ask you about charge balance

1 in a -- in an OLED device. There are references
2 in your Declaration to requiring design
3 considerations to ensure good charge balance to --
4 to make a good OLED; right?

5 A. Yes.

6 Q. So what does charge balance refer to?

7 A. Ultimately, you want the same number of
8 holes arriving in the active region as the number
9 of electrons there and available to recombine to
10 generate light.

11 And if you have in excess of one, which
12 means a shortage of the other, those kind of free
13 species can cause quenching and lifetime
14 degradation. So you want to have the same -- same
15 number. And you want to kind of have the right
16 dwell time in the -- in the active region, and not
17 have those -- those species going and looking for
18 other damaging activities, basically.

19 And so that's -- that's one of the
20 differences between fluorescent devices and
21 phosphorescent devices. Phosphorescent devices
22 are much more sensitive to -- to charge imbalances

1 than the fluorescent devices.

2 But that's -- that's basically the --
3 the design consideration. You want to try to
4 deliver equal amounts of both electrons and holes
5 to the active region and have them get spread out.

6 And one way you can kind of manage that
7 is to create a potential barrier on either side to
8 block the excess and have them wait around and not
9 get in.

10 And you also don't want to recombine the
11 electrons and holes outside in the active region
12 where they can recombine non-radiatively and cause
13 damage or emit light you don't want and basically
14 reduce efficiency.

15 Q. You have two OLED device stacks that
16 have the same electrodes. Would you seek to have
17 different energy levels for the ETLs in each of
18 those devices?

19 MS. ZHONG: Objection, form.

20 A. Potentially, yes.

21 Q. Why?

22 A. Depends on your active region and your

1 emitter materials.

2 Q. Go to -- if you could go to page --
3 paragraph 134 of your first Declaration.

4 A. Yeah. I see it.

5 Q. Now, in Ma, we were just talking about
6 how Ma has examples of electrons-only devices and
7 hole-only devices; right?

8 A. Yes.

9 Q. Would there be a hole surplus in a
10 electron-only device?

11 A. In electron-only device? I think you
12 just have electrons.

13 Q. So there wouldn't be a surplus of holes
14 that needs correction by doping the ETL in an
15 electron-only device with Liq; correct?

16 MS. ZHONG: Objection, form.

17 A. Electron-only device is not a full
18 device. It's not -- not measuring light output.
19 He's measuring electrical characteristics.

20 So it's not -- you can't take a lot away
21 from that in terms of device structure. He's
22 using those -- those proxy devices to determine

1 the -- the injection characteristics.

2 So there's no -- no device performance.

3 So you -- I don't think you can read anything out
4 of that except what he reads, which is that, you
5 know, the -- the lithium fluoride's, you know,
6 helping with charging balance.

7 MR. LEE: Let's take a break.

8 MS. ZHONG: Sure.

9 (Recess in proceedings.)

10 THE STENOGRAPHER: We're back on the
11 record.

12 MR. LEE: So I have further questions at
13 this time, and I will pass the witness.

14 MS. ZHONG: Okay. Sorry. Can we take
15 some break? Why don't we set it at
16 45 minutes, and if I can get back before
17 then, I will just put a message in the chat.
18 Does that work for everyone?

19 THE WITNESS: Fine for me.

20 MS. ZHONG: Okay.

21 MR. LEE: 45 minutes is a little bit of
22 time to just be sitting here.

1 MS. ZHONG: Well, you could have told me
2 that you are almost running out of...

3 MR. LEE: Oh. I was checking my notes.

4 MS. ZHONG: Okay. I'll aim for 30, but
5 your colleague last time, when I said 30, I
6 didn't come back in 30 and she was
7 complaining, so I thought I would just give
8 it more time.

9 So, at any rate, I will probably just --
10 when I'm ready to go back on, I'll put a
11 message to everybody when I will be back.
12 Does that work?

13 MR. LEE: As long as we're --

14 MS. ZHONG: Okay.

15 MR. LEE: -- in a reasonable amount of
16 time.

17 MS. ZHONG: Okay. Let's go off the
18 record, then.

19 THE STENOGRAPHER: We're off the record.

20 (Recess in proceedings.)

