

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3 SAMSUNG DISPLAY CO., LTD.,)
4)
5 Petitioner,)
6)
7 vs.)
8) CASE NO. IPR2024-01095
9) PATENT NO. 11,828,425
10 PICTIVA DISPLAYS)
11 INTERNATIONAL, LTD.,) B2
12)
13 Patent Owner.)

8
9
10
11 REMOTE DEPOSITION UPON ORAL EXAMINATION OF
12 RUSSELL HOLMES
13 HIGHLY CONFIDENTIAL
14 ATTORNEY'S EYES ONLY
15

16 WEDNESDAY, SEPTEMBER 3, 2025
17 6:05 A.M. (PACIFIC STANDARD TIME)

18 (All participants appeared remotely)
19

20 TAKEN AT THE INSTANCE OF THE PETITIONER
21
22
23

24 REPORTED BY:
25 MONNA J. NICKESON, RPR, CRR, CCR, CSR CA 14430
JOB: 7567672

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I N D E X

SAMSUNG DISPLAY VS. PICTIVA DISPLAYS

CASE NO. 2:23-cv-486

WEDNESDAY, SEPTEMBER 3, 2025

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IDENTIFIED/MARKED EXHIBITS

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1 BE IT REMEMBERED that on WEDNESDAY,
2 SEPTEMBER 3, 2025, at 6:05 A.M. (PACIFIC
3 STANDARD TIME), the remote deposition of
4 RUSSELL HOLMES was taken before Monna J.
5 Nickeson, Certified Realtime Reporter,
6 Registered Professional Reporter, Certified
7 Livenote Reporter, Certified Court Reporter
8 (WA 3322), Certified Shorthand Reporter (ID
9 1045), (OR 16-0441), (CA 14430), the
10 following proceedings took place:

11 * * * * *

12 THE COURT REPORTER: My name is
13 Monna Nickerson. I am a Certified Realtime
14 Reporter, a Certified Court Reporter in
15 California, license number 14430.

16 Doctor, can you please raise your
17 right hand to be sworn?

18 RUSSELL HOLMES
19 having been first duly sworn to tell the truth, the
20 whole truth, and nothing but the truth,
21 testified as follows:

22 EXAMINATION

23 BY MS. ZHONG:

24 Q. Good morning, Professor. Can you
25 please state your name for the record?

1 A. My name is Russell Holmes.

2 Q. Professor, you submitted two
3 declarations in this proceeding, correct?

4 A. Yes, I submitted two declarations in
5 this proceeding.

6 Q. And they are Exhibit 1003 and
7 Exhibit 1044, correct?

8 (Exhibit 1003 was identified.)

9 (Exhibit 1044 was identified.)

10 THE WITNESS: Correct, that's right.

11 BY MS. ZHENG:

12 Q. And do you believe that you need
13 Exhibit 1044 to make the case of obviousness
14 for claims 2 and 19 -- 17?

15 MR. LEE: Objection. Calls for a
16 legal conclusion.

17 THE WITNESS: I'm sorry, could you
18 repeat the question? I don't think I heard
19 all of it.

20 BY MS. ZHONG:

21 Q. Okay. Do you think that you need
22 Exhibit 1044 to make your case for obviousness?

23 MR. LEE: Objection. It calls for a
24 legal conclusion.

25 THE WITNESS: So, again, I'm not

1 entirely sure what you mean by "do I need?"

2 I think my opinion is quite clear in
3 my original declaration. And my response
4 and my reply declaration is responding
5 directly to the issues raised by
6 Dr. Pattison.

7 BY MS. ZHONG:

8 Q. Do you think you need the evidence
9 in your reply declaration?

10 A. Again, I don't know what you mean by
11 "need." I think the evidence in my reply
12 declaration is consistent with what I showed in
13 my original declaration.

14 Q. So do you think that your
15 original -- strike that.

16 So do you think that the exhibits
17 attached to your original declaration are
18 sufficient to prove your case of obviousness?

19 MR. LEE: Objection. Calls for a
20 legal conclusion.

21 THE WITNESS: So I'm not certain
22 what you mean by "need" and so I'm hesitant
23 to take an opinion on what's needed and
24 what's not in an IPR proceeding.

25 My impression as a nonlegal expert

1 is that everything I've generated and
2 everything I've brought to the board is
3 considered as part of the case.

4 In terms of what's needed and what's
5 not, I'm not sure how to interpret that in
6 a legal way.

7 BY MS. ZHONG:

8 Q. I didn't say "need" in this case.

9 A. I think you said, "do I need my
10 reply declaration?"

11 Q. That's not what I asked.

12 A. Oh, okay.

13 Q. -- The question.

14 A. Well, so, apologies if I misstated
15 that.

16 Q. Do you think that the exhibits
17 attached to your original declaration are
18 sufficient to prove your case of obviousness?

19 MR. LEE: Objection. Form.

20 THE WITNESS: Again, the exhibits
21 attached to my initial declaration, I
22 think, supported my opinion in my initial
23 declaration for the case of obviousness.

24 And responding to questions raised
25 by Dr. Pattison, I think I've expanded

1 those further and supported those further
2 in my reply declaration.

3 BY MS. ZHONG:

4 Q. Why did you cite additional
5 evidence?

6 A. So in my reply declaration I'm
7 responding directly to comments and points
8 raised by Dr. Pattison. And so I'm responding
9 to those by citing additional evidence to
10 support the points I made in my initial
11 declaration.

12 Q. So you don't think the exhibits
13 attached to your original declaration is
14 sufficient; is that right?

15 MR. LEE: Objection. Misstates the
16 testimony.

17 THE WITNESS: No. As I already
18 stated, I think the exhibits attached to my
19 initial declaration supported the opinion
20 that I took in my initial declaration.

21 Dr. Pattison raised some questions I
22 think related to his interpretation of my
23 initial declaration, and so I offered
24 exhibits to further support my opinion in
25 the case.

1 BY MS. ZHONG:

2 Q. So you expanded your opinion; is
3 that correct? In your reply declaration?

4 MR. LEE: Objection. Misstates the
5 testimony.

6 THE WITNESS: No. As I said, I
7 offered additional exhibits to support my
8 opinion.

9 BY MS. ZHONG:

10 Q. And did you expand your opinion in
11 your reply declaration?

12 MR. LEE: Objection. Misstates
13 testimony.

14 THE WITNESS: Again, all I'm doing
15 in my reply declaration is responding to
16 points raised by Dr. Pattison and offering
17 further support for my opinion.

18 BY MS. ZHONG:

19 Q. In your original declaration, you
20 did not provide any evidence regarding the use
21 of lithium fluoride as an n-dopant; is that
22 correct?

23 (The Court Reporter requested
24 clarification.)

25 MR. LEE: Objection.

1 BY MS. ZHONG:

2 Q. Did you cite any evidence regarding
3 the use of lithium fluoride as an n-dopant
4 other than in Diekmann?

5 MR. LEE: Objection. Outside the
6 scope.

7 THE WITNESS: So, again, Diekmann
8 cites lithium fluoride as a preferred
9 n-dopant. So I didn't need to cite any
10 additional evidence. It's in our primary
11 reference.

12 BY MS. ZHONG:

13 Q. And did you cite any document as to
14 how lithium fluoride provides -- operates as an
15 n-dopant?

16 MR. LEE: Objection. Outside the
17 scope.

18 THE WITNESS: No. I didn't offer
19 any additional support beyond Diekmann for
20 how Lithium fluoride operates as an
21 n-dopant. But that is raised already in
22 Diekmann. So I didn't see the need to
23 offer further evidence.

24 BY MS. ZHONG:

25 Q. Okay. So you could have cited some

1 documents but you chose not to because you
2 didn't think it was necessary at the time of
3 your original declaration; is that correct?

4 MR. LEE: Objection. Form. Outside
5 the scope. Misstates testimony.

6 THE WITNESS: So I didn't choose to
7 cite any additional references for lithium
8 fluoride because it was already described
9 in Diekmann, already stated in Diekmann.

10 BY MS. ZHONG:

11 Q. So you did not see a need to cite
12 additional documents at the time of your
13 original declaration regarding the use of
14 lithium fluoride other than Diekmann; is that
15 correct?

16 MR. LEE: Same objections.

17 THE WITNESS: At the time, since
18 Lithium fluoride was already clearly
19 disclosed as a dopant in Diekmann, I didn't
20 see the need to include an additional
21 reference.

22 (Exhibit 1050 was identified.)

23 BY MS. ZHONG:

24 Q. Exhibit 1050, Choi -- sorry. Yes,
25 so the Choi reference, which is Exhibit 1050,

1 do you know who located it?

2 A. I don't recall who located it. That
3 might have been me. But at this point, it's so
4 long ago I don't recall.

5 Q. Do you see that page 1 of
6 Exhibit 1050 says:

7 This content was downloaded from IP
8 address 131.212.251.152 on June 5?

9 (The Court Reporter requested
10 clarification.)

11 BY MS. ZHONG:

12 Q. Do you see on page 1 of Exhibit 1050
13 it's stated:

14 This that content was downloaded
15 from IP address 131.212.251.152 on June 5, 2024
16 at 16:57 at the bottom?

17 A. Yes, I see that footnote on the
18 first page.

19 Q. Do you know who downloaded this
20 document?

21 A. Again, I don't know who downloaded
22 this document.

23 Q. But it's clear that it was
24 downloaded more than a year ago?

25 A. Yes, certainly.

1 Q. And it was downloaded at the time of
2 your original declaration?

3 A. That's approximately the time of my
4 original declaration.

5 Q. Okay. But it was not attached to
6 your original declaration?

7 A. No, I didn't cite this paper in my
8 original declaration.

9 Q. Any reason you did not cite it?

10 A. I -- I don't think I saw the need to
11 cite this and also it's not -- it's also not
12 prior art.

13 Q. Okay. So you don't believe that
14 Exhibit 1050 is prior art?

15 A. Again, I'm not an expert on
16 precisely how to determine when prior art is
17 but I'm just looking at the copyright date of
18 2009 and the publication date of June 22nd,
19 2009 and assuming that this would not be prior
20 art based on what I've been told on priority
21 dates.

22 MR. LEE: I'll object to that as
23 calling for a legal conclusion.

24 MS. ZHONG: You're objecting to your
25 own witness' testimony.

1 MS. LEE: No, I was objecting to the
2 question.

3 BY MS. ZHONG:

4 Q. Do you know who -- so you cited
5 an -- several additional exhibits from 1049 to
6 1059 in your reply declaration; is that right?

7 A. I just --

8 Q. Why don't you take a look at your
9 pages 4 and 5, the reply declaration pages 4
10 and 5.

11 A. Sure.

12 Yes, I'm looking at page 4 and 5.

13 Q. You see that on pages 4 and 5 you
14 listed the exhibits?

15 A. Yes.

16 (Exhibit 1049 was identified.)

17 (Exhibit 1058 was identified.)

18 BY MS. ZHENG:

19 Q. Okay. So Exhibit 1049 to 1058,
20 those are the exhibits, they are the new
21 exhibits you cited for your reply declaration;
22 is that right?

23 A. Yes, those are the new exhibits I
24 cite in the reply.

25 Q. And who located those exhibits?

1 A. So again, as I've already stated,
2 I'm not sure if I initially found Choi or not,
3 I found Endo, Choudhury. I believe I found
4 Zheng as well, the two short references were
5 also mine, so with the exception of Choi, I'm
6 pretty confident that those are the ones that I
7 found.

8 Q. When did you find Endo?

9 A. Again, I -- I don't know.
10 I certainly recall reading that paper in the
11 past, but I don't know when it was downloaded,
12 for example.

13 Q. For this proceeding, were you aware
14 of it at the time of your original declaration?

15 A. I actually alluded to that work in
16 my original deposition.

17 Q. I was asking a slightly different
18 question. Were you aware of it at the time of
19 your original declaration?

20 A. So I -- I think I answered that.
21 I actually mentioned this work in my original
22 deposition.

23 Q. You said "deposition," I was asking
24 about declaration.

25 A. Oh, declaration. Again, I may have

1 been aware. Again, I don't recall exactly the
2 timeline here, especially from my original
3 declaration since that was a while ago.

4 Q. Why don't we pull up your original
5 declaration, which is Exhibit 1003.

6 Let's go to the last page and it was
7 signed on July 2nd, 2024?

8 Do you see that?

9 A. I am just going to have to open it.
10 Yes, I see the signature page from
11 my original declaration.

12 Q. Okay. So have you read -- were you
13 aware of the Endo paper?

14 A. Again, I'm not certain if I was
15 aware of it before or after that date, so I
16 just can't say with certainty.

17 Again, certainly, as when I was in
18 my deposition, I mentioned this work so it was
19 something that I was aware of but I don't
20 recall if I had actually looked at this paper
21 again in the context of my declaration.

22 Q. Okay. So did you review this paper
23 as part of the deposition preparation?

24 A. I might have seen this paper in
25 thinking about my deposition preparation

1 perhaps. Again, I was reading a lot of papers
2 at the time. So...

3 Q. Now, were you aware of the Choudhury
4 or the So paper?

5 A. The Choudhury paper is a paper that
6 I found more recently in building my reply.

7 Q. What about the Zheng paper, Exhibit
8 1052?

9 A. Sorry, I just want to go back to
10 that exhibit list now. You're talking 1052?

11 Q. Yes, the Zheng paper.

12 A. Yes, the 1052, I think that's one
13 that I found in looking -- or constructing my
14 reply.

15 Q. Okay. And what about the 1053 and
16 1054 the two Schwartz paper?

17 A. Those are papers I looked at in
18 constructing my reply, primarily because they
19 are referenced in Dr. Pattison's exhibit.

20 Q. Okay. Were you aware of those
21 papers before?

22 A. I was certainly aware of that work,
23 but I -- I don't think I had reconsulted those
24 papers before for the purpose of this case.

25 Q. What about the Choudhury work, were

1 you aware of those?

2 A. I'm not sure if I had seen that
3 Choudhury paper before, so that I don't think
4 I'm as confident in being able to answer.

5 Q. I'm not saying about the paper
6 itself but the work in general, were you aware
7 of that work?

8 A. Again, my answer is the same because
9 that particular work, if I was aware of it, it
10 would have been via that paper.

11 Q. Okay. What about the Zheng paper or
12 the Jiang -- the work underlying that paper?

13 A. I don't think I was familiar with
14 that work, again, prior to the work on my
15 reply.

16 Q. Okay. And you are active in the
17 OLED field?

18 A. I'm sorry. Are you asking, am I
19 active in the OLED field?

20 Q. Uh-huh.

21 A. Yes, I am.

22 Q. You've been active in the OLED field
23 for at least 20 years?

24 A. Yes, that's correct.

25 Q. Okay. And do you consider yourself

1 to be pretty familiar with the literature in
2 general?

3 A. Yes, I do.

4 Q. Let's take a look at Exhibit 1050
5 first. This is a paper by LG Display,
6 Exhibit 1050, the Choi paper?

7 A. Yes, I'm looking at it.

8 Q. That's a paper by LG Display?

9 A. Yes, the authors have an affiliation
10 of LG Display.

11 Q. Okay. And I think one shows the
12 OLED stack for the device they are looking at?

13 A. Yes, Figure 1 shows a schematic
14 structure of the fabricated OLED device.

15 Q. Okay. And --

16 (The Court Reporter requested
17 clarification.)

18 THE WITNESS: Schematic structure.

19 BY MS. ZHONG:

20 Q. So similar to the Ma structure,
21 between the doped ETL and the cathode, there is
22 a pure electron injection layer; is that
23 correct?

24 A. I'd like to reopen Ma as well, if
25 we're also going to discuss that.

1 Q. Sure.

2 And Ma, I believe is Exhibit 100 --

3 A. That's 1010, I have it.

4 Q. 1010.

5 (Exhibit 1010 was identified.)

6 THE WITNESS: Okay. And your
7 question was related to what aspect of Ma
8 and Choi.

9 BY MS. ZHENG:

10 Q. So in both Ma and Choi's complete
11 device structure, there is an electron
12 injection layer between the cathode and the
13 electron transport layer; is that correct?

14 A. In Choi's device and in Ma's device,
15 there is an electron injection layer, correct.

16 Q. And both of them are florescent
17 based; is that correct?

18 A. I would agree, Ma's is fluorescent
19 OLED, I want to just refamiliarize myself with
20 Choi to make sure I can testify correctly there
21 as well. Just give me a minute.

22 I don't think Choi actually
23 discloses if this is a fluorescent emitter or a
24 phosphorescent emitter.

25 Q. Okay. It's a blue emitting layer,

1 right?

2 A. I would agree, it's a blue emitting
3 layer.

4 Q. You don't know what ABH034 and SD1
5 is; is that right?

6 A. That's what I'm saying. I'm
7 assuming SD1 is an emitter but I don't know
8 what type.

9 Q. Do you know what SFC is?

10 A. I don't think the acronym SFC is
11 defined.

12 Q. Is that a supplier?

13 A. Again, if I look at context, it
14 could be the supplier since LG Chem is
15 parenthetically cited after LGC101 but, again,
16 I -- I haven't had to, I haven't had to know
17 what SFC is to draw an opinion.