21 THE STENOGRAPHER: We are back on the
22 record.

1 MS. ZHONG: Okay.

2 EXAMINATION

3 BY MS. ZHONG:

4 Q. Dr. Pattison, do you recall discussion
5 with counsel about your work at DoE?

6 A. I do.

7 Q. You have managed hundreds of OLED
8 projects over the years for the DoE; is that
9 correct?

10 A. I would say hundreds of lighting
11 projects, OLED and LED.

12 Q. Okay. Do you recall any of those --
13 strike that.

14 For the OLED projects you have managed
15 over the years, do you recall any of them involved
16 the use of lithium quinolate as an n-dopant in ETL
17 layer?

18 A. I do not.

19 Q. And do you recall the use of lithium
20 quinolate in ETL layer of electron transport layer
21 in general over the years?

22 A. I do not.

1 Q. Okay. You mentioned that when you first
2 got it, the OLED programs that you were managing
3 were for solid-state lighting. Do you recall that
4 discussion?

5 A. I do.

6 Q. Is that different from OLED -- strike
7 that.

8 Is the use of OLED in solid-state
9 lighting different than use of OLED in displays?

10 A. It can be. There's a lot of overlap.

11 But lighting and displays drive
12 different architectures of OLEDs and different
13 material sets and have different cost constraints
14 so they're -- that -- like I say, it's a lot of
15 the time that underlying materials are very
16 similar but the -- the -- and ultimate
17 architectures are pretty different.

18 Q. Okay. So when OLED is used as
19 backlighting source, is there a separate display
20 panel before the backlight?

21 A. If -- if you use an OLED panel as a
22 backlight, that -- that -- that would mean there

1 has to be, at least through technology, a liquid
2 crystal layer in between to generate the images
3 and filter the white light into colored light.

4 Q. If you use the OLED as backlighting
5 source, does it make sense to include
6 touch-sensing components into the OLED?

7 MR. LEE: Objection, outside the scope.
8 Objection, leading.

9 A. If -- if you were using OLEDs as a
10 backlight, you -- you would put the touch sensor
11 essentially on the liquid crystal portion of the
12 display, not -- not the OLED portion of the
13 display.

14 Q. Why is that?

15 A. Well, because the liquid crystal --

16 MR. LEE: Objection. Again, outside the
17 scope.

18 A. Liquid -- liquid crystal portion would
19 be the front -- front part of the display because
20 the backlight is necessarily behind the liquid
21 crystal. So you -- the -- the -- you would
22 integrate the touch sensor with the liquid

1 crystals.

2 Q. Okay.

3 MS. ZHONG: Can you please pull up
4 Exhibit 1001, which I believe is tab
5 number 7.

6 REMOTE TECHNICIAN: Stand by.

7 MS. ZHONG: And can you please go to
8 page 107, PDF page 107, claim 1, the bottom
9 of -- of that column. Yeah.

10 Q. So claim 1 recites, "A device comprising
11 an organic light-emitting" device -- "diode
12 comprising," et cetera, et cetera.

13 Do you see that?

14 A. I do.

15 Q. And an organic light-emitting diode
16 basically -- strike that.

17 OLED stands for organic light-emitting
18 diode; correct?

19 A. Correct.

20 Q. Does a reference to an OLED imply
21 certain threshold light output and operating
22 voltages?

1 A. It implies a threshold voltage, right.
2 So that's how a diode works, is, like, you have an
3 IV curve with a turn-on voltage. So if your
4 voltage is below the turn-on voltage, no current
5 flows. And, then, if it's above the turn-on
6 voltage, then you start to have current flow.

7 And -- and, then, for -- for it to be a
8 light-emitting diode, then the light output has to
9 be a function of the current, of the current
10 that's flowing. So that's -- that's the
11 definition of an OLED.

12 And also, if you go to a negative
13 voltage, no -- no light comes out.

14 Q. Okay. So if in the active region of the
15 OLED the operating voltage is 10 volts and above,
16 would a person of ordinary skill in the art
17 consider that -- still consider that to be an
18 OLED --

19 MR. LEE: Objection, outside the scope.

20 Q. -- it's a device where is a different
21 operating principle?

22 MR. LEE: Objection, outside the scope.

1 Objection, leading.

2 A. I would -- I would say the visible light
3 voltages and the voltage range that's described in
4 these patents for an OLED relate to -- well, the
5 wavelength range -- sorry.

6 The spectrum described in this -- in
7 the -- in these -- all of these OLEDs we've been
8 talking about were all indivisible light. And
9 visible light has a turn-on voltage between, like,
10 2.5 volts and -- and 1.8 volts, or something like
11 that. Right? And that's -- that's a physical
12 relationship between the -- the energy of the
13 light output being emitted and the -- and the
14 voltage barrier to achieve that energy.

15 So if I have a -- a blue OLED for
16 50 nanometers, for example, then the -- the
17 threshold voltage -- not counting other resistive
18 layers and energy barriers, but the threshold
19 voltage for that emission process would be, like,
20 2.7 volts.

21 There could be some additional voltages,
22 there always are, that -- that increase that, and

1 resistances also, which -- which affect the IV
2 curve. But if someone just put a 10-volt light
3 emitter in front of me and asked if this was an
4 OLED, unless it's like a mid -- mid-range IR
5 device or -- or just a really, really terrible
6 device, I would say probably not, it's probably
7 some sort of other type of light emission process
8 going on.

9 Q. Okay. So even though the kind does not
10 expressly recite any particular voltages,
11 et cetera, by virtue of referencing an OLED there
12 is an implied threshold operating voltage and
13 light output; is that correct?

14 MR. LEE: Objection, leading.

15 THE WITNESS: Sorry.

16 A. No. Yeah. There is a hundred --
17 absolutely an implied voltage in the active region
18 is what you have, so. My mistake.

19 When I -- you know, so the active region
20 voltage will be absolutely relatable to the -- and
21 directly relatable to the wavelengths of emission
22 from that device or the shortest wavelength of

1 emission if you have a multicolor device and it's
2 a singular function, so. And this is -- what I'm
3 saying applies to each junction. So you can have
4 multi-junction.

5 But if you said an OLED or an LED, that
6 means it has a turn-on voltage, it has diode
7 behavior, which means it doesn't turn on negative
8 voltage. It has a -- a -- a characteristic
9 current voltage relationship, and there's a
10 relationship between the light output and the --
11 and the current, not -- not necessarily the
12 voltage.

13 Q. Okay. Do you recall discussion with
14 counsel regarding how the n-dopants are supposedly
15 distributed within the electron transport layer?

16 A. Yeah. The gradient kind of discussion.

17 Q. Yeah.

18 Is there anything in Ma that indicates
19 Ma has a gradient concentration of lithium
20 quinolate in the Bphen layer?

21 A. No.

22 He just -- the gradient would be -- so

1 it's co-deposited, in my recollection, in Ma. The
2 two different materials, they're deposited
3 together. And there's no mention made of -- of a
4 gradient. So the -- the universal assumption
5 would be that it's -- it's not a gradient, it's
6 just a -- a static deposition.

7 Q. Is there a block layer between Ma's
8 lithium quinolate Bphen layer and its emitting
9 layer?

10 A. No.

11 Q. Does Ma indicate how its device would
12 perform if a blocking layer is inserted between
13 its Bphen electron transport layer and the
14 light-emitting layer?

15 A. That wasn't part of Ma's discussion or
16 experiment.

17 Q. Would a person of ordinary skill in the
18 art necessarily expect that the conductivity would
19 be -- would be improved if there is such a
20 blocking layer between the electron transport
21 layer and the emission layer?

22 MR. LEE: Objection, outside the scope.

1 A. Normally, a blocking layer incurs a
2 voltage penalty by creating a potential barrier
3 for the -- for the charges to -- to move. So --
4 so it would -- it would -- it's a -- kind of a
5 tradeoff space, where you might use a blocking
6 layer to improve charge balance or to reduce
7 quenching, but it would have a -- almost always
8 have a negative impact on -- on applied voltage.

9 Q. Okay. Do you recall discussion with
10 counsel of substituting a single layer within a
11 known OLED stack and the resulting performance?

12 A. I do.

13 Q. Okay. Would a person of ordinary skill
14 in the art be able to predict the change
15 precipitated by substituting Diekmann's electron
16 donor n-dopant with lithium quinolate?