18 Q. Do you know whether SFC
19 supplies PHOLED phosphorescence emitter
20 material?

21 (The Court Reporter requested
22 clarification.)

23 BY MS. ZHONG:

24 Q. Do you know whether SFC supplies
25 phosphorescent emitter materials?

1 A. Again, I don't think I've actually
2 taken a position on what SFC is. It's possible
3 that could be the supplier, but I -- I don't
4 know anything about SFC or what SFC stands for.

5 Q. Now, according to this paper, the
6 reason why lithium quinolate is helping with a
7 conductivity is supposedly because lithium
8 quinolate has a lower LUMO than the electron
9 transport matrix material; is that correct?

10 MR. LEE: Objection. Form.

11 THE WITNESS: So I'm going to reread
12 part of Choi to make sure I familiarize
13 myself before answering.

14 So can you state your question
15 again?

16 BY MS. ZHONG:

17 Q. What's Choi's theory as to why this
18 lithium quinolate is helping with the
19 electronic conductivity of the electron
20 transport layer?

21 A. So -- okay, so in terms of what is
22 Choi's theory regarding what's helping the
23 electron conductivity?

24 Choi points to, in some respects,
25 the LUMO level at the interface with the

1 cathode but Choi also looks explicitly at
2 electron conduction through the layer and shows
3 in their data that -- including LIQ improves
4 that electron conduction.

5 Q. So page 062101-1, Choi states:

6 A lithium-Q-doped ETL can be
7 expected to exhibit a lower electron barrier
8 height.

9 Do you see that?

10 A. I'm looking for it.

11 Q. At the moment of the right-hand
12 column last sentence remember?

13 A. Sorry. You said we're on
14 page 062101 dash?

15 Q. One.

16 A. Okay. I see the sentence you're
17 referring to.

18 Q. What does that sentence referring
19 to? What is that is that sentence referring
20 to?

21 A. Choi is simply stating the
22 Lithium-quinolate-doped ETL can reduce the
23 barrier height for injection.

24 Q. And why is that?

25 A. It could be a variety of reasons.

1 As I described in my initial declaration, doped
2 ETLs frequently have a combined effect of
3 increasing the conductivity of the ETL, while
4 also improving injection into the ETL.

5 Q. And where did you state that in your
6 original declaration?

7 A. I'd have to consult my original
8 declaration to find that text, but I can do
9 that.

10 Q. Sure.

11 A. So, again, I touch on this point in
12 my original declaration in paragraphs 41 and
13 42, describing the prior art where, in several
14 instances, the use of a n-doped ETL means the
15 OLED does not also require the use of an EIL
16 necessarily.

17 Q. So you think that your discussion of
18 the need to get -- strike that.

19 So you think that your discussion of
20 the fact that a doped ETL allows a system to
21 get rid of EIL is supporting your -- the theory
22 that the doped EIL helps to reduce the
23 injection barrier?

24 MR. LEE: Objection. Misstates the
25 testimony.

1 THE WITNESS: So I'll just note
2 first, I didn't say anything about a doped
3 EIL. What I said was a doped ETL can have
4 the simultaneous benefit of improving
5 conductivity through the ETL and injection
6 into the ETL.

7 BY MS. ZHONG:

8 Q. Now, does Diekmann expressly state
9 that the doped layer is an ETL layer versus an
10 EIL layer?

11 A. So, again --

12 MR. LEE: Outside the scope of the
13 reply declaration.

14 THE WITNESS: I'll just, again, say
15 I was going to open Diekmann. I don't
16 think I've talked about this issue in my
17 reply.

18 Is there a specific question you
19 want to ask regarding the reply or point to
20 the reply in this Diekmann-related question
21 that you're asking?

22 BY MS. ZHONG:

23 Q. Well, you're clearly taking the
24 coaching hint from your counsel, but answer the
25 question as posed, please.

1 MR. LEE: That was not an instance
2 of coaching. I'm just lodging my
3 objections.

4 THE WITNESS: All right. I'm
5 opening Diekmann to refamiliarize myself
6 with the terminology.

7 So please restate your question, if
8 possible.

9 BY MS. ZHONG:

10 Q. So does Diekmann expressly state
11 that the doped layer is an electron transport
12 layer as opposed to an electron injection
13 layer?

14 MR. LEE: Objection. That is out of
15 scope.

16 THE WITNESS: So Diekmann is --
17 discusses both electron transport and
18 electron injection layers.

19 As I describe in my initial
20 declaration, my interpretation of
21 Diekmann's Figure 2 is that they're
22 referring to a doped electron transport
23 layer.

24 BY MS. ZHONG:

25 Q. I'm asking you where Diekmann says

1 that expressly?

2 A. Right. And, again, as I stated in
3 my original declaration, my response is that,
4 as a person skilled in the art reading
5 Diekmann, it's quite clear they're referring to
6 an n-doped ETL.

7 Q. And that would be a doped electron
8 injection layer?

9 MR. LEE: Objection. Outside the
10 scope.

11 THE WITNESS: In Diekmann, since
12 Diekmann notes explicitly that the doped
13 layer may be next to the cathode, but not
14 need be next to the cathode, that would
15 indicate to a person skilled in the art
16 that this is an electron transport layer
17 rather than an electron injection layer.

18 BY MS. ZHONG:

19 Q. The structure that you're pointing
20 to has the doped layer immediately next to the
21 cathode; is that correct?

22 A. In that figure, that is correct.
23 But Diekmann is clear that it need not be next
24 to the cathode.

25 Q. The specific structure that you are

1 relying on is explicitly next to the cathode;
2 is that correct?

3 A. The structure that -- the
4 combination that we'd be looking at with
5 Diekmann and Ma, if that's what we're
6 effectively referring to, would have the
7 n-doped ETL next to the cathode.

8 Q. And we have established that in Ma
9 that was electron injection layer between the
10 doped electron transport layer and the cathode,
11 correct?

12 MR. LEE: Objection. Form.

13 THE WITNESS: I already testified, I
14 think, that Ma has an electron injection
15 layer in their device.

16 BY MS. ZHONG:

17 Q. Let's take a look at Exhibit 1049,
18 which is a Kido paper or Endo paper.

19 Do you it open?

20 A. I have it open now.

21 Q. Okay. Are you familiar with
22 Professor Kido's work?

23 A. I'm familiar with Professor Kido's
24 work.

25 Q. Do you know when he started working

1 in the OLED field?

2 A. No, I don't know when he started
3 working in the OLED field exactly.

4 Q. In the '90s?

5 A. Yes, I think Professor Kido was
6 active in the '90s.

7 Q. So he is -- he is a person with
8 extraordinary ability at the time of the
9 invention, right?

10 MR. LEE: Objection to the extent it
11 calls for a legal conclusion.

12 THE WITNESS: So, again, I'm not
13 sure what "extraordinary ability" means.
14 I would say he was a person skilled in the
15 art at the time of the invention.

16 BY MS. ZHONG:

17 Q. He is a person with above-average
18 skill in the art, correct?

19 A. Again, I don't know if there's,
20 like, a particular -- I'm not familiar with the
21 legal weight of the term "above-average skill
22 in the art."

23 Clearly, he's a professor running a
24 group in this area. So he would be an expert
25 in the area of OLEDs, I can certainly attest to

1 that.

2 Q. Okay. He's an expert in the field
3 of OLED at the time of the invention in 2008,
4 2009?

5 A. I think that's a fair comment.

6 Q. Okay. Do you know anything about
7 Jun Endo, the first named inventor -- the
8 author? Sorry.

9 A. I don't think I know anything
10 specifically about Jun Endo.

11 Q. The doctor -- or Mr. Endo would be
12 working under Professor Kido?

13 A. I'm sorry, you referred to them as
14 Dr. Endo?

15 Q. I said, Dr. or Mr. Endo would be
16 working under Professor Kido?

17 A. Generally, looking at a publication
18 like this and seeing the same affiliation
19 between Endo and Kido, you might assume they're
20 working together. But I don't know who is
21 working under who, whose -- I don't know the
22 specifics of how the study was managed.

23 Q. Do you know what is the turn-on
24 voltage for the devices in this Endo or Kido
25 paper?

1 MR. LEE: Objection. Form.

2 THE WITNESS: Can you point me to a
3 specific usage, just so I can better
4 understand the specific context you're
5 looking at?

6 BY MS. ZHONG:

7 Q. Can you clarify what information you
8 are seeking?

9 A. You asked do I know the turn-on
10 voltage or do I know what is the turn on
11 voltage in this paper?

12 Q. Uh-huh.

13 A. Are you looking for a particular
14 number? Is there a more specific question
15 about turn-on voltage that you have?

16 Q. Do you understand what turn-on
17 voltage is?

18 A. Yes, I understand what the turn-on
19 voltage is in an OLED.

20 Q. Okay. So can you determine from the
21 information contained in this paper what the
22 turn-on voltage is for these devices?

23 A. Yes. Looking at the data in this
24 paper I can assess what the turn-on voltage is
25 in these devices.

1 Q. What are the turn-on voltages?

2 A. Which device would you like me to
3 look at? There's a variety that are discussed
4 in this paper.

5 Q. The lithium quinolate and the sodium
6 quinolate ones.

7 A. Again, that's not specific enough.
8 This paper looks at a few different approaches
9 to making an OLED. So if you could point to
10 something more specific, that would be helpful.

11 Q. Why don't we take a look at
12 Figure 2.

13 A. All right.

14 Q. Okay.

15 A. Yes. So what is your question
16 regarding Figure 2, then?

17 Q. What are the turn-on voltages for
18 each of the devices in this figure?

19 A. So turn-on voltage for an OLED is
20 usually when you see the rapid increase in
21 current and/or luminance.

22 When it comes to luminance, the
23 exact threshold luminance where one pulls the
24 turn-on voltage off can vary a little bit
25 depending on the group and depending on the

1 sensitivity of their instrument.

2 However, here, the turn-on voltage
3 would be, again, when one sees this steep
4 increase in luminance versus voltage.

5 So nominally, one could assess the
6 turn-on voltage of the undoped -- or, I guess,
7 these are devices with an electron injection
8 layer.

9 So the device with no electron
10 injection layer would be approximately a four
11 volts or so. And then looking at the data for
12 the dope devices, it looks like it would be
13 something more like three or two volts, but --
14 but there's no data to compare it, 10 to minus
15 2, so...

16 Q. Is 10 to the minus 2 --

17 (The Court Reporter requested
18 clarification.)

19 BY MS. ZHONG:

20 Q. Is 10 to the minus 2 candela per
21 meter -- per square meter an acceptable
22 luminance?

23 A. Can you be more specific,
24 "acceptable luminance" for -- for what?

25 Q. For OLED.

1 A. Is there a particular application or
2 are you talking about a research device?
3 What -- specifically what?

4 Q. Just what a person skilled in the
5 art would consider to be an OLED.

6 A. So, again, I'll interpret your
7 question I think you're trying to ask, which
8 is, just is it acceptable for the device to be
9 turned on? I would say yes. That may not be
10 necessarily the standard that every group uses
11 as a turn-on voltage and that's what I alluded
12 to earlier, is it depends on the sensitivity of
13 the measuring equipment as well.

14 I think a lot of groups will often
15 use a threshold of 1 or 10 candelas per meter
16 squared to take their turn-on voltage but
17 there's some -- some variability in that.

18 Q. Okay. So what is the threshold your
19 group applies?

20 A. I think in the past, we've reported
21 turn-on voltages at something like one candela
22 per meter square.

23 Q. Okay.

24 A. So... but, again, there's that --
25 when it comes to luminance, it depends on the

1 sensitivity of your measuring apparatus.

2 Q. So if the turn-on voltage is beyond
3 the 10 volts, do you consider that to be an
4 OLED device?

5 MR. LEE: Objection. Scope.

6 THE WITNESS: So can you restate the
7 question? The turn-on voltages above?

8 BY MS. ZHONG:

9 Q. 10 volts.

10 A. So you're saying if you construct an
11 OLED --

12 Q. Mm-hmm.

13 A. -- and its turn-on voltage is high,
14 is it still an OLED?

15 Q. Yes.

16 So if you, for example, if you look
17 at Figures 3, the n-doped one, right?

18 A. Yes.

19 Q. I think the -- if you look at one
20 candela per -- no, that's current density,
21 sorry.

22 A. Yes.

23 Q. But if you look at Figure 2 -- no,
24 that's -- 1 is slightly -- actually slightly
25 lower than that.

1 A. That's 7 volts.

2 Q. Yeah. (Sotto voce.)

3 Okay. So assume that if it's
4 10 volts, but then instead of 7 volts, do you
5 consider that to be an OLED?

6 MR. LEE: Objection. Form. Outside
7 the scope.

8 THE WITNESS: So I would have to,
9 I think, better understand more about the
10 specifics of what your device looks like
11 since this is a hypothetical.

12 Are you saying this device if it was
13 10?

14 BY MS. ZHONG:

15 Q. Yes. A similar structure. If it's
16 10.

17 A. So if this device was turned on at
18 10 volts, would it be still be an OLED?

19 Q. Correct?

20 A. Yes, it would still be an OLED.

21 Q. So what is an OLED?

22 A. So, again, I just want to make sure
23 I'm understanding the -- the objective here.

24 So is there a particular aspect that
25 this relates to my reply declaration or

1 anything you can point to or is this more a
2 general question?

3 Q. You mentioned OLEDs throughout your
4 declaration, correct?

5 A. Yes.

6 Q. I'm trying to understand what your
7 understanding of OLED is.

8 A. Okay. So I'll answer in the context
9 of Endo's since that's what we're talking
10 about.

11 The structure shown in Figure 2,
12 which has an anode of indium tin oxide, a
13 hole-transport layer of NPD and then an
14 emissive/electron transport layer of Alq3
15 followed by alkaline metal complex layer,
16 followed by aluminum is essentially the
17 archetype of what the initial OLED developed at
18 Kodak looks like.

19 Q. Okay.

20 A. So the first OLEDs developed at
21 Kodak used a hole-transport layer similar to
22 NPD, used Alq as a emissive layer and an
23 electron transport layer.

24 Q. Mm-hmm.

25 A. And so the --

1 (The Court Reporter requested
2 clarification.)

3 MS. ZHONG: Alq3, I put it in the
4 chat for you.

5 (The Court Reporter requested
6 clarification.)

7 THE WITNESS: So, again, this is a
8 archetypical OLED device constructed from,
9 again, two thin film organic materials and
10 even if the voltage was 10 volts,
11 especially in a research paper, I wouldn't
12 cease to call it an OLED.

13 Frequently in research papers, there
14 may be investigations of -- including
15 different layers that -- perhaps push the
16 voltage up or push the voltage down, that
17 doesn't necessarily mean it's no longer an
18 OLED.

19 BY MS. ZHONG:

20 Q. Okay. OLED, in this part,
21 electroluminescence, correct?

22 A. An OLED emits via electron hole
23 injection to form an exciton. When that
24 exciton recombines, that process is
25 electroluminescence.

1 Q. If you apply very high voltage
2 before any light is emitted, is that
3 necessarily through electroluminescence, or it
4 might be through some other mechanism?

5 A. So that, that's a pretty broad
6 hypothetical. I think I would have to have a
7 better sense of the specific device and system
8 that you're thinking about and what the actual
9 observation looks like for the light emission.

10 Q. If it's a -- the same structure but
11 if you have to apply a very high turn-on
12 voltage, you still consider that to be an OLED
13 regardless turn-on voltage?

14 A. So, again, can you -- I don't
15 generally like to speak in absolutes, like
16 "regardless," so can you be more specific in
17 terms of what -- what we're talking about here?

18 Again, are we still talking about
19 Endo? When you say a "large voltage," what,
20 what do we mean here?

21 Q. So in your hypothetical combination,
22 what will be the turn-on voltage?

23 A. What hypothetical combination are
24 you talk referring to?

25 Q. Your combination of Ma and of

1 Diekmann?

2 A. Great. I just wanted to make sure I
3 understood the specifics.

4 So I'll interpret your question as
5 to mean, if I were to take Diekmann, which
6 already has an n-doped ETL applied to a
7 phosphorescent OLED and replace that n-dopant
8 that's already present as cesium, barium or
9 lithium fluoride, perhaps, with Liq, would I
10 expect the device to work and with reasonable
11 voltage? Yes, I would.

12 Q. What would be the voltage?

13 A. Based on what I see in my -- I
14 suspect the voltage would be -- would be
15 reasonable. I can't assign an exact number.
16 But I suspect it would be an operating OLED
17 that emits spectrum luminescence.

18 Q. Have you constructed such a device?

19 A. Have I constructed a Diekmann-type
20 device with an Liq-doped ETL?

21 Q. Correct.

22 A. I have not constructed that device
23 myself.

24 Q. Have you ever constructed an OLED
25 device with lithium quinolate in the electron

1 transport layer?