17 MS. ZHONG: Objection, outside the
18 scope.

19 A. No. I mean, clearly that's not
20 predictable and wasn't predictable at the time of
21 the patent. It's -- yeah, it's -- it's a big
22 change.

1 And, you know, you're not just changing
2 one thing. You're changing also the -- the --
3 well, it's not predictable because you don't know
4 what the -- the electron transport layer would be
5 that you're using the host.

6 And the mechanism's changing. And --
7 and the only guidance you might have is -- is with
8 Ma, which has a different -- a different emission
9 material, type of emission material, and different
10 charge balance considerations. So it would -- it
11 would not be predictable at all to, you know, what
12 would happen.

13 Q. You said there's a difference in
14 mechanism. What is the mechanism that Ma
15 speculates or hypothesizes the improvement in the
16 conductivity results from?

17 MR. LEE: Objection, outside the scope.

18 A. His speculation is that it's charge
19 hopping kind of between the interfaces of the
20 mixed materials, the lithium quinolate and the
21 Bphen, you know, so that it's not -- it's not a
22 result of increased electron concentration, it's

1 the result of -- of improved mobility of the
2 existing electrons. That was his speculation.

3 And on the contrary, with the hole --
4 the hole side of the equation, he's pretty clear
5 that that's -- that he's affecting the hole
6 concentration.

7 Q. In Ma's device -- if you can pull up tab
8 11, Exhibit 1010, page 811, his experiment.

9 MR. LEE: We don't have to show it on
10 the screen.

11 Q. Dr. Pattison, if you have access to that
12 document locally.

13 A. It's on the screen.

14 Q. Okay. So in experiment for Ma's OLED
15 device, what is between the Bphen lithium
16 quinolate layer and the aluminum cathode?

17 MS. ZHONG: Objection, outside the
18 scope.

19 A. It's a -- a lithium fluoride,
20 1 nanometer lithium fluoride layer.

21 Q. And what's the function of that lithium
22 quinolate layer?

1 MR. LEE: Objection, outside the scope.

2 A. That would be an electron injection
3 layer.

4 Q. Is there such an electron injection
5 layer in the Diekmann device structure?

6 MR. LEE: Objection, outside the scope.

7 A. I don't -- I don't -- yeah, I don't
8 recall that -- that -- Diekmann's using the term
9 or claiming lithium fluoride -- need lithium
10 fluoride as an electron injection layer. I
11 don't -- I don't think he -- he uses that.

12 Q. Okay. And in Ma, the emitter layer is a
13 pure aluminum quinolate layer or aluminum Q3; is
14 that correct?

15 MR. LEE: Objection, outside the scope.

16 A. It's ALQ3, yes.

17 Q. Okay. Do you know what is the middle
18 layer in Diekmann's Fig. 2A structure?

19 MR. LEE: Objection, outside the scope.

20 A. It's some phosphorescent iridium-based
21 material, by my recollection. So it's -- it's a
22 phosphorescent material; whereas, this is a

1 fluorescent material.

2 This is -- this is basically, in Ma, a
3 very simple research-level device. And in
4 Diekmann, the -- the active region is a
5 phosphorescent material or materials blend.

6 Q. Why don't we just pull up Exhibit 1004,
7 which is tab 8, Diekmann. And let's go to
8 original page 91. And I believe it's PDF page 94.

9 A. Okay.

10 Q. Okay. Why don't you read to yourself
11 the second and third paragraph.

12 MR. LEE: This is outside the scope.

13 A. Okay.

14 Q. Okay. So is it the case that in
15 Fig. 2A, the emitter is not a single-color emitter
16 but there are actually three stacks with --

17 MR. LEE: Objection, form.

18 Q. For example, what is -- first of all, a
19 thickness of approximately 20 nanometers,
20 SEB-010:SEB020 layer, then with a thickness of a
21 10 nanometer -- an iridium belt layer, then with a
22 thickness of about 10 nanometer and then a

1 TMM-04:TER012 layer.

2 Do you see that?

3 MR. LEE: Objection, outside the scope,
4 leading.

5 A. Yes, I see that.

6 I mean, the last sentence says, "This
7 organic layer stack is suitable for emitting white
8 light."

9 And that was a clarification I provided
10 earlier on. You know, white light, you really
11 need a multi-emitter system to -- to make that
12 light.