2 A. I don't think I've ever constructed
3 a device with Liq in the electron transport
4 layer.

5 Q. What kind of n-doped have you used
6 in the past for phosphorescent OLED?

7 MR. LEE: Objection. Scope.

8 THE WITNESS: So I want to make sure
9 I understand the question that you're
10 asking: What kind of conductivity dopants
11 have I used in the past in the electron
12 transport layer of a phosphorescent
13 dopant -- phosphorescent device?

14 BY MS. ZHONG:

15 Q. When you say "conductivity dopant,"
16 what do you mean by that?

17 A. An N-type or P-type dopant.

18 Q. In the electron transport layer --
19 yes, sure.

20 A. Yeah. I don't -- I'd have to go
21 back and look through some of my earlier
22 publications. I don't think I've recently
23 published a phosphorescent OLED that as an
24 explicit N-type doping in the electron
25 transport layer.

1 Q. Have you ever used an P-doping in
2 the electron transport layer?

3 A. No, I can say I never used P-doping
4 in an electron transport layer.

5 Q. Do you think anyone would use
6 P-doping in an electron transport layer?

7 A. I don't immediately see a reason why
8 someone would use a P-dopant in an electron
9 transport layer, but that doesn't mean there
10 isn't some creative application that I'm not
11 aware of.

12 Q. Okay. Now, do you see that in the
13 Endo paper at the bottom page 1, they assign
14 the low level of lithium quinolate as minus 2.5
15 electron volts from the vacuum level.

16 Do you see that?

17 A. So bottom of page 1, let me just
18 find that. I see that sentence.

19 Q. Can you go back to Exhibit 1050?
20 Figure 2, the schematics of the energy-level
21 diagram of the Liq-doped ETL; do you see that?

22 A. I see -- Figure 2? Yes, I see that.

23 Q. Do you see that the LUMO listed
24 there seems to be minus 3.15?

25 A. I see in Figure 2 that the LUMO is

1 listed as 3.15.

2 Q. Do you know why there is a pretty
3 significant change, difference there in the two
4 reported numbers?

5 MR. LEE: Objection. Scope.

6 THE WITNESS: So I'll have to take a
7 moment to just read briefly if either
8 author is clear on how they get that
9 number.

10 BY MS. ZHONG:

11 Q. For the Choi one, if you go to the
12 previous page, it looks like -- for the HOMO,
13 they identify photoelectrometer, AC-2
14 measurement and LUMO is adding on the UV
15 absorption gap.

16 A. What I was looking for more was
17 actual data, rather just than a description.

18 Q. Okay.

19 A. But I'm just going to take a quick
20 look at both papers.

21 Q. Sure.

22 A. So I don't know why the energy
23 levels are different. That's not something
24 that impacted my opinion in my reply
25 declaration.

1 Q. So it appears that in both the Choi
2 paper and the Endo paper, there is some
3 noticeable difference between the LUMO level of
4 the lithium quinolate and the ETL layer; is
5 that correct?

6 MR. LEE: Objection. Form.

7 THE WITNESS: So what are the
8 energies you'd like me to compare in Endo?

9 BY MS. ZHONG:

10 Q. So, for example, Endo reports the
11 lowest unoccupied molecular orbital, which is
12 LUMO, level of lithium quinolate is minus 2.5
13 electron volt from the vacuum level while that
14 of the aluminum Q3 is minus 3.0 eV, correct?

15 A. I see that sentence.

16 (The Court Reporter requested
17 clarification.)

18 MS. ZHONG: Aluminum Q3 is minus
19 3.0 eV.

20 Those things are in the document
21 itself, the exhibit itself, so hopefully it
22 will help you to verify the spelling.

23 BY MS. ZHONG:

24 Q. Do you see that, Dr. Holmes?

25 A. Sorry. Do I -- can you just tell me

1 what "that" is again? Just I want to make sure
2 I'm looking at the right thing.

3 Q. Okay. So in the Endo paper, do you
4 see that the -- that LUMO level for lithium
5 quinolate is minus 2.5 eV while that for the
6 aluminum Q3 is minus 3.0 eV?

7 A. Yes, I see that sentence.

8 Q. So there is a 0.5 eV difference in
9 the LUMO level?

10 A. Yes, I see the sentence that states
11 Liq is minus 2.5 eV, or its LUMO, and Alq is
12 minus 3.0 eV for its LUMO. So they're, at
13 least according to Endo, would be --

14 (The Court Reporter requested
15 clarification.)

16 THE WITNESS: Yes, I can repeat my
17 answer.

18 So I was just stating that the --
19 I do see that the Liq LUMO, at least
20 according to Endo, is minus 2.5 electron
21 volts from the vacuum level, while the LUMO
22 for Alq3, according to Endo, is minus
23 3.0 eV from the vacuum level. I see that.

24 BY MS. ZHONG:

25 Q. So there 0.5 eV difference in the

1 LUMO levels; is that correct?

2 MR. LEE: Objection. Form.

3 THE WITNESS: The difference between
4 2.5 and 3.0 is 0.5 eV difference.

5 BY MS. ZHONG:

6 Q. Is that considered to be significant
7 energy gap?

8 MR. LEE: Objection. Outside the
9 scope.

10 THE WITNESS: Can you tell me what
11 you mean by "Is that considered to be a
12 significant energy gap"? Significant in
13 what respect?

14 BY MS. ZHONG:

15 Q. As far as electron injection is
16 concerned.

17 MR. LEE: Outside the scope.

18 THE WITNESS: So, again, I think it
19 all depends. I'm not sure how I interpret
20 that per se, and it's not something I've
21 really thought about in terms of what
22 energies are significant or not when it
23 comes to electron injection.

24 BY MS. ZHONG:

25 Q. Okay. Do you see that the -- what

1 Endo says is with lithium Q's LUMO level being
2 minus 2.5 eV it makes the barrier height for
3 electron injection for aluminum cathode to the
4 organic layers lower for aluminum Q3?

5 Do you see that?

6 A. I see that Endo is stating that,
7 yes.

8 Q. And do you think that the lowering
9 of the injection barrier -- strike that.

10 So if the Lithium Q LUMO, instead of
11 minus 2.5 eV it will be minus 2.9 eV -- or
12 not -- minus 2.95 eV, would the reduction in
13 barrier height be significant enough for there
14 to be material -- meaningfully more electron
15 injection into the organic layers?

16 MR. LEE: Objection. Form. Outside
17 the scope.

18 THE WITNESS: I'm sorry, again, I
19 think "meaningfully" -- and this isn't
20 something I've had to develop an opinion on
21 in my reply declaration.

22 So I don't know how much the current
23 would necessarily change in changing these
24 LUMO levels from one number to another.
25 It's not something I've had to think about

1 in detail for this case.

2 BY MS. ZHONG:

3 Q. Okay. So if the lithium Q's LUMO
4 level is at the same level as aluminum Q3, do
5 you think that it would help reduce the
6 barrier -- injection barrier?

7 MR. LEE: Same objection. Outside
8 the scope.

9 THE WITNESS: So, again, as I
10 already said, that's not something I've had
11 to develop an opinion on for the purposes
12 of my declaration or reply declaration.

13 And so in terms of what the energy
14 levels are that change injection by a
15 certain amount or a different amount,
16 that's just not something I have an opinion
17 on to offer here.

18 BY MS. ZHONG:

19 Q. I'm just asking you, do you have an
20 understanding as to why there is a reduction in
21 the injection barrier by incorporating lithium
22 quinolate?

23 MR. LEE: Objection. Scope.

24 THE WITNESS: So are you asking --
25 that's a different question.

1 Are you requesting about Endo and
2 why Endo argues there's a difference in
3 injection barrier with Liq?

4 BY MS. ZHONG:

5 Q. Sure, you can answer that question.

6 A. Well, is that what you're asking?
7 I guess, I'm not clear on what the question is
8 you'd like me to answer.

9 Q. You can answer that question.

10 A. Okay. So then, to answer that, I'll
11 just consult Endo's conclusion.

12 So, again, Endo, in looking at the
13 use of Liq as a dopant in the ETL, hypothesizes
14 that their data suggests that alkaline metal
15 ions in the complexes are actually being
16 reduced free metal by the interaction with the
17 cathode and that that's actually doping the
18 interface as a means to improve the injection.

19 Q. So Endo's theory is that lithium
20 quinolate is reduced to lithium-free metal; is
21 that correct?

22 A. That's correct.

23 Q. Do you know how much reduction there
24 is, the extent of the reduction?

25 A. Endo doesn't describe the extent of

1 reduction.

2 Q. Okay. But Endo's theory is that
3 lithium quinolate is going to be reduced to
4 lithium metal?

5 A. Yes.

6 Q. And why does Endo state that lithium
7 quinolate reduces the injection barrier for
8 aluminum Q3?

9 A. Is there a particular part of Endo
10 you're referring to when you say they state
11 that?

12 Q. The end of page 1.

13 A. Sorry, where in the end of page 1?
14 The paragraph we were just talking about?

15 Q. Yes.

16 A. I don't see a reference to barrier
17 lowering in that last little paragraph we were
18 discussing. Is there a particular sentence I'm
19 missing?

20 Q. It says:

21 The lowest unoccupied molecular
22 orbital, LUMO, level of lithium Q is minus
23 2.5 eV from the vacuum level while that of
24 aluminum Q3 is minus 3.0 eV, making the barrier
25 heights for electron injection from aluminum

1 cathode having a work function of minus 4.2 eV,
2 to the organic layers lower for aluminum Q3.

3 Do you see that?

4 A. I do.

5 Q. Okay.

6 A. But you asked the question about the
7 injection getting better with Liq. That
8 sentence doesn't talk about that.

9 Q. I said why is the barrier height
10 lower?

11 A. With -- just for Alq?

12 Q. What does this sentence mean?

13 A. This sentence is simply saying that
14 if you look at a simple energy alignment
15 between the cathode and each of these
16 materials, the energy difference between the
17 cathode and Alq is smaller than the energy
18 difference between the cathode and Liq.

19 Q. And so that's a situation that's
20 reversed from the Choi situation?

21 MR. LEE: Objection. Form.

22 THE WITNESS: So I just want to
23 reopen Choi. Can you just -- I assume
24 you're pointing to Figure 2. Can you just
25 re-ask the question specifically for Choi?

1 BY MS. ZHONG:

2 Q. So in Choi the energy difference
3 between the cathode and lithium Q's LUMO is
4 smaller than the energy difference between
5 aluminum and the ETL LUMO; is that correct?

6 A. That's what Figure 2 shows.

7 Q. Okay. And in Endo, they used --
8 instead of using a LUMO level of minus 3.15,
9 they were hypothesizing that the Lithium Q LUMO
10 level is minus 2.5 eV, right?

11 A. Endo lists the LUMO level of Liq as
12 minus 2.5 eV.

13 Q. So instead of minus 2.5 eV, if the
14 Lithium Q's LUMO level is actually minus
15 3.15 eV as reported by Choi, then the barrier
16 height between aluminum and aluminum lithium Q
17 would be smaller than that between aluminum and
18 aluminum Q3; is that right?

19 MR. LEE: Objection. Outside the
20 scope.

21 THE WITNESS: So in looking at
22 Figure 2, the deeper LUMO, the 3.15 LUMO,
23 would bring it closer to the cathode.

24 BY MS. ZHONG:

25 Q. Okay. So the LUMO level of lithium

1 quinolate is kind of important in Endo's theory
2 as to why things working or not working, right?

3 MR. LEE: Objection. Form. Outside
4 the scope.

5 THE WITNESS: So I didn't have to --
6 the LUMO level of Liq wasn't something that
7 impacted my opinion in my initial
8 declaration or my reply declaration. So
9 it's not something that I've actually
10 looked at as part of the proceeding.

11 And since the Endo actually is
12 describing Liq as disassociating to form a
13 free lithium metal. I don't think the LUMO
14 level of Liq is as important.

15 BY MS. ZHONG:

16 Q. Do you know what evidence Endo
17 actually has that free lithium is formed?

18 A. So Endo, in their discussion of
19 their results -- actually I want to reread one
20 part of Endo here just to make sure I answer
21 your question correctly.

22 So Endo, in their work, is -- is
23 arguing that the disassociation of Liq to form
24 lithium, and ultimately dope their -- their
25 ETL, is the most consistent model that's --

1 that's basically reflecting their data.

2 They also extensively compare this
3 hypothesis to prior work relating to other
4 complexes and note that this idea of institute
5 doping where, basically, a complex is used and
6 then a metal is essentially freed after
7 deposition of, let's say, the cathode has been
8 described before in the literature and applied
9 previously, for example, for lithium fluoride.

10 And so they're also grounding their
11 hypothesis in prior work that has also
12 suggested the generation of lithium from other
13 complexes.

14 Q. Okay. But isn't the fact that part
15 of Endo's theory is that the -- because the
16 LUMO level is Liq is actually higher than the
17 LUMO level of aluminum Q3, such that the energy
18 gap between aluminum and lithium Q is larger
19 than the energy gap between aluminum and
20 aluminum Q3 such that the simple energy diagram
21 is not going to explain the improvement in the
22 experiment results.

23 MR. LEE: Objection to form.

24 BY MS. ZHONG:

25 Q. That's why we went forward with a

1 proposal of reduction of lithium complex to
2 free metal.

3 MR. LEE: Objection. The form.

4 THE WITNESS: So, again, I can't
5 speak to, you know, what was, what was
6 their thought process in terms of, you
7 know, how they -- how they came about their
8 hypothesis.

9 I think if you read Endo, they spend
10 a significant amount of the text referring
11 to prior work on in situ doping to support
12 their claim that that's what's going on
13 here.

14 And also make a strong parallel to
15 lithium fluoride, also having this sort of
16 character to further solidify the behavior
17 of Liq versus other dopants that behave in
18 a similar way.

19 So I think they actually are very
20 strong in their description of Liq as an
21 in situ dopant just looking at the prior
22 art.

23 BY MS. ZHONG:

24 Q. So you agree with Endo that free
25 lithium is formed when cathode is deposited on

1 the same quinolate; is that correct?

2 A. I think that Endo's interpretation
3 of Liq is consistent with the rest of the
4 literature and what I did a -- when I wrote my
5 initial declaration, I pointed out prior art
6 that also suggested Liq would disassociate. So
7 I think that Endo's conclusions are sound.

8 Q. Okay. So let's see what we can
9 agree.

10 You agree that lithium quinolate
11 would disassociate into anode lithium cation
12 and some kind of an anion?

13 (The Court Reporter requested
14 clarification.)

15 BY MS. ZHONG:

16 Q. I'm sorry about my accent.

17 So we agree that lithium quinolate
18 would disassociate into lithium cation and
19 anion, or it would be reduced into lithium
20 metal; is that correct?

21 MR. LEE: Objection. Form.
22 Misstates testimony.

23 THE WITNESS: So what I have pointed
24 to in my original declaration and in my
25 reply declaration, is that there is ample

1 support in the literature to suggest that
2 Liq, when it sees the cathode metal will
3 disassociate.

4 BY MS. ZHONG:

5 Q. And would disassociating to either
6 lithium cation or lithium metal; is that
7 correct?

8 A. Again, I haven't had to take a
9 position necessarily on the precise chemical
10 path via which the doping occurs, whether
11 there's a cation, whether it's a pure metal,
12 whether both are formed at different stages,
13 that's not something that impacted my opinion.

14 What impacted my opinion was that
15 there is significant prior art that indicates
16 that disassociation will occur.

17 Q. But you don't know what the
18 disassociation species will be; is that
19 correct?

20 A. Again, I haven't had to take a
21 specific position on the chemical pathways of
22 the disassociation and how that ultimately
23 leads to doping.

24 The prior art is quite clear that
25 there will be a disassociation and that that

1 will permit doping of the electron transport
2 layer.

3 Q. Okay. Do you know whether small
4 metals such as lithium or lithium cation would
5 form in this disassociation?

6 A. So I think that's -- that's what I
7 just answered, which is that the prior art
8 suggests that lithium quinolate will
9 disassociate but the specifics of whether it's
10 immediately LI plus or LI metal, and again,
11 that's not, not something that I've taken an
12 opinion on in my reply declaration.

13 Q. And do you know the extent of the
14 disassociation?

15 A. Again, I don't think that's
16 something that's impacted my opinion. The
17 prior art is clear that the disassociation
18 essentially occurs.

19 Q. Okay.

20 MS. ZHONG: Why don't we take a
21 break.

22 THE COURT REPORTER: Off the record.

23 (A recess was taken.)

24 BY MS. ZHONG:

25 Q. So, Dr. Holmes, there are only two

1 papers cited before 2008 that included an
2 electron transport layer doped with lithium
3 quinolate; is that correct?

4 A. So I'm just going to consult my
5 exhibit list, my reply declaration.

6 Yes, that's correct.

7 Q. So let's just be clear. One is Ma,
8 Exhibit 1010, and the other is the Endo paper,
9 1049; is that correct?

10 A. Yes.

11 Q. And in both of those papers, the
12 electron transport layer is the aluminum
13 quinolate or aluminum Q3; is that correct?

14 A. That's correct -- no, that's not
15 necessarily correct. So in Endo -- let me just
16 check Endo here for a moment.

17 Q. You're right. So Endo --

18 (The Court Reporter requested
19 clarification.)

20 (Parties speaking simultaneously.)

21 THE WITNESS: Yeah, I'll just -- so
22 in Endo --

23 BY MS. ZHONG:

24 Q. Go ahead.

25 A. I'm just going to note that in Endo,

1 they both -- they both, Alq and BPhen with Liq,
2 and so there's -- -- those are both electron
3 transport layers and both of them are
4 demonstrated as doping.

5 And then in Ma, Ma actually dopes
6 BPhen with Liq, and there, BPhen is again
7 serving as the end if the electron transport
8 layer. So I would disagree with your initial
9 assessment.

10 BY MS. ZHONG:

11 Q. So in both cases, the aluminum Q3 is
12 the emissive layer; is that correct?

13 A. In both Ma and in Endo, yes, the
14 light emission is coming from Alq3.

15 Q. So in both systems, there is an Alq3
16 component in their OLED stack?

17 A. In both papers, Alq3 is the emissive
18 material in the OLED stack.

19 Q. Okay. So there is Alq3 material in
20 that OLED stack somewhere?

21 A. Yes, it's the emissive material so
22 it's within the stack.

23 Q. Let's now go to the Choudhury paper
24 or the So paper.

25 Do you know -- are you familiar with

1 Professor So, Franky So?

2 A. Let me just open the paper first.

3 Q. So that will be Exhibit 1051.

4 (Exhibit 1051 was identified.)

5 THE WITNESS: I have it.

6 Please repeat your question.

7 BY MS. ZHONG:

8 Q. Do you know Professor So, Franky So?

9 A. Yes, I know Professor So.

10 Q. Do you know, is he an expert in the
11 field of OLED at the time of the invention?

12 MR. LEE: Objection. Outside the
13 scope.

14 THE WITNESS: Yes, I would
15 categorize Franky So as an expert at the
16 time of the invention.

17 BY MS. ZHONG:

18 Q. Do you know Dr. Choudhury? The
19 first name of the inventor of Exhibit 1051?

20 (Exhibit 1051 was identified.)

21 THE WITNESS: I don't know
22 Choudhury; nor do I know if he's a graduate
23 student or someone who already has a Ph.D.

24 BY MS. ZHENG:

25 Q. If you look at the footnote with the

1 star, do you see that there's Professor F. So,
2 Dr. K.R. Choudhury?

3 A. Yes, I see that.

4 Q. Does that indicate to you that he
5 has a Ph.D.?

6 A. Yes, it does. I hadn't recalled
7 that designation.

8 Q. And what is a definition of POSITA?

9 A. So I'll go back to my, I guess
10 initial declaration to answer that question.

11 Q. Mm-hmm.

12 A. Let me just open it.

13 Q. So page 44.

14 A. Just opening it.

15 So as I write in paragraph C4 on
16 page 44: A POSITA, in my opinion, at the time
17 of the alleged invention would have had a
18 bachelor's degree in chemistry, physics, or a
19 comparable field of study, and at least three
20 years of research or industrial experience with
21 organic optoelectron light-emitting devices.

22 Q. Okay. So would Dr. Choudhury be
23 someone with above average skill set at the
24 time of the invention then?

25 A. So again, I didn't have to consider

1 Dr. Choudhury's educational or personal
2 background at the time of the invention.
3 I don't know a bachelor degree they had but I
4 assume they would have had some sort of
5 bachelor's degree in these areas, clearly have
6 a Ph.D. so they have experience in this area,
7 too, it's quite possible that they would have
8 been a person skilled in the art.

9 Q. Okay. So he would have more than
10 three years of research, correct, given his
11 Ph.D.?

12 A. Again, I don't know the specifics of
13 Dr. Choudhury's background in general. If
14 someone has a Ph.D., that would imply they have
15 more than three years of research, but I can't
16 comment on the specifics of Dr. Chaudhry's
17 background without knowing what his background
18 is.

19 Q. Okay. What's -- how long does an
20 average Ph.D. -- strike that.

21 How long does it take to get a Ph.D.
22 on average?

23 MR. LEE: Objection. Outside the
24 scope. Relevance.

25 THE WITNESS: So getting a Ph.D. in

1 my group, on average, takes about five to
2 five and a half years.

3 BY MS. ZHONG:

4 Q. Is that typical --

5 A. Maybe average of five and a half
6 years.

7 Q. Okay. Is that typical for people in
8 your field to get a Ph.D. within that time
9 period?

10 A. I think that would be typical for
11 students in science and engineering, yes.

12 Q. So would you think that someone who
13 graduated from your group would possess
14 above-average skill set as defined by you?

15 A. Yes, I would.

16 Q. Would you expect the same for people
17 graduating from a reputable university -- like
18 a -- with a Ph.D. from a reputable university?

19 MR. LEE: Objection. Outside the
20 scope.

21 THE WITNESS: So I think I want to
22 understand a little bit more specifics on
23 what you mean by a "reputable university."

24 In my description of a person
25 skilled in the art, let's go back to my

1 declaration again. Just open that
2 paragraph again.

3 So what I note again is that
4 bachelor's degree in chemistry, physics or
5 comparable field of study --

6 BY MS. ZHONG:

7 Q. Mm-hmm.

8 A. -- and at least three years of
9 research or industrial experience with organic
10 optoelectron light-emitting devices.

11 And so the "and" is important.

12 And --

13 Q. Mm-hmm.

14 A. -- so for students graduating from
15 my group, I know what their experience is and I
16 know that they have the relevant experience of
17 organic optoelectron light-emitting devices,
18 I'd have to know a little bit more about what
19 you mean about this hypothetical case in order
20 to answer with certainty.

21 Just being a reputable university --
22 I can't remember if that's the terminology you
23 used -- doesn't necessarily say whether or not
24 you have three years of experience in organic
25 optoelectronic light emitting devices.

1 BY MS. ZHONG:

2 Q. Does Professor So's research focus
3 on optoelectronic OLED device?

4 A. Some of Professor So's research
5 focuses on organic optoelectronic
6 light-emitting devices, but I don't know where
7 Dr. Choudhury received their Ph.D. or training,
8 per se.

9 Q. Is University of Florida -- does
10 Dr. So have a reputable program in OLED?

11 A. Yes, Dr. So has a reputable program
12 in OLEDs.

13 Q. Now, in Exhibit 1051, that system
14 again involves the use of aluminum Q3, correct?

15 A. I'm going to have to open Exhibit
16 1051. This is Choudhury. Okay. Let me go to
17 that.

18 Yes. So in Choudhury, Alq3 is
19 what's being investigated, yes.

20 Q. Do you see in Table 1 of Choudhury,
21 there is the reported conductivity for undoped
22 aluminum Q3 and a 4 percent doped aluminum Q3?

23 A. Yes, I see Table 1.

24 Q. For an OLED application, what would
25 be a suitable conductivity range for the

1 electron transport layer?

2 A. I don't think I have -- I haven't
3 had to establish such a range in my declaration
4 or reply declaration. And so I don't have a
5 specific range of conductivities that I could
6 point to as being suitable or unsuitable.

7 Q. And the 4 percent, is that weight
8 percent or the molar percent?

9 (The Court Reporter requested
10 clarification.)

11 BY MS. ZHONG:

12 Q. Weight percent or molar percent?

13 A. I'll have to just look at Choudhury
14 to see they're specific on that.

15 It's weight percent.

16 Q. And does lithium fluoride exist only
17 as lithium canide and fluoride or they're bound
18 in some kind of crystal structure?

19 MR. LEE: Objection. Outside the
20 scope.

21 THE WITNESS: So can you rephrase
22 your question? I'm not sure I understand
23 what you're asking.

24 BY MS. ZHONG:

25 Q. So lithium fluoride, does it exist

1 only as a lithium cation and lithium anion, or
2 there's a crystal structure with many lithium
3 fluoride bound together?

4 MR. LEE: Objection to form.

5 Outside the scope.

6 THE WITNESS: So, again, I don't
7 think I'm understanding what you're asking.

8 So you're saying can Lithium
9 fluoride exist in a crystal structure where
10 there's many lithiums and fluorines bound
11 together?

12 BY MS. ZHONG:

13 Q. Correct.

14 A. So that's not something that I've
15 had to consider in the context of my reply
16 declaration or my work in this proceeding.

17 Is there a specific connection to
18 Choudhury that you want me to make or to my
19 reply declaration?

20 Q. So lithium fluoride is a Lewis
21 structure, right? That's what chemists
22 typically call them, the Lewis structure.

23 So what is the actual form of
24 lithium fluoride that existed?

25 MR. LEE: Objection. Form.

1 BY MS. ZHONG:

2 Q. In the material?

3 MR. LEE: Objection. Form.

4 THE WITNESS: So in what material?

5 Just as standalone lithium fluoride? So
6 lithium fluoride is a salt.

7 BY MS. ZHONG:

8 Q. Okay.

9 A. If you're purchasing Lithium
10 fluoride from a chemical supplier, you purchase
11 raw lithium fluoride powder. Lithium fluoride
12 is a salt and presumably it could be present as
13 a fine crystal and granular material, in which
14 you'd have lithiums and fluorines bound to each
15 other. I'm not sure if that's what you're
16 getting at, but --

17 Q. Sure.

18 A. I don't think I follow what the
19 question is asking.

20 Q. So in what form is lithium -- does
21 the lithium fluoride exist in the Choudhury
22 paper? Either as a dopant or as a pure lithium
23 fluoride injection layer?

24 MR. LEE: Objection. Form.

25 THE WITNESS: So Choudhury discusses

1 doping of lithium fluoride into Alq3. And
2 Choudhury proposes that what ultimately
3 happens is Lithium fluoride is activated by
4 the cathode to become, essentially, an
5 in situ dopant.

6 BY MS. ZHONG:

7 Q. And their proposal is that it's
8 going to react with aluminum Q3, right?

9 A. Their proposal is that an anion of
10 Alq3 is formed.

11 Q. Okay. What if they -- instead of
12 Alq3, it's another -- it's an organic electron
13 transport layer, like BPhen, what would be
14 formed?

15 A. I suspect you'd form the same thing,
16 that you'd also form some sort of anion. But
17 that's not something that I've had to
18 specifically look in detail at as part of my
19 reply declaration.

20 Q. What kind of anion?

21 A. I don't think I follow the question.

22 Q. So their proposal the anion is
23 aluminum Q3 radical anion, correct? In the
24 Choudhury paper?

25 A. Yes, that's correct.

1 Q. Okay. What would be the
2 corresponding anion in the BPhen system?

3 A. So, again, I haven't gone and
4 actually looked at what the specific electric
5 chemistry would be in a variety of different
6 electron transport layers.

7 Q. And do you see that PDF page 6 they
8 have a reaction that seems to have the Gibbs
9 free energy of almost zero, which is a neutral
10 reaction?

11 A. I see that.

12 Q. So instead of a aluminum Q3, if it's
13 BPhen, do you know what's the energy -- what
14 the Gibbs free energy would be?

15 MR. LEE: Objection. Outside the
16 scope.

17 THE WITNESS: I didn't investigate
18 what the Gibbs free energy would be for a
19 reaction of Liq and BPhen.

20 BY MS. ZHONG:

21 Q. So do you think the reaction would
22 be favorable and take place?

23 MR. LEE: Objection. Outside the
24 scope.

25 THE WITNESS: Again, it's not

1 something I considered. The exhibits I've
2 presented show that Alq can act as an
3 n-dopant and Alq can associate.

4 In fact, Endo also shows -- pardon
5 me, Liq, not Alq. And Endo shows, again,
6 that Liq also serves as a dopant in BPhen.

7 So in the specific case of BPhen,
8 there is prior art to support its use of
9 Liq as well.

10 BY MS. ZHONG:

11 Q. But in that -- in both systems,
12 there is Alq3 somewhere in the OLED stack,
13 correct?

14 MR. LEE: Objection. Form.

15 THE WITNESS: So when you say "in
16 both systems," just so I'm clear, what are
17 the two that you're comparing?

18 BY MS. ZHONG:

19 Q. Endo, Ma, and now let's also adding
20 the Choudhury, in all three systems, somewhere
21 in the OLED stack there's aluminum Q3, correct?

22 A. All three of those devices use Alq3
23 as an emissive layer.

24 Q. As an emissive layer and/or as an
25 electron transport layer, correct?

1 MR. LEE: Objection. Form.

2 THE WITNESS: So Choudhury also uses
3 Alq3 as an electron transport layer that's
4 doped with lithium fluoride. They also
5 have an electron transporting blocking
6 layer of PCP.

7 Ma uses Alq as an emissive layer
8 with doped BPhen as the electron transport
9 layer.

10 And then in Endo, Alq, depending on
11 the device, can serve either as the
12 emissive layer and the electron transport
13 layer or just the emissive layer with
14 BPhen.

15 BY MS. ZHONG:

16 Q. And according to this paper by
17 Choudhury, they actually experienced that the
18 aluminum seems to be able to diffuse throughout
19 the entire layer, correct?

20 MR. LEE: Objection to form.

21 THE WITNESS: Can you point to a
22 particular part of Choudhury?

23 BY MS. ZHONG:

24 Q. Sure. PDF page 6. And why don't
25 you do a search of the word "shorting,"

1 s-h-o-r-t-i-n-g.

2 A. Okay. Let me just reread that
3 paragraph.

4 Q. Yeah. Just read the paragraph for
5 context.

6 A. Okay. Can you just please restate
7 your question?

8 Q. Okay. Is it true that according to
9 the Choudhury paper aluminum will diffuse
10 through the OLED stack?

11 A. So I don't think I would
12 characterize the passage that you've pointed me
13 to as necessarily supporting that.

14 Choudhury references some prior work
15 that has suggested that silver atoms can
16 diffuse through layers of an OLED stack. And
17 they speculate in their work that metal
18 diffusion may be part of the reason that they
19 saw a greater instance of shorts in
20 single-carrier devices.

21 And so they're hypothesizing that
22 there could be diffusion of the cathode, but I
23 don't think they have said that they think
24 there is metal diffusion through the OLED
25 stack. They seem to be referring specifically

1 to their single-carrier devices.

2 Q. What is a single-carrier device?

3 A. A single-carrier device is usually a
4 structure that's designed only to carry either
5 electrons or holes. And it's frequently used
6 as a way to look at electron or hole transport.

7 Q. So they're referring to
8 electron-only devices or hole-only devices?

9 A. Single-carrier devices can be also
10 be referred to as electron or hole-only
11 devices.

12 Q. Okay. So you think that the BCP
13 paper -- BCP layer between the aluminum Q3
14 electron transport and aluminum Q3 emissive
15 layer is going to stop the diffusion of the
16 metal?

17 MR. LEE: Objection. Outside the
18 scope.

19 THE WITNESS: I haven't had to
20 consider the diffusion of the metal through
21 the OLED stack and the degree to which BCP
22 or another layer stops it. So that's not
23 something that I've considered as part of
24 my declaration or reply declaration.

25

1 BY MS. ZHONG:

2 Q. Do you know whether lithium fluoride
3 would diffuse through the BCP layer?

4 A. I -- again, I haven't considered
5 whether or not lithium fluoride would diffuse
6 through the BCP layer as part of my declaration
7 or reply declaration.

8 Q. What's the ability you-- strike
9 that.

10 So as between lithium quinolate and
11 lithium fluoride, which one has a better
12 ability to refuse through the electron
13 transport layer?

14 MR. LEE: Objection. Form.

15 THE WITNESS: So you're asking
16 between lithium fluoride and lithium
17 quinolate, which one has an ability to
18 diffuse through the electron transport
19 layer?

20 BY MS. ZHONG:

21 Q. Yeah, which one is a better
22 diffuser?

23 A. A better diffuser? I haven't
24 considered explicitly the -- the diffusivity of
25 lithium fluoride versus Liq in electron

1 transport layers.

2 With Liq, what I point to is, the
3 Diekmann explicitly calls out molecular dopants
4 as being attractive for a lower diffusivity and
5 Liq being a molecular dopant would fit that --
6 fit that preference stated in the Diekmann.

7 Q. Is lithium fluoride also a molecular
8 dopant?

9 A. So I haven't considered how to
10 characterize lithium fluoride as a molecular
11 dopant, whether it's a molecule or not.
12 I think Liq is a molecular dopant.

13 Q. An electron dopant that can
14 disassociate; is that right?

15 A. Liq is a molecular dopant that can
16 dissociate when it molecular that's what the
17 prior art supports.

18 Q. Do you have any idea of the extent
19 of illuminate diffusion?

20 MR. LEE: Objection.

21 THE WITNESS: Is there a particular
22 structure, are you saying in Choudhury or
23 the single-carrier devices? I am not sure
24 I understand what the context is.
25

1 BY MS. ZHONG:

2 Q. Do you think the reaction between
3 the cathode and lithium fluoride or lithium
4 quinolate doped ETL, the extent of the reaction
5 of diffusion is going to differ based on
6 whether it's a single-carrier device versus a
7 full OLED?