13 Q. Okay. So instead of a single-emitter
14 layer, you basically have three emitter layers
15 stacked on top of each other; is that correct?

16 A. They can be --

17 MR. LEE: Objection, outside the scope
18 and leading.

19 A. They can be stacked or intermixed.

20 Q. Okay. Would they require different
21 charge balance considerations?

22 MR. LEE: Objection, outside the scope

1 and leading.

2 A. Yes.

3 Q. So as among the three different color
4 emission layers, each would have a -- different
5 charge balance considerations; is that correct?

6 MR. LEE: Same objections.

7 A. You would take the active region as a
8 whole, having charge balance considerations. So
9 you'd want to balance the -- the concentration
10 materials to -- to emit a white light. You know,
11 you wouldn't want to have, like, mostly blue and
12 just a little bit of red or green. So it'd be,
13 you know, a complicated kind of balancing act.

14 And, then, you want to make sure you
15 kind of have the -- the -- the charge -- charge
16 supply, you know, also being balanced to, you
17 know, connect with each emitter material.

18 And, then, you also want to be very
19 careful about quenching because -- because
20 phosphorescent materials are much more susceptible
21 to quenching.

22 Q. Okay. So it's a much more complicated

1 system than the single-emitter system in Ma; is
2 that correct?

3 MR. LEE: Objection, outside the scope
4 and leading.

5 A. Yeah.

6 It's kind of like a Ferrari versus a
7 Model T, something -- it's a -- it's different.

8 Q. Let's take a look at the last paragraph.

9 Do you recall discussion with counsel
10 where he asked you where in Diekmann it says
11 lithium fluoride acts as an electron donor?

12 Do you recall that discussion?

13 A. I do recall that discussion.

14 Q. Okay. Take a look at the last
15 paragraph. And starting from the sixth -- sixth
16 line from bottom, starting with the sentence, "On
17 it's outer side facing the cathode..."

18 A. Yeah. The -- the dopant 410 can be, for
19 example, cesium, barium, or lithium fluoride.
20 Yeah.

21 I'm sorry. In my haste, I was just
22 searching LIF and -- and missed this.

1 But, yeah, clearly, Diekmann is
2 intending for lithium fluoride to act as an
3 electron donor dopant.

4 Q. Okay. So here, Diekmann is saying
5 dopant 410 acts as electron donor and, as
6 examples, lithium fluoride is one such electron
7 donor dopant example; is that correct?

8 A. Yes.

9 MR. LEE: Objection, leading.

10 Q. Do you recall discussion with counsel of
11 the use of NET-5 with NDN-1?

12 A. I do.

13 Q. Okay. Why don't we go to page 5 of
14 Diekmann, which I believe is PDF page 8.

15 A. Okay.

16 Q. Okay. So in Diekmann NET-5 with NDN-1
17 is used as electron injecting layer; is that
18 correct?

19 MR. LEE: Objection, leading.

20 A. That's -- yeah, that's what this says.

21 Q. And Diekmann lists a separate set of
22 materials for its electron conducting layer; is

1 that correct?

2 MR. LEE: Objection, leading.

3 A. Yeah. In the -- in the paragraph above,
4 it describes electron-conducting layer materials
5 and then it describes electron-injecting layer
6 materials.

7 Q. Okay. So if you already have an
8 electron transporting layer or electron conducting
9 layer, would it make sense to use NET-5 with NDN-1
10 as a second transporting layer?

11 MR. LEE: Objection, beyond the scope.

12 A. I don't -- I don't know -- yeah, no, it
13 wouldn't.

14 Q. Do you recall discussion with counsel
15 regarding the properties of NET-5 and NDN-1?

16 A. I do.

17 Q. Okay. Those materials were available
18 from Novaled; is that correct?

19 MR. LEE: Objection.

20 A. I believe -- I believe so. That would
21 be why they're promoting them and advertising
22 them. I never -- I never bought them myself.

1 Q. Okay. Do you -- a person of ordinary
2 skill in the art would know how to test for the
3 relative energy levels of NET-5 and NDN-1 compared
4 to materials in the -- strike that.

5 So if a person of ordinary skill in the
6 art had access to NET-5 and NDN-1, physical
7 samples, would they know how to manage the
8 relative energy levels of those two materials
9 compared to the other organic layers in the stack?