8 MR. LEE: Objection. Form.

9 THE WITNESS: So I haven't
10 considered how the diffusion of the cathode
11 metal might depend on OLED architecture.

12 But I will highlight again, just
13 that, Choudhury is pointing to that as only
14 a hypothesis for shorting in their
15 single-carrier devices.

16 BY MS. ZHONG:

17 Q. Do you think their hypothesis is
18 consistent with what Endo is saying?

19 MR. LEE: Objection, form.

20 THE WITNESS: Can you be more
21 specific? What specifically about
22 Choudhury/Endo are you asking is
23 consistent?

24 BY MS. ZHONG:

25 Q. Is Choudhury's hypothesis of what's

1 going on there in their system is consistent
2 with Endo's hypothesis of what is going on in
3 his system?

4 MR. LEE: Objection. Form.

5 THE WITNESS: In my opinion, what
6 Choudhury demonstrates is that lithium
7 fluoride is essentially an in situ dopant,
8 that lithium fluoride mixed with Alq on its
9 own does not necessarily change the
10 formidable position of Alq3 and that that
11 comes with the metal deposition on lithium
12 fluoride and Alq to realize that change in
13 behavior and that is analogous to what Endo
14 is saying for Liq.

15 And so comparing Choudhury and Endo,
16 it shows that the lithium fluoride and Liq
17 are operating through similar mechanisms.

18 BY MS. ZHONG:

19 Q. And when you say "in situ dopant,"
20 you mean that you need to have an activated
21 metal to diffuse into that layer to activate
22 the lithium complex. Is that what you mean?

23 A. I don't know that I'd use the term
24 "activated" metal. What I'm saying is that the
25 in situ doping requires the deposition of the

1 cathode.

2 Q. And the cathode basically activates
3 the lithium complex?

4 A. The cathode leads to some
5 disassociation of the lithium complex that then
6 results in doping, or some reaction that then
7 results in doping.

8 Q. And you don't know what that is?

9 A. Well, in Choudhury, there's a
10 hypothetical reaction that's listed that we've
11 already discussed, so...

12 Q. And that's specific to alum Q3?

13 A. I don't know that it's specific to
14 aluminum Q3 and in my opinion, it's probably
15 not specific to aluminum Q3, but I don't have
16 a, as I said, the thermodynamics of other
17 reactions available?

18 Q. And would the radical anion be
19 stable for a pure organic compound?

20 MR. LEE: Objection. Outside the
21 scope.

22 THE WITNESS: So, again, I'm not
23 sure what you mean by with the "radical
24 anode be stable for a pure organic
25 compound." Can you rephrase your question?

1 BY MS. ZHONG:

2 Q. Why don't you do a word search of
3 "radical anion"?

4 A. Okay.

5 Q. Do you see the words "radical
6 anions"?

7 A. I do.

8 Q. What's the radical -- what is a --
9 what are the radical anions in the equation
10 below?

11 A. So this isn't something that I've
12 had to opine on in my declaration or reply
13 declaration. And so assessing specifics of
14 radical anion behavior isn't something that
15 I've offered a specific opinion on in my reply.

16 Q. And do you see that the next
17 paragraph says: A formation of radical anion
18 of aluminum Q3 is responsible for the n-doping
19 effect?

20 A. Yes, I see that sentence.

21 Q. Okay. Do you know whether there is
22 corresponding formation radical anion of the
23 organic electron transport layers?

24 A. So I --

25 Q. Is that something you considered?

1 A. So I would refer to Alq as an
2 organic electron transport layer.

3 So Alq is commonly referred to as an
4 organic semiconductor. It's an organic
5 electron transport layer.

6 Q. It includes a metal?

7 A. I'm sorry?

8 Q. It includes a metal center?

9 A. Yes. But it's still referred to as
10 an "organic semiconductor."

11 Q. Okay. And do you know what will be
12 the corresponding radical anion in electron
13 transport layer with no metal --

14 A. That's not something --

15 Q. -- pure organics --

16 A. That's not something that I
17 considered in my reply; -- or it's not
18 something that I opined on in my reply.

19 The data -- the data is sufficient
20 in showing that Liq will act as n-dopant.

21 Q. Do you know whether BPhen will form
22 radical anion?

23 A. With Liq, LiF, is there -- can you
24 ask the question more specifically?

25 Q. Well, can BPhen form a radical anion

1 in the presence of lithium complexes?

2 A. So I think I've already noted that
3 that's, that's not something that I've looked
4 into deeply. I don't have the corresponding
5 reaction for BPhen.

6 Q. Okay. Do you have an opinion one
7 way or the other?

8 A. My opinion is that Liq serves as a
9 N-dopant in BPhen based on the prior art.

10 Q. Okay. Does BPhen form any kind of
11 radical anion in the presence of lithium
12 quinolate?

13 A. I think that's the question I just
14 answered, that I -- I haven't looked into the
15 reactions specifically between Liq and BPhen,
16 my opinion isn't informed by the prior art that
17 shows the Liq is N-dopant in BPhen.

18 Q. Okay. So you have no opinion
19 whether a radical anion is formed in BPhen in
20 the presence of lithium quinolate; is that
21 correct?

22 A. In looking at, for example, Endo,
23 Endo is using their data to support the idea
24 that Liq leads to lithium doping of BPhen.

25 I have not had to take a further

1 opinion on what anion might form and what it
2 might look like.

3 Q. Okay. So Endo paper is 2002,
4 correct?

5 A. Just confirming that. Yes, the Endo
6 paper is 2002.

7 Q. Ma is 2008?

8 A. Ma is 2008, correct.

9 Q. And when is the next paper that
10 actually used lithium quinolate in the
11 documents that you relied on?

12 MR. LEE: Objection. Outside the
13 scope.

14 THE WITNESS: Sorry. Just want to
15 make sure I understand, what is the
16 question you're asking? When is the next
17 paper?

18 BY MS. ZHONG:

19 Q. When is the next paper that actually
20 uses lithium quinolate to document electron
21 transport layer?

22 A. In terms of prior references, those
23 are the two papers that I'm relying on as
24 lithium quinolate doped electron transport
25 layer.

1 Q. Okay. We can look beyond 2008 and
2 2009.

3 A. Oh, okay.

4 So the additional paper that I note
5 that has the lithium quinolate doped electron
6 transport layer is the Choi paper, which is
7 2009.

8 Q. Okay. And what -- which one is the
9 first one that actually uses lithium quinolate
10 in connection with a PHOLED phosphorescence
11 emitter?

12 A. So with Ma and Endo, as we've
13 already discussed, both of those devices use
14 Alq3 as an emissive layer, which is florescent
15 emitter.

16 And as I, as I mentioned in Choi, I
17 don't think it's obvious whether or not their
18 emitter is fluorescent or phosphorescent
19 because it's a proprietary chemical.

20 Q. Okay. And when is the one that you
21 know that is using a phosphorescent material?

22 MR. LEE: Objection to form.

23 THE WITNESS: So the exhibits I'm
24 citing -- well, the exhibits I brought --
25 I brought to this proceeding don't apply a

1 phosphorescent emitter with an Liq doped
2 ETL.

3 BY MS. ZHONG:

4 Q. And do you know when is the first
5 example that you know for sure there is the use
6 of lithium quinolate together with
7 phosphorescent material?

8 A. That's not something I had to look
9 into as part of my declaration, reply
10 declaration, in terms of specifically when it
11 was applied to a phosphorescent emitter.

12
13 As I argue in both my declaration
14 and reply declaration, it would have been
15 obvious to a person skilled in the art to apply
16 lithium quinolate as an n-dopant in the ETL of
17 a phosphorescent OLED just because at the time
18 of the '425, there were many prior art examples
19 of n-doped ETLs and phosphorescent OLEDs using
20 a variety of dopants.

21 Q. And do you know a Dr. Katona?

22 A. Dr. Katona. Can you give me a first
23 name and an affiliation?

24 Q. Thomas Katona. I'm not exact sure
25 of his affiliation.

1 Do you know a Dr. Thomas Katona?

2 A. I may have -- I may have met
3 Dr. Thomas Katona before, but I'm actually not
4 positive.

5 Q. Do you know that he is the expert
6 for Samsung in the district court case for the
7 '425 patent?

8 MR. LEE: Objection. Outside the
9 scope. Relevance.

10 THE WITNESS: I was not aware of
11 that.

12 BY MS. ZHONG:

13 Q. So I assume you did not talk to him
14 regarding his opinion in district court on this
15 case, correct?

16 A. No.

17 Q. And you did not read his deposition
18 transcript, correct?

19 A. No, I have not read his deposition
20 transcript.

21 Q. So do you want me -- do you prefer
22 to use Exhibit Share or Dropbox?

23 A. I have both of them open. So we can
24 attempt whichever you'd prefer. I'd like to be
25 able to download anything that you're going to

1 try to show me.

2 Q. Definitely. I think you can do
3 both. Do it either way?

4 THE COURT REPORTER: For my benefit,
5 do you mind putting it in Exhibit Share.

6 MS. ZHONG: Yeah. So I'm going to
7 copy stuff over.

8 So I have copied over into the
9 marked exhibit, Exhibit 1, Dr. Katona's
10 June 13th, 2025 transcript. And I will
11 mark this entire transcript as confidential
12 and Dr. Katona's transcript as
13 confidential, outside counsels' eyes only.

14 (Exhibit 1 was marked.)

15 MR. LEE: I'm going to take a second
16 to review the newly introduced exhibit and
17 lodge my objections before we continue
18 testimony. I have not been able to
19 download the exhibit yet.

20 MS. ZHONG: You need to refresh it.
21 I see it there.

22 THE COURT REPORTER: Counsel, do you
23 want me to separate the confidential from
24 the original.

25 MS. ZHONG: I don't think so. Nope.

1 We will just file anything under seal.
2 That's fine.

3 MR. LEE: I'm going to object to
4 this document as irrelevant, hearsay and
5 based on foundation because Dr. Holmes has
6 testified that he has not reviewed any
7 transcript of a deposition of Dr. Katona.

8 And also object to the inclusion of
9 this document in the transcript or into the
10 exhibits as against the board's rules and
11 improper attempt to run around the board's
12 rules preventing introduction of new
13 exhibits with the sur-reply.

14 BY MS. ZHONG:

15 Q. Dr. Holmes, do you have the exhibit?

16 A. I have it open.

17 Q. Can you please go to page 132?

18 A. Yes, I'm at 132.

19 Q. Do you see the exchange between --
20 page 132, lines 4 through 9?

21 A. I see that.

22 Q. Do you see the exchange concerns
23 whether a lithium quinolate blend is
24 necessarily n-doped?

25 MR. LEE: Objection. Misstates the

1 document.

2 BY MS. ZHONG:

3 Q. Is that correct?

4 MR. LEE: Objection. Outside the
5 scope. And I'm going to object to this
6 entire line of questioning as improper,
7 outside the scope.

8 BY MS. ZHONG:

9 Q. Is that correct?

10 A. Can you restate the question?

11 Q. So the question is, a lithium
12 quinolate blend is necessarily n-doped,
13 correct? That was the question, correct?

14 MR. LEE: Objection. Outside the
15 scope. I'm going to object to this entire
16 line of questioning as improperly seeking
17 to have the witness simply read exhibits
18 that cannot be properly part of the record
19 into the record through this deposition
20 transcript.

21 And if you continue, I'm going to
22 ask to take a break to consider whether we
23 need to call the board on this issue.

24 MS. ZHONG: Sure.

25

1 BY MS. ZHONG:

2 Q. Dr. Holmes, please answer the
3 question.

4 A. Can you please restate the question?

5 Q. Okay. If your counsel does not
6 trying to interrupt the deposition again.

7 So the question is that a lithium
8 quinolate blend is necessary n-doped, correct?
9 And the answer that Dr. Katona provided is:

10 I think we have covered this
11 multiple times that lithium quinolate can be an
12 n-dopant and also cannot be.

13 That's the exchange, correct?

14 MR. LEE: And I'll lodge the same
15 objections.

16 THE WITNESS: So, again, I haven't
17 reviewed this document, as I've already
18 noted.

19 It looks like this is a 300-page
20 deposition transcript. And I can't render
21 an opinion on this document without having
22 had time to look at it in detail and
23 understand all the associated exhibits and
24 arguments.

25 This is apparently from a district

1 court case. That's not something that I've
2 been involved in.

3 And so I think it would be
4 inappropriate for me to offer any opinions
5 on this particular document.

6 BY MS. ZHONG:

7 Q. I'm not asking you to render an
8 opinion. I'm asking you whether that's the
9 exchange that just took place. I haven't asked
10 my next question yet.

11 Can you answer the question that's
12 posed rather than taking the coaching objection
13 from your counsel?

14 MR. LEE: Objection. Argumentative.
15 Objection. I mean, you're clearly, by
16 admission of counsel, you are just seeking
17 to introduce a document that cannot be
18 introduced into this proceeding by having
19 the witness just read what's been provided
20 to him. You're here to ask him
21 cross-examination --

22 MS. ZHONG: Exactly. I am entitled
23 to ask him a question to see whether he has
24 considered all the available relevant
25 information. Clearly, he hasn't. So

1 stop --

2 MR. LEE: This is evidence that the
3 deponent testified that he has not --

4 (Parties speaking simultaneously.)

5 MS. ZHONG: Listen, you have -- stop
6 interrupting me -- stop interrupting his
7 answer. Okay? He is in the middle of
8 answering it and --

9 MR. LEE: You asked the question --

10 (Parties speaking simultaneously.)

11 MS. ZHONG: Stop doing that. It's
12 improper.

13 MR. LEE: You asked the question and
14 I'm lodging my objection in response to
15 your --

16 MS. ZHONG: Okay. You've already
17 lodged it. And you've interrupted this
18 deposition enough. I know you don't like
19 this line of question, but you should have
20 prepared your witness for.

21 MR. LEE: This is not a document
22 that Dr. Holmes has reviewed as he has
23 already testified.

24 MS. ZHONG: And I'm entitled to ask
25 for his opinions, so stop.

1 MR. LEE: You're entitled to ask him
2 questions about -- to cross-examine him on
3 the substance --

4 MS. ZHONG: Exactly. So stop --
5 (Parties speaking simultaneously.)

6 MR. LEE: -- testimony which he has
7 provided in his reply declaration, which
8 this is not responsive to.

9 MS. ZHONG: It is responsive to. So
10 stop. Let me ask my question.

11 BY MS. ZHONG:

12 Q. Dr. Holmes, did you see the exchange
13 on page 132, lines 4 to 9.

14 Do you see that?

15 MR. LEE: Objection. Form. I'm
16 going to object to having the witness read
17 from a transcript that he has never
18 reviewed before into the transcript of this
19 proceeding because that is a runaround
20 against the board's rules preventing
21 introduction of the exhibits with
22 sur-reply.

23 MS. ZHONG: Well, you should have
24 introduced this one. There is a board rule
25 of the duty of candor, anything that's

1 inconsistent with the positions. And it
2 has not been filed before. You guys should
3 have filed it. You have not done that.

4 That's the same thing in the 223
5 proceeding. You've done it again and
6 again, and I'm just surprised you guys are
7 doing this.

8 MR. LEE: Counsel, Pictiva Display
9 is not a party to the proceeding in which
10 this deposition was taken. And so I do not
11 understand why you believe that we would
12 have any access to this transcript. That's
13 not what the board rules require.

14 So can you, you know, refer me to
15 what the board rules are? That's --

16 MS. ZHONG: You may consult your
17 co-counsel who used to a deputy chief judge
18 and see whether you have a duty of candor
19 to the board to disclose inconsistent
20 positions.

21 And if he says on the record that
22 you don't have a duty, great. We'll take
23 that to the board.

24 MR. LEE: We don't disagree that
25 there is a duty. We disagree that

1 there's --

2 MS. ZHONG: You say you don't --

3 (Parties speaking simultaneously.)

4 MR. LEE: We disagree that that
5 somehow requires us to somehow find an
6 exhibit which we are not privy to and
7 that --

8 MS. ZHONG: You guys are privy to.
9 You have -- is that why you refuse to
10 answer --

11 (Parties speaking simultaneously.)

12 (The Court Reporter requested
13 clarification.)

14 MR. LEE: As I was saying, we also
15 disagree that there's any consistency, but
16 let's also just stop shouting and just --
17 you know, we can talk about it on a break,
18 if you would like, but I'm going to object
19 to this entire line of questioning as
20 totally improper.

21 MS. ZHONG: And you state that 100
22 times already. And let me just put on the
23 record, Covington -- we asked Covington to
24 enter into an appearance in district court.
25 You refused to do it but you insisted on

1 having access to the expert report in the
2 district court and you also have access --
3 my understanding is you have access to all
4 those transcript as well.

5 So to state that you have no access
6 to them, that's a blank lie.

7 MR. LEE: I understand --

8 MS. ZHONG: That's not the truth.
9 Okay?

10 MR. LEE: I understand that it is
11 Pictiva that's been seeking to file these
12 papers from the district court, and it was
13 Pictiva's request that we, you know, agree
14 to some arrangement in order that -- that
15 the available to Pictiva in these
16 proceedings. So...

17 BY MS. ZHONG:

18 Q. So, Dr. Holmes, do you agree with
19 Dr. Katona, that a lithium quinolate plant is
20 not necessarily n-doped and lithium quinolate
21 does not necessarily have to act as an n-dopant
22 in the blend?

23 MR. LEE: Objection. Outside the
24 scope. Objection. Form.

25 THE WITNESS: So I see the text that

1 you're pointing to. Lines 4 through 9.

2 I would have to know more context
3 about Dr. Katona's position to understand
4 what blends he's referring to and what the
5 full scope is of what he's saying.

6 I unfortunately can't offer an
7 opinion just based on one response from
8 Dr. Katona about what he's thinking and
9 what his opinion is.

10 BY MS. ZHONG:

11 Q. So is it a position that lithium
12 quinolate and electron transport layer is
13 necessarily acting as an n-dopant?

14 MR. LEE: Objection. Outside the
15 scope. Objection. Misstates testimony.

16 THE WITNESS: So in looking at
17 lithium quinolate in electron transport
18 layer, based on what I've reported on in my
19 declaration and my reply declaration, I am
20 using support from the literature to
21 support the usage of Liq has an n-dopant in
22 a variety of ETLs, that's what I can be
23 confident in -- in offering as my opinion.

24 In terms of the more general
25 questions that are being considered here,

1 again, I'd have to better understand the
2 full scope of what's going on.

3 BY MS. ZHONG:

4 Q. Is lithium quinolate in electron
5 transport layer necessarily an n-dopant?

6 MR. LEE: Objection. Asked and
7 answered. Objection. Beyond the scope.

8 THE WITNESS: Lithium quinolate, as
9 I've described in my declaration and reply
10 declaration, can be used as an n-dopant and
11 have shown that it's an n-dopant in variety
12 of electron-transport material.

13 Lithium quinolate could be also be
14 used as an electron transport layer itself,
15 in which case, it clearly wouldn't be an
16 n-dopant, it would be the ETL.

17 BY MS. ZHONG:

18 Q. Okay. So if lithium quinolate is
19 blended with another organic material that can
20 act as an electron transport layer, is lithium
21 quinolate necessarily an n-dopant?

22 MR. LEE: Objection. Outside the
23 scope. Objection. Form.

24 THE WITNESS: What I've emphasized
25 and what I've said and in my declaration,

1 reply declaration is that I'm relying on
2 the prior art that clearly shows Liq has a
3 dopant in several electron transport
4 materials.

5 BY MS. ZHONG:

6 Q. So if lithium quinolate is a major
7 phase, is that still a dopant?

8 (The Court Reporter requested
9 clarification.)

10 BY MS. ZHONG:

11 Q. So if lithium quinolate is a major
12 phase of the planned, is that still a dopant?

13 MR. LEE: Objection. Outside the
14 scope. Relevance.

15 THE WITNESS: So I didn't, in my
16 declaration or reply declaration, have to
17 form an opinion on whether there's an upper
18 limit of where Liq is no longer a dopant in
19 a given material.

20 Of course, in neat film, it's no
21 longer a dopant, it's the
22 electron-transport material. I suspect
23 there could be some upper limit but it is
24 not something that I had to draw a specific
25 opinion on.

1 BY MS. ZHONG:

2 Q. Okay. Why don't we take a look at
3 Exhibit 1049, the Endo paper.

4 A. Okay.

5 Q. Sorry. I think it might be the Choi
6 paper -- yeah, Choi paper, Exhibit 1050,
7 actually.

8 A. Okay.

9 Q. And do you see that he has plans
10 ranging from 3, 2, 1 electron transport layer
11 to lithium Q to 1, 2, 3 or 1, 2, 5 electron
12 transport layer to three parts of lithium
13 quinolate or five parts of lithium quinolate?

14 MR. LEE: Misstates the document.

15 BY MS. ZHONG:

16 Q. Do you see the --

17 A. Is there a particular figure you're
18 pointing to?

19 (The Court Reporter requested
20 clarification.)

21 BY MS. ZHONG:

22 Q. Figures 3. Figure 3.

23 A. Yes, I see Figure 3 and I see the
24 date as a function of concentration of Liq in
25 the ETL.

1 Q. Okay. So for -- when ETL to lithium
2 quinolate, when ETL seems to be the minor
3 component, is lithium quinolate still a dopant?

4 MR. LEE: Objection. Outside the
5 scope. Misstates the document.

6 THE WITNESS: So, again, I think
7 what I answered already was that I -- I
8 wasn't asked or I didn't have to take an
9 opinion on where the upper limit might be
10 for Liq or any other dopant, for that
11 matter, when it ceases to be a dopant.

12 Certainly in neat film, it's not a
13 dopant anymore but I didn't form an opinion
14 on what that threshold might be for
15 different dopants.

16 BY MS. ZHONG:

17 Q. So if the plan is 80 percent lithium
18 quinolate, 20 percent ETL, you still consider
19 lithium quinolate to be a dopant?

20 MR. LEE: Objection. Outside the
21 scope.

22 THE WITNESS: So, again, that's not
23 what I said. What I said was that I didn't
24 establish a firm upper limit on when a
25 particular dopant would stop being a

1 dopant.

2 BY MS. ZHONG:

3 Q. And I'm asking for a specific
4 composition.

5 MR. LEE: Objection.

6 BY MS. ZHONG:

7 Q. 80 percent, 80 percent is similar
8 quinolate. 20 percent ETL, is that -- is
9 lithium quinolate acting as a dopant?

10 A. So I think I already answered that,
11 that I didn't form an opinion on what the upper
12 limit would be on when Liq is a dopant and when
13 it's not a dopant.

14 Q. What is a "dopant"?

15 A. So a dopant in the context of --
16 again, if you can go back to my first
17 declaration, is a material that's added to an
18 electron transport layer that increases the
19 conductivity.

20 Q. So the electron transport layer can
21 be 1 percent of the material and 99 percent the
22 material can be the dopant that's added to it?

23 MR. LEE: Objection. Misstates the
24 testimony.

25 THE WITNESS: Again, that's not what

1 I said. What I said is that I did not form
2 an opinion on what the upper limit is for a
3 particular combination of the dopant and
4 the ETL, and in this case, the Alq and --
5 and Alq. And so that's not something that
6 I drew an opinion on in my reply or in my
7 initial declaration, and so I'm -- I'm
8 hesitant to establish an opinion right now.

9 BY MS. ZHONG:

10 Q. So I'm asking you the question. So
11 if you have a composition that's 65 percent
12 lithium quinolate, 35 percent of the electron
13 transport layer, is lithium quinolate an
14 n-dopant or not? Or you have not formed an
15 opinion?

16 MR. LEE: Objection. Beyond the
17 scope.

18 THE WITNESS: I think I've answered
19 that several times for different
20 hypothetical compositions that you've
21 offered.

22 But in my declaration, in my reply
23 declaration, I haven't taken an opinion on
24 what the upper limit would be for -- for
25 doping.

1 I obviously acknowledge that Liq,
2 too, can be used in a neat film, in which
3 case, it's obviously no longer a dopant but
4 I -- I didn't specify a particular
5 concentration at which one goes from doping
6 to non-doping with -- with Liq.

7 It's not something that I had to do
8 to form my opinions.

9 BY MS. ZHONG:

10 Q. So I'm asking very specific
11 composition and I need to have an answer.

12 65 percent by weight is quinolate,
13 35 percent electron transport layer is lithium
14 quinolate acting as a n-dopant?

15 A. Again --

16 MR. LEE: Objection. Outside the
17 scope. Asked and answered and
18 argumentative. He's provided an answer,
19 Counsel.

20 MS. ZHONG: Do you want to make
21 additional speaking objections?

22 MR. LEE: That was not a speaking
23 objection.

24 MS. ZHONG: You may want to consult
25 your co-counsel.

1 BY MS. ZHONG:

2 Q. Dr. Homes, please answer the
3 question.

4 A. I'm happy to answer --

5 MR. LEE: Same objections.

6 THE WITNESS: I'm happy to answer
7 the question again.

8 Where Liq is no longer n-dopant, if
9 there's a concentration that's a critical
10 point where one would no longer consider it
11 a dopant is not something that I formed an
12 opinion on in my declaration or reply
13 declaration.

14 It is not something that I had to
15 form an opinion on because the prior art
16 characterizes Liq as an N -- dopant. And
17 so --

18 (The Court Reporter requested
19 clarification.)

20 THE WITNESS: Prior art
21 characterizes Liq as a dopant. And so in
22 the combinations that I'm making between Ma
23 and Suzuki or Ma and Diekmann, the prior
24 art supports the use of Liq as a dopant,
25 and that's on which I'm basing my opinion

1 and building those combinations.

2 And so, again, I didn't have to take
3 a position on an upper limit for when Liq
4 would no longer be a dopant. And, again,
5 I'm not going to form a new opinion here on
6 something that I haven't already considered
7 and thought carefully about.

8 BY MS. ZHONG:

9 Q. So you have not -- for the specific
10 composition I provided, you do not have an
11 opinion as to whether for that specific
12 composition lithium quinolate is serving as a
13 dopant or not; is that correct?

14 MR. LEE: Objection. Form. Outside
15 the scope.

16 THE WITNESS: Again, I have not
17 formed an opinion in my declaration or
18 reply declaration on where there's an upper
19 limit for when Liq may no longer be a
20 dopant in an ETL.

21 BY MS. ZHONG:

22 Q. For a 1-to-1 mixture by weight of
23 ETL to lithium quinolate, do you have an
24 opinion as to whether lithium quinolate serves
25 as a dopant in that context?

1 MR. LEE: Objection. Outside the
2 scope. Form.

3 THE WITNESS: So what I'll consider,
4 and the way I built my opinion and
5 considered the prior art, is in looking at,
6 for example, the prior art, you know,
7 looking at whether it's Ma, for example, or
8 Endo, you know, 1-to-1, there is still
9 referred to as doping.

10 And so depending on the system,
11 depending on the data, there could be other
12 things for other systems that need to be
13 considered, but certainly, Ma and Endo
14 would categorize that as doping.

15 BY MS. ZHONG:

16 Q. Is that how you would characterize
17 it?

18 A. Again, from my perspective, as I've
19 already noted, I'm basing my opinion on the
20 prior art. And so I am looking at the prior
21 art and assessing the community's
22 interpretation of Liq as a n-dopant for the
23 ETL.

24 And so the question of, again,
25 specific concentrations that are being applied,

1 didn't impact my opinion in that regard.

2 Q. So in your opinion, lithium
3 quinolate can be the major phase and still be a
4 dopant; is that correct?

5 MR. LEE: Objection. Misstates the
6 testimony. Outside the scope. Incomplete
7 hypothetical.

8 THE WITNESS: So I have not said
9 that. What I've said is that Liq, based on
10 the prior art, can be an n-dopant in the
11 ETL of an OLED.

12 And that, in forming my opinions, in
13 writing my declaration and reply
14 declaration, I did not take a position on a
15 specific concentration that would be, say,
16 an upper limit or when a material may or
17 may not cease to be a dopant.

18 BY MS. ZHONG:

19 Q. Do you typically call something
20 that's, like, 65 percent of the composition a
21 dopant?

22 MR. LEE: Objection. Form. Outside
23 the scope. Relevance.

24 THE WITNESS: So when you say
25 "typically," can you refer me to what

1 you're referring to? Because the word
2 "dopant" can mean a lot of different
3 things.

4 BY MS. ZHONG:

5 Q. So outside this litigation, have you
6 ever described a mixture of material -- strike
7 that.

8 So outside the context of this
9 litigation, have you ever used dopant to
10 describe a material that's 65 percent of the
11 blend?

12 A. So --

13 MR. LEE: Objection. Was that the
14 complete question? Because I'm going to
15 lodge my objection as outside the scope.
16 Lack of relevance.

17 THE WITNESS: So in a mixture of
18 materials, in preparing a mixture of
19 materials, one can refer to co-doping, for
20 example, a mixture of materials.

21 BY MS. ZHONG:

22 Q. So both components are dopants?

23 MR. LEE: Objection. Misstates
24 testimony. Outside the scope. Relevance.

25 THE WITNESS: So I just want to make

1 sure I'm clear on if this is referring to a
2 particular part of my reply declaration so
3 that I can make sure that I'm commenting on
4 the correct aspect of what you're looking
5 for.

6 BY MS. ZHONG:

7 Q. I'm so glad you picked up the hint
8 from your counsel.

9 A. I'm sorry, can you just repeat?

10 Q. I said, I'm so glad you picked up a
11 hint from your counsel.

12 A. I see.

13 Q. So for the -- you mentioned that
14 outside the litigation, when you are referring
15 to a mixture, you call them co-doping.

16 So my question to you is. If you
17 have materials A and B mixed together, are you
18 referring to both components as dopants?

19 MR. LEE: Objection. Misstates the
20 testimony. Outside the scope. Relevance.

21 THE WITNESS: What I said previously
22 was that, in some instances, when one
23 creates a mixture of two materials, the
24 action of creating that mixture can be
25 co-doping.

1 BY MS. ZHONG:

2 Q. Are both materials considered
3 dopants, then?

4 A. I don't think --

5 MR. LEE: Beyond the scope.

6 THE WITNESS: I don't think for the
7 purposes of this particular proceeding I
8 had to consider questions of doping and
9 terminology for doping.

10 My opinion is formed based on the
11 fact that when specifically consider
12 n-doping of the electron transport layer,
13 there's ample support in the prior art for
14 Liq to serve as an n-dopant in the electron
15 transport layer.

16 And so questions related to upper
17 limit for concentration, whether
18 something's called a dopant versus
19 something else, didn't come into forming my
20 opinion.

21 BY MS. ZHONG:

22 Q. Okay. You seem to be avoiding my
23 question.

24 So my question to you, when you say
25 "co-doping," is that referring to mixing A and

1 B together?

2 MR. LEE: Objection. Argumentative.
3 Outside the scope. Relevance.

4 THE WITNESS: So what I mentioned
5 earlier, and I'll just restate, is that the
6 practice of including two materials in a
7 mixture can sometimes be referred to as
8 co-doping.

9 BY MS. ZHONG:

10 Q. Okay. And so do you consider both A
11 and -- the material A and the material B in the
12 mixture to be dopants, then?

13 MR. LEE: Objection. Outside the
14 scope. Relevance. Asked and answered.

15 THE WITNESS: Again, I would have to
16 know more about the specifics of the
17 situation that we're describing in order to
18 comment any further on this hypothetical.

19 BY MS. ZHONG:

20 Q. So can you give me an example where
21 you are referring to mixing A and B together as
22 co-doping?

23 A. I don't have --

24 MR. LEE: Outside the scope.
25 Relevance.

1 THE WITNESS: I don't have an
2 example off the top of my head regarding
3 co-doping. That's not something that I
4 thought about in the context of the
5 '425 IPR. And so it's not something that I
6 have an immediate example off the top of my
7 had head. I'd have to think more about
8 that and find appropriate literature.

9 THE COURT REPORTER: Is it possible
10 to take a break?

11 MS. ZHONG: Sure.

12 (A recess was taken.)

13 BY MS. ZHONG:

14 Q. Dr. Holmes, simply because lithium
15 quinolate is used in an electron transport
16 layer doesn't mean that it will be used as an
17 n-dopant; is that correct?

18 A. So I'll interpret your question to
19 mean that is Liq necessarily an n-dopant?
20 I suspect there's instances where it may not
21 be.

22 Q. So the mere presence of lithium
23 quinolate in the electron transport layer
24 doesn't mean lithium quinolate is being used as
25 an n-dopant. It can be used as a matrix

1 material or host material; is that correct?

2 MR. LEE: Objection. Outside the
3 scope.

4 THE WITNESS: So, again, I -- those
5 terms I haven't had to consider in the
6 context of the '425.

7 I have based my testimony on where
8 Liq is explicitly used as an n-dopant in
9 the prior art, and that's how I've
10 supported my combinations that I've
11 described in my declaration.

12 BY MS. ZHONG:

13 Q. Can you answer the question that I
14 posed, which is, the mere presence of lithium
15 quinolate in the electron transport layer
16 doesn't mean lithium quinolate is being used as
17 an n-dopant; is that correct?

18 MR. LEE: Objection. Form. Outside
19 the scope. Asked and answered.

20 THE WITNESS: So I've noted before
21 that Liq can be used as an
22 electron-transport material in its own
23 right, in which case, it wouldn't be a
24 dopant.

25 And I've commented already that my

1 opinion is based on the fact that Liq has
2 been previously used as an n-dopant in a
3 variety of electron transport materials.

4 Whether there's some threshold for
5 when it may or may not be a dopant, that's
6 not something that I've taken a position on
7 and not something that I've had to have to
8 inform my opinion.

9 BY MS. ZHONG:

10 Q. Can you please take a look at
11 Exhibit 1050, the Choi paper?

12 A. Yes.

13 Q. And can you please go to Figure 2?

14 A. Yes, I see Figure 2.

15 Q. In Figure 2, the box on the
16 left-hand side, do you see there is a solid box
17 with dash lines in there?

18 A. Yes, I see the box.

19 Q. What does the presentation --
20 representation mean?

21 MR. LEE: Objection. Outside the
22 scope.

23 THE WITNESS: So in Figure 2, let me
24 just make sure there isn't something more
25 specific in Choi. Give me a one moment to

1 read the text associated with Figure 2.

2 So Figure 2 is described by Choi, on
3 the first page of the paper, it is just an
4 energy-level diagram for part of the OLED
5 that they are considering in their work and
6 the solid box would represent presumably
7 the HOMO-LUMO levels of an ETL, although
8 they are not labeled explicitly; so it's
9 not obvious what material they're referring
10 to, but they would refer to an ETL.

11 BY MS. ZHONG:

12 Q. Okay. What's a dashed box? What --
13 what -- what are the dashed lines?

14 A. So the dashed lines in Figure 2, by
15 virtue of the fact that they are labeled and
16 that Liq is being noted as related to those
17 dashed lines, would presumably be the HOMO-LUMO
18 level of Liq.

19 Q. So why the HOMO-LUMO for lithium
20 quinolate illustrated as dashed lines within
21 the box rather than as a solid box itself?

22 MR. LEE: Objection. Outside the
23 scope. Relevance.

24 THE WITNESS: So -- well, again, I
25 don't know why Choi, for example, did that.

1 But it might just indicate that there's two
2 materials in that layer, for example.

3 BY MS. ZHONG:

4 Q. Does that indicate one is a dopant,
5 the other is a matrix material?

6 A. No.

7 MR. LEE: Objection. Same
8 objections.

9 THE WITNESS: I don't think that
10 specifies anything about the composition of
11 the -- of the layer.

12 BY MS. ZHONG:

13 Q. Can you pull up Exhibit 1054, the
14 second Schwartz paper?

15 (Exhibit 1054 was identified.)

16 THE WITNESS: Yeah, I just have to
17 download it. Yes, I have it.

18 BY MS. ZHONG:

19 Q. Does this paper mention the lithium
20 quinolate or lithium-quinolate complex in any
21 way?

22 A. I'm just going to quickly skim the
23 paper to make sure I answer the lithium complex
24 part of your question correctly.

25 I don't think this -- this paper

1 does not mention lithium quinolate and I don't
2 think this paper mentions lithium complexes.

3 Q. Okay. This is an academic paper,
4 correct?

5 A. Yes. This is from an academic
6 group.

7 Q. Can you go to the figure in the
8 experiment section on page 2, Figure 1?

9 A. Yes, I'm looking at Figure 1.

10 Q. Do you see the energy diagram on the
11 lower left-hand corner?

12 A. Yes, I see the energy diagram.

13 Q. Okay. Do you see the Novaled HTL
14 system?

15 A. I see the box labeled "Novaled HTL."

16 Q. And Novaled HTL system would be
17 Novaled's proprietary system?

18 A. That would be my presumption.

19 Q. Okay. But it's available to the
20 academic institute, like, like a based group,
21 research group, right?

22 A. That's an important distinction
23 because this -- this group worked closely with
24 Novaled. So just because it's available to
25 this group would not mean it would be widely

1 available.

2 Q. Did you attempt to get Novaled's
3 material?

4 A. At any point in my career, is that
5 what you're asking?

6 Q. Around that time, yeah.

7 A. No, I've never attempted to get
8 Novaled's material.

9 Q. Not at any point in your career?

10 A. No. In general, I prefer not to use
11 proprietary systems because when you do use
12 them, it makes it more challenging to
13 understand specifically why the device might be
14 getting better or -- or worse.

15 Q. Do you know whether the material is
16 available to industrial groups?

17 A. I don't know the specific
18 availability of Novaled's HTL material.

19 Q. Do you know the academic groups
20 that's working with Novaled at the time?

21 A. So are you --

22 MR. LEE: Beyond the scope.
23 Relevance.

24 THE WITNESS: So I just want to make
25 sure I'm clear, are you -- are you asking,

1 did I know any of these researchers at the
2 time?

3 BY MS. ZHONG:

4 Q. No. I'm just asking you: Do you
5 know how many academic research groups Novaled
6 was collaborating at the time?

7 MR. LEE: Objection. Outside the
8 scope and relevance.

9 THE WITNESS: No, I don't. It's
10 just that Novaled was basically a company
11 that had come out of this group, the
12 technology came from this group. And so
13 that's why I know they were working
14 together. I don't know the breadth of the
15 full collaboration, scope.

16 BY MS. ZHONG:

17 Q. Okay. And did you know anyone who
18 trying to get Novaled's system -- strike that.

19 Do you know of any academic groups
20 who attempted to get access to Novaled's
21 proprietary materials and got turned down?

22 A. I don't know of a specific academic
23 group who's tried to get Novaled material and
24 turned down. But if that were to be occur, I
25 probably wouldn't be made aware of it.

1 Q. Okay. Do you see that there are
2 several materials where you have material A
3 column, material B? Do you see that, for
4 example -- an example is NBP, column
5 Ir(MDQ)2(acac)?

6 MR. LEE: Objection. Form.

7 THE WITNESS: You're referring to
8 the labels in the energy diagram in
9 Figure 1?

10 BY MS. ZHONG:

11 Q. Yes.

12 A. I see the -- the -- yes, I see that
13 usage, yeah.

14 Q. And what is a does a colon signify?

15 A. What the use of the colon, what does
16 that signify?

17 Q. Yes.

18 A. Usually if it's a -- a mixture of
19 multiple materials, there would be a colon or
20 maybe a dash between the two materials to
21 indicate that there two materials are present
22 in the layer.

23 Q. And does it like -- what's the
24 material before the colon?

25 MR. LEE: Objection. Outside of the

1 scope.

2 THE WITNESS: Again, it depends on
3 the situation, you know, the -- if I look
4 at TCTA-TPBi, you know, those two materials
5 are -- are both probably there in similar
6 quantities. And so it doesn't necessarily
7 imply -- imply a composition per se.

8 BY MS. ZHONG:

9 Q. Uh-huh.

10 What about for the iridium one?

11 A. Which iridium one?

12 Q. The two iridium ones.

13 A. So in -- in both of those films,
14 iridium complex is the emitter.

15 Q. So they're dopants?

16 A. They're certainly the emissive
17 dopant.

18 Q. Okay. You would not consider them
19 to be the host materials, would you?

20 MR. LEE: Objection. Outside the
21 scope. Relevance.

22 THE WITNESS: So in these
23 situations, I'd have to better understand
24 what the -- what the specifics are to make
25 that kind of assessment. It's not the

1 something that I have to think about in
2 context of -- of this work.

3 Certainly, the iridium complexes
4 would be the emitter and -- and they are
5 included in that layer as an emissive
6 dopant.

7 BY MS. ZHONG:

8 Q. Have you ever referred to an emitter
9 as a host material?

10 MR. LEE: Objection. Outside the
11 scope. Relevance.

12 BY MS. ZHONG:

13 Q. In your academic work, that is?

14 MR. LEE: Same objections.

15 THE WITNESS: I'd -- I'd have to go
16 back and look at my publications as if I've
17 actually referred to -- yeah, how I've
18 referred to emitters before. It's quite
19 possible I have but it's -- it's not
20 something that I -- I thought about in
21 preparation for these proceedings or in
22 preparing my declaration or reply
23 declaration.

24 BY MS. ZHONG:

25 Q. Can you give an example where you

1 actually -- you have cited several papers, your
2 own papers, correct, in this proceeding?

3 MR. LEE: Objection.

4 THE WITNESS: I've cited one of my
5 papers as an exhibit in this proceeding.

6 BY MS. ZHONG:

7 Q. Did you refer to the emitter as the
8 host material or -- in that paper?

9 MR. LEE: Objection. Beyond the
10 scope. Relevance.

11 THE WITNESS: I haven't reviewed
12 that paper in a while, but I can do so
13 right now and make sure I answer correctly
14 your question. Just have to find that
15 exhibit.

16 Is that exhibit on Exhibit Share
17 even? I don't see it. But I might be
18 missing something.

19 BY MS. ZHONG:

20 Q. Do you have the Dropbox? That
21 should have the full exhibit.

22 A. Oh, yes. I can open the Dropbox.
23 Again, I haven't looked at that
24 exhibit. Do you know what the exhibit number
25 is?

1 Q. You can take a look at your -- your
2 reply declaration pages 2 through 4.

3 A. Oh, right. Right.

4 Actually, I don't think I have cited
5 my work in --

6 Q. In this proceeding?

7 A. Yeah, I'm thinking about the
8 '164 IPR proceeding.

9 Q. Okay.

10 So do you recall any instance where
11 any of the papers you cited refers to the --
12 refers -- strike that.

13 Do you recall any of the papers that
14 you have reviewed or cited in this proceeding,
15 labels the emitter material as the host
16 material?

17 MR. LEE: Outside the scope.
18 Relevance.

19 THE WITNESS: So I -- it's not
20 something that I had to consider in my
21 declaration, or reply declaration. I'd
22 have to go back through the exhibits to see
23 if there's any instance where that occurs.
24 I don't have an example off the top of my
25 head right now.

1 BY MS. ZHONG:

2 Q. You have recently found Zheng paper,
3 correct, Exhibit 1052?

4 (The Court Reporter requested
5 clarification.)

6 BY MS. ZHONG:

7 Q. You have recently found the Zheng
8 paper, Z-h-e-n-g, Exhibit 1052.

9 A. Yes, I reference the Zheng paper.

10 Q. In the Zheng paper, lithium
11 quinolate is used as an injection layer,
12 correct?

13 A. If you give me one second, I just
14 want to make sure that I have it open.

15 Thank you.

16 Yes, in the Zheng paper, they're
17 looking at comparing the performance of lithium
18 fluoride and lithium quinolate as an injection
19 layer.

20 Q. That is the same as in the Liu
21 paper, Exhibit 1018, correct?

22 (Exhibit 1018 was identified.)

23 MR. LEE: Objection. Form.

24 THE WITNESS: Just in terms of what
25 you mean "that is the same," can you

1 clarify more specifically with what you're
2 comparing?

3 BY MS. ZHONG:

4 Q. In the Liu paper, lithium quinolate
5 is also used as an electron injection layer,
6 correct?

7 A. Yes. I'm just going to open the
8 paper. Yes, in the Liu paper as well, lithium
9 quinolate is being applied as a electron
10 injection layer.

11 Q. And so do you consider the Zheng
12 paper to be duplicative or cumulative -- not
13 duplicative.

14 Is the Zheng paper accumulative of
15 the information contained in the Liu paper?

16 MR. LEE: Objection. Calls for a
17 legal conclusion.

18 THE WITNESS: I'm happy to compare
19 those two exhibits. Can you just tell me
20 what you mean by "duplicative" or
21 "cumulative"? I'm not familiar with the
22 weight of those terms.

23 BY MS. ZHONG:

24 Q. Does Zheng teach anything beyond
25 what Liu does for the purpose of your

1 declaration?

2 A. I just want to review, review for a
3 moment here.

4 So Zheng offers further support for
5 the similar use of Liq and LiF, basically,
6 again pointing to how the community views these
7 two materials and used these two materials.

8 And Zheng also echoes some aspects
9 of Liu in terms of the advantages of Liq as
10 well.

11 Q. Does Zheng teach you anything that
12 Liu doesn't?

13 A. So to answer that, I want to just
14 take a quick look at my reply declaration.

15 So in comparing Liu and Zheng, I
16 think they're supporting a similar application
17 of Liq and LiF. They offer slightly different
18 perspectives on a slightly different hypotheses
19 on how Liq and LiF operate, but in both cases,
20 they support the conclusion that these
21 materials are very similar in how they are used
22 and ultimately how they would be expected to
23 behave as materials and OLEDs.

24 Q. Okay. And do you see in Zheng, how
25 they compared the performance of the devices

1 made with aluminum Q3 electron transport layer
2 versus to pure organic electron transport
3 layer, DPVBi and MEH-PPV?

4 A. Is there a figure you're referring
5 to specifically? So Figure 3?

6 Q. There's Figure 3 and compared to
7 Figure 2, I believe. Yes -- Figure 1.

8 A. I see that they're examining several
9 different systems, yes.

10 Q. And for the two pure organic
11 electron transport layers, the turn-on voltage
12 did not drop significantly compared to the
13 undoped layer; is that correct?

14 MR. LEE: Objection. Form.

15 THE WITNESS: When you're referring
16 to the two pure electron transport layers,
17 you're referring to Figure 3?

18 BY MS. ZHONG:

19 Q. Yes, to pure organic electron
20 transport layers in the MEH-PPV?

21 A. So -- so I'll just note that -- I'll
22 just note that DPVBi --

Q. Mm-hmm.

A. -- and MEH-PPV are not really
electron transport layers. They can carry

1 electrons but they are not generally regarded
2 as good electron transport layers in the same
3 way that maybe Alq might be.

4 These materials are being selected
5 for this particular study to just show some
6 diversity of application across different
7 emitters and also in the case of MEH-PPV,
8 solution-process polymer devices as well.

9 And so the way I would read this
10 data is that Liq and LiF lead to a reduction in
11 turn-on voltage across all systems, whether
12 it's Alq in Figure 1 or these other perhaps
13 less optimized devices in Figure 3.

14 Q. In the case of the two materials
15 shown in Figure 3, the turn-on voltage only
16 drops slightly, correct? Turn-on voltage?

17 (The Court Reporter requested
18 clarification.)

19 MR. LEE: Objection. Form.
20 Objection. Outside the scope.

21 THE WITNESS: So in Figure 3, the
22 turn-on voltage does get smaller -- is
23 improved in both cases with the electron
24 injection layer. It's challenging to know
25 what the precise turn-on voltage is, of

1 course, just because the data is not
2 plotted logarithmically. And so, you know,
3 the current density data is linear and so
4 the turn on is going to be buried somewhere
5 in that -- that very low current regime of
6 behavior.

7 So it's clear, looking at the
8 forward current, that the device is
9 improved, but in terms of the specifics of
10 the turn-on voltage, that's -- that's
11 perhaps harder to assess.

12 Looking at the inset luminance
13 current density behavior, it's clear that
14 there's a substantial improvement in
15 luminance from the device regardless of
16 which injection layer is used.

17 BY MS. ZHONG:

18 Q. Given the large turn-on voltage, is
19 light emitted through electroluminescence or
20 some other mechanisms may be going on as well?

21 MR. LEE: Objection to form.

22 Misstates the document.

23 THE WITNESS: So I'll first just
24 restate what I said before, which is that,
25 it's actually, you characterize turn-on

1 voltage as large, that's not actually
2 straightforward to assess from Figure 3
3 because you don't have the data plotted
4 logarithmically.

5 And so I wouldn't necessarily
6 characterize the turn-on voltage as -- as
7 "large" per se. But I have absolute
8 certainty that the emission from this
9 device is electroluminescence.

10 BY MS. ZHONG:

11 Q. Because what?

12 A. Pardon me?

13 Q. What's the basis?

14 A. Well, that's a -- as a person
15 skilled in the art, I understand how an OLED
16 works, I understand how an OLED looks and I
17 don't see a competing mechanism that would be
18 capable of giving so much luminance out of
19 these devices and so the -- and the literature
20 is pretty clear that in such structures, you
21 have electroluminescence exciton recombination
22 as to mechanism for light- --

23 (The Court Reporter requested
24 clarification.)

25 THE WITNESS: Sorry.

1 In -- in such -- I don't know where
2 you want me to start.

3 In such structures, you have
4 exciton, e-x-c-i-t-o-n recombination as to
5 your source of luminescence and so you have
6 electroluminescence here.

7 Let me look more closely at Zheng to
8 see if there's additional evidence for
9 that, but that's not something
10 that certainly I would have thought would
11 be in question in looking at -- at Zheng,
12 but let me have a quite look to see if I
13 can provide additional support for that.

14 Yeah, so the further support that
15 I'd offer is that in the conclusion, the
16 authors do clearly note that Liq is also
17 very effective, to be used as an electron
18 injection layer for DPVBi based blue OLED
19 and MEH-PPV base orange polymer OLED, those
20 are the corresponding emission colors of
21 those materials that were well-known at the
22 time of this paper.

23 And so, again, that would -- that
24 would lead the reader to believe that this
25 is, in fact, operating as one would expect,

1 which is the electrons are in holes, are
2 being injected, excitons are being formed
3 and those excitons are recombining to give
4 you the characteristic light emission of
5 the emissive material, either DPVBi or
6 MEH-PPV.

7 So I don't have any concern about
8 there being some other process active here.

9 BY MS. ZHONG:

10 Q. So is DPVBi the -- actually the
11 emission layer?

12 A. So in these devices, DPVBi, the
13 device is very simple, it's only indium tin
14 oxide, TPD, DPVBi and then the DIL cathode
15 structure, and so DPVBi is the emission layer
16 and the structure is the -- is the emissive
17 material in these structures.

18 BY MS. ZHONG:

19 Q. So there is no electron transport
20 layer?

21 A. Well, so DPVBi is playing the role
22 as well as the electron-transport material. It
23 has to because electrons need to get into the
24 device.

25 Q. So the electron is injected directly

1 into the device, right, through the lithium
2 fluoride or lithium quinolate layer?

3 MR. LEE: Objection.

4 THE WITNESS: So electrons are being
5 injected from the cathode into the device
6 and -- and having to travel through DPVBi.

7 BY MS. ZHONG:

8 Q. So TPD is a hole-transport material,
9 right?

10 A. Yes. TPD is a hole-transport
11 material and this device serving as the
12 hole-transport layer.

13 Q. So the holes enter into the DPVBi
14 layers through TPD?

15 A. So my -- again, I don't have an
16 energy diagram here but yes, my assumption
17 would be that holes from TPD are entering DPVBi
18 to form excitons.

19 Q. Okay. And electrons are entering
20 through DPVBi, so --

21 (The Court Reporter requested
22 clarification.)

23 THE WITNESS: So -- yeah, I'll just
24 restate simply.

25 So holes are traveling through TPD,

1 electrons would be traveling through DPVBi
2 and then excitons are forming in DPVBi to
3 recombine them as light.

4 BY MS. ZHONG:

5 Q. And is that the same for the device
6 containing MEH-PPV?

7 A. Yes, similar. So in the device
8 containing MEH-PPV, MEH-PPV is the
9 light-emitting material and it has to also be
10 able to transport electrons as well.

11 And so you would have holes being
12 injected from PEDOT into MEH-PPV and excitons
13 formed in MEH-PPV so that they can recombine
14 and emit light.

15 In this context, PEDOT actually is
16 P-E-D-O-T.

17 Q. Sorry.

18 Do you know the bulking level for
19 cesium and barium?

20 MR. LEE: Objection. Form.

21 THE WITNESS: Is there a particular
22 reference you want to point me to to answer
23 that question?

24 BY MS. ZHONG:

25 Q. Based on your experience, what's a

1 doping level when you use cesium or barium as
2 an n-dopant?

3 MR. LEE: Objection. Form. Outside
4 the scope.

5 THE WITNESS: So I haven't
6 previously used cesium or barium as a
7 n-dopant, so I don't think I have a
8 reference point to -- to provide there from
9 my own work.

10 BY MS. ZHONG:

11 Q. What about for lithium?

12 MR. LEE: Same objections.

13 THE WITNESS: I don't think I've
14 used lithium as a dopant in my prior work
15 either but I'd have to recheck my -- my
16 publication record.

17 BY MS. ZHONG:

18 Q. Have you ever used an n-dopant
19 electron-transport material before?

20 MR. LEE: Objection. Form.

21 THE WITNESS: Just in any of my
22 prior work?

23 BY MS. ZHONG:

24 Q. Correct.

25 A. I'd have to think carefully about

1 various publications I've been involved in.
2 I don't think I've published on n-doping
3 explicitly in the ETL, but I'd have to go back
4 and look more carefully at some of my older
5 publications but I certainly haven't recently.

6 Q. Now, I understand that you only
7 cited two pre-2008 paper on using lithium
8 quinolate as a dopant in -- strike that.

9 You have only cited two pre-2008
10 paper in which lithium quinolate is used -- is
11 mixed as an electron-transport material for the
12 electron transport layer.

13 Are these the only two papers you
14 came across?

15 MR. LEE: Objection. Form.
16 Misstates testimony.

17 THE WITNESS: So I, as I mentioned
18 earlier, yes, there's two papers that I'm
19 referencing, Endo, et al. and Ma, et al.,
20 that use Liq as an explicit dopant for
21 n-doping in ETL.

22 Those are the only two that I
23 included. I didn't see the need to look
24 for any additional support of the opinion
25 that I came to.

1 BY MS. ZHONG:

2 Q. Okay. Did you manage to locate any
3 other ones that you just -- that you did not
4 cite?

5 A. I don't think there's -- if memory
6 serves me, any other publications that I -- I
7 didn't cite but, again, I didn't look
8 exhaustively because I felt like Ma, then
9 subsequently Endo, supported the position that
10 I had to take in this respect in my opinion.
11 I think my opinion was substantiated by
12 those -- those references already.

13 Q. Okay. And those papers are six
14 years apart?

15 A. Yes, 2002, 2008, those two papers
16 are six years apart, I would agree with that.

17 Q. Is there a charge transfer file from
18 one LUMO to another?

19 MR. LEE: Objection. Form. Outside
20 the scope.

21 THE WITNESS: What do you mean by
22 "it"?

23 BY MS. ZHONG:

24 Q. I don't think I said "it." Is there
25 a charge transfer, not file transfer, is there

1 charge transfer from the LUMO of one material
2 to the LUMO of another material?

3 A. Okay. I heard you say, "Is 'it'
4 charge transfer," so you're -- can you just
5 restate your question again?

6 Q. Is there charge transfer from a LUMO
7 of one material to the LUMO of another
8 material?

9 MR. LEE: Objection. Form.

10 THE WITNESS: So again, what
11 materials are we talking about
12 specifically?

13 BY MS. ZHONG:

14 Q. ETL and lithium quinolate, for
15 example.

16 A. Can you specify a particular ETL?
17 Like, can it -- whether or not there's charge
18 transfer between any two materials will depend
19 on the LUMO alignment.

20 Q. The ETL in Diekmann?

21 A. Okay. So I didn't have to take an
22 opinion in terms of whether or not there's
23 charge transfer between the ETL of Diekmann and
24 Liq.

25 You know, looking at the preferred

1 dopants of Diekmann, Diekmann implies that
2 there's electron donation from cesium, barium
3 and lithium fluoride to the electron
4 transporter. Not being specific about which
5 combination, for example, they are looking at.
6 But --

7 Q. Mm-hmm.

8 A. -- in Diekmann, it's implied there's
9 some charge transfer for some of the dopants.

10 Q. Okay. And cesium has a relatively
11 low, either you call HOMO or whatever the --
12 ionization potential where the -- where
13 electrons can be removed and injected into the
14 LUMO of the electron transport layer, correct?

15 MR. LEE: Objection. Form.

16 THE WITNESS: Cesium has a low work
17 function which is what allows electrons to
18 potentially be injected into the LUMO of
19 electron-transport material.

20 BY MS. ZHONG:

21 Q. Lithium quinolate does not have a
22 comparable HOMO level, correct?

23 MR. LEE: Objection. Outside the
24 scope.

25 THE WITNESS: So, again, there's --

1 first of all, cesium doesn't have a HOMO
2 level either. Cesium has a work function,
3 and so the -- the terminology of using
4 HOMO-LUMO for cesium isn't -- doesn't work.

5 Lithium quinolate, as we've used
6 discussed already in the context of
7 Choudhury and lithium fluoride would be an
8 in situ dopant which would mean that it's
9 an initial HOMO and LUMO would not be
10 representative of any charge transfer
11 process if there was one.

12 You'd be looking at the eventual
13 reaction with -- with lithium as is
14 described in Choudhury.

15 BY MS. ZHONG:

16 Q. But you don't know what the reaction
17 product is when the electron-transport material
18 is not -- is neither -- is not aluminum Q3,
19 correct?

20 MR. LEE: Objection. Misstates
21 testimony.

22 THE WITNESS: What I've said before
23 is that I don't have a specific reaction
24 for every ETL combined with Liq or LiF.
25 But the prior art supports that Liq will be

1 an n-dopant in other ETLs like BPhen, like
2 Alq.

3 BY MS. ZHONG:

4 Q. Did you say Liq or Alq?

5 A. That it would be a dopant in BPhen
6 or Alq. The Liq would be a dopant in BPhen or
7 Alq.

8 Q. So your position now is that lithium
9 quinolate will necessarily be an n-dopant in
10 other ETLs; is that correct?

11 MR. LEE: Objection. Misstates
12 testimony.

13 THE WITNESS: Can you please restate
14 the question? I wasn't clear if you said
15 "will" or "won't."

16 BY MS. ZHONG:

17 Q. Is it now your position that lithium
18 quinolate will necessarily be an n-dopant when
19 it is mixed into an ETL material?

20 MR. LEE: Objection. Outside the
21 scope. Asked and answered.

22 THE WITNESS: So my position is that
23 there's support in the prior literature for
24 Liq being a dopant in several ETLs and that
25 a person skilled in the art would then see

1 that Liq is an n-dopant that offers
2 functionality. An OLED would have
3 motivation to combine that with Diekmann
4 with an expectation of success.

5 BY MS. ZHONG:

6 Q. And what makes you believe that when
7 lithium quinolate mixed -- is mixed with
8 Diekmann's L -- strike that.

9 What makes you believe that when
10 lithium quinolate is mixed with Diekmann's
11 electron transport layer, it will serve as an
12 n-dopant?

13 A. Well, so one of Diekmann's electron
14 transport layers is Alq and so there's the
15 opportunity in combining Ma and Diekmann to use
16 Liq in Alq of which there is support for
17 n-doping.

18 And then second to that, there's
19 prior work at the time, primarily, again, by He
20 and Pfeiffer and others, that show that there's
21 many other suitable ETLs as well.

22 So Diekmann only lists three, but a
23 person skilled in the art would understand that
24 there's other ETLs that certainly would work as
25 well.

1 Q. Okay.

2 A. So I think that there's plenty of
3 flexibility there for a person skilled in the
4 art to use Liq and Diekmann with an expectation
5 of success.

6 Q. Did you cite a document where Alq3
7 is use as electron transport layer in
8 connection with a phosphorescent OLED?

9 A. Let me just consult my exhibits so I
10 can answer that. Just give me a moment here.

11 Yes, I have two exhibits on
12 record --

13 Q. Okay.

14 A. -- that are phosphorescent and OLEDs
15 that utilize Alq as an electron transport
16 layer.

17 Q. Which exhibits?

18 A. 1013 and 1014.

19 Q. The Baldo one?

20 A. They are both Baldo references.

21 Q. Are they for white light emitting?

22 A. No, you had asked me about a
23 phosphorescent OLED. One that's in the red and
24 one that's in the green.

25 Q. What about for white light emission?

1 (The Court Reporter requested
2 clarification.)

3 BY MS. ZHONG:

4 Q. What about for white light emission
5 as in Diekmann?

6 MR. LEE: Object to form.

7 THE WITNESS: Just so I'm clear,
8 you're asking, do any of the exhibits I
9 have cited use Alq in a white OLED?

10 BY MS. ZHONG:

11 Q. Correct. Including -- and including
12 a PHOLED.

13 A. Right, I'm going to have to look at
14 my exhibits again.

15 So I reference only two -- only two
16 of my exhibits pertain to white light-emitting
17 devices that also contain the phosphorescent --

18 Q. Mm-hmm.

19 A. -- emitters and neither of them use
20 Alq.

21 Q. Okay. And is the phosphorescence
22 system in the Baldo one, the same as in
23 Diekmann or Suzuki?

24 MR. LEE: Objection. Form.

25 THE WITNESS: Can you be more

1 specific about what about Baldo you're
2 comparing to Diekmann or Suzuki?

3 BY MS. ZHONG:

4 Q. Is it the same PHOLED system?

5 A. So I have to reconsult Diekmann and
6 Suzuki to answer that. Just give me one
7 moment.

8 Q. And are all the other -- the organic
9 phosphorescent (indecipherable)?

10 (The Court Reporter requested
11 clarification.)

12 THE WITNESS: So Suzuki does list
13 the phosphorescent emitter used in both of
14 those Baldo papers as possible emitters in
15 their work as well.

16 I need to look at Diekmann to see if
17 that's the same.

18 Diekmann lists the emitter in the --
19 I think in the second Baldo paper, I
20 mentioned as an emitter in their structure
21 as well. So iridium, tris iridium
22 phenylene is listed in both patents as an
23 emitter and platinum octaethylporphyrin is
24 listed in Suzuki.

25 (The Court Reporter requested

1 clarification.)

2 THE WITNESS: Sorry. How about
3 we'll just call it Ir(ppy), i-r-p-p-y,
4 let's do that.

5 Ir(ppy) is listed as an emitter in
6 both Diekmann and Suzuki and that's the
7 emitter used in the second Baldo paper.
8 And platinum octaethylporphyrin is listed
9 as an emitter in Suzuki, so PtOEP and
10 that's the emitter used in the first Baldo
11 paper.

12 BY MS. ZHONG:

13 Q. Does the Baldo paper use the same
14 stack structure as Diekmann?

15 A. So the Baldo paper is not an n-doped
16 ETL and so it's not an identical stack to
17 Diekmann's Figure 2 because Diekmann's Figure 2
18 has an n-doped ETL.

19 Q. Okay. So other than the n-doped,
20 the ETL, does Baldo have the same material set
21 as in Diekmann or the structure as in Diekmann?

22 MR. LEE: Objection. Outside the
23 scope.

24 THE WITNESS: So again, Diekmann,
25 it's -- I would say it's similar, you know,

1 Diekmann's device is configured or with an
2 intent to make white light; Baldo's device
3 is green light-emitting device, and so
4 there's obviously differences in
5 architecture.

6 BY MS. ZHONG:

7 Q. What about the organic materials,
8 like the hole-transport layers?

9 A. So in my opinion, Diekmann is very
10 open as to what can be used as its various
11 transport materials, so I think that the layers
12 included in Baldo could potentially be applied
13 in Diekmann, it would just depend on the
14 specific architecture, but this is increasingly
15 hypothetical in terms of trying to match
16 materials up.

17 Q. Well, paragraph 104 of your opening
18 declaration, you are referencing a very
19 specific structure in Diekmann, correct? In
20 the material set?

21 MR. LEE: Objection. Outside the
22 scope.

23 THE WITNESS: Yeah, let me just
24 refer back to my declaration.

25 So what was the paragraph you'd like

1 me to look at in my original declaration?

2 BY MS. ZHONG:

3 Q. Paragraphs 104 and paragraph 105.

4 A. Let me just reread them.

5 Q. And feel free to consult Diekmann
6 page 91 that is cited.

7 A. Again, in my original declaration,
8 what I'm commenting on there is specifically
9 the emissive layer, the emissive layer is the
10 device, right, the structure of the three
11 layers Diekmann is using or one example of
12 Diekmann could use to emit white light, I'm not
13 actually specifying a particular hole-transport
14 layer there in my declaration.

15 Q. So is it your testimony that you're
16 not relying on the specific structure disclosed
17 on page 91 of Diekmann?

18 MR. LEE: Objection. Misstates
19 testimony.

20 THE WITNESS: No, that's not my
21 testimony. In regards to Diekmann, that
22 structure would absolutely be an acceptable
23 version of the device provided that the
24 structure is finished with a hole-blocking
25 layer, which is noted in Figure 2 and

1 Liq-doped ETL layer.

2 So the description of Diekmann on --
3 in paragraph 91 is only half of a device.
4 They don't offer the electron-transporting
5 side of the structure, but, no, the HIL and
6 HTL there would be -- would be certainly
7 what I'd be using as the example for
8 Diekmann.

9 BY MS. ZHONG:

10 Q. Well, why don't you take a look at
11 the part that it actually -- Diekmann page 91
12 that is cited -- that paragraph 104 and 154 are
13 based on.

14 A. All right. So is there -- I have --
15 is there a particular aspect that isn't
16 consistent with what I just said?

17 Q. Well, so 91 --

18 A. Yes.

19 So the first two --

20 Q. It mentions an organic layer stack 4
21 with the following layers starting from the
22 cathode layer.

23 A. So, right, if you read all of that
24 paragraph, first of all, they're clearly
25 starting from the anode layer and so that

1 cathode I'm interpreting must be anode because
2 they are talking about the hole transporting
3 side of the device.

4 Q. Mm-hmm.

5 A. So they talk about TNATA and
6 spiro-TAD, which are going to transport holes.
7 They talk about three emissive layers, which
8 will generate white light; and then they do not
9 specify explicitly the blocking layer and
10 n-doped ETL.

11 So what I said a few moments ago was
12 the structure listed in that paragraph is
13 completely acceptable, one would just have to
14 complete the structure explicitly so that it
15 matches Figure 2 with the blocking layer and
16 n-doped ETL and a cathode.

17 Q. Okay. So this one does specify what
18 the hole injection and hole-transport layer
19 needs to be, right?

20 A. TNATA and spiro-TAD are explicitly
21 described as hole-carrying