10 MR. LEE: Objection, outside the scope.

11 A. Yeah, that would be -- that would be
12 pretty simple.

13 Q. Do you recall a discussion with counsel
14 regarding the routineness or ease of making
15 changes to concentrations and thickness in Ma's
16 devices?

17 A. I do.

18 Q. Okay. Would a person of ordinary skill
19 in the art even know how to design the experiments
20 in order to make the appropriate concentration of
21 thickness changes?

22 MR. LEE: Objection, leading, outside

1 the scope.

2 A. No.

3 The way the -- the skill level of the
4 person of skill in the art that we've been talking
5 about is not someone designing experiments with
6 new kind of untested materials. They'd be more a
7 person operating the machine under the direction
8 of a professor or a more senior researcher, maybe
9 someone with a Ph.D.

10 Q. Okay. So the people who would design --
11 strike that.

12 So based on your knowledge and
13 experience, the person who would design the
14 experiments would be a person with high skill
15 levels than that designed for a person of ordinary
16 skill in the art; is that correct?

17 MR. LEE: Objection, outside the scope.

18 A. I agree. That's my experience.

19 Q. Do you recall discussion with counsel of
20 an electron-only device and whether it is an OLED
21 device?

22 A. I do.

1 Q. Okay. I believe you said an
2 electron-only device is not an OLED device; is
3 that correct?

4 A. It's got to have an active material and
5 it has to have electrons and holes being delivered
6 to the active emitting material in order for it to
7 be an actual OLED device.

8 Q. And when you say "active material,"
9 you're -- are you referring to the light-emitting
10 layer?

11 A. Yes.

12 MR. LEE: Objection, leading.

13 Q. Okay. So an electron-only device and a
14 hole-only device do not have an emitting layer; is
15 that correct?

16 A. That's correct.

17 MS. ZHONG: Okay. That's all the
18 questions I have.

19 And I will pass the witness.

20 MR. LEE: Let's just take five.

21 MS. ZHONG: Okay.

22 MR. LEE: Go off the record.

1 THE STENOGRAPHER: We're off the record.

2 (Recess in proceedings.)

3 THE STENOGRAPHER: We are on the record.

4 MR. LEE: Thank you for your time today,
5 Dr. Pattison. I have no further questions.

6 MS. ZHONG: Have a nice weekend,
7 Everyone.

8

9

10 AND FURTHER THIS DEPONENT SAITH NOT.

11 SIGNATURE RIGHTS RESERVED.

12 (Deposition concluded at 6:55 p.m.)

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1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

2 I, April Reid, Registered Professional
3 Reporter, Certified Realtime Reporter and Notary
4 Public within and for the State of Florida do
5 hereby certify:

6 That P. MORGAN PATTISON, Ph.D., the
7 witness whose deposition is hereinbefore set
8 forth, was duly sworn by me before the
9 commencement of such deposition and that such
10 deposition was taken before me and is a true
11 record of the testimony given by such witness.

12 I further certify that the adverse
13 party, SAMSUNG DISPLAY CO., LTD., was represented
14 by counsel at the deposition.

15 I further certify that the deposition of
16 P. MORGAN PATTISON, Ph.D. occurred remotely via
17 Zoom on FRIDAY, JULY 25, 2025, from 12:01 p.m.
18 Eastern Standard Time to 6:55 p.m. Eastern
19 Standard Time.

20 I further certify that I am not related
21 to any of the parties to this action by blood or
22 marriage, I am not employed by or an attorney to

1 any of the parties to this action, and that I am
2 in no way interested, financially or otherwise, in
3 the outcome of this matter.

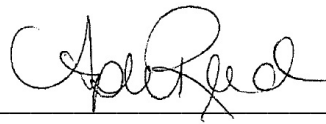
4 IN THE WITNESS WHEREOF, I have hereunto set my
5 hand this 5th day of August, 2025.

6

7

8

9

A handwritten signature in cursive script, appearing to read "April Reid", is positioned above a horizontal line.

10

April Reid, RPR, CRR, Notary Public

11

State of Florida, County of Orange

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Commission No. 455787/HH 436060

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Expires: August 22, 2027

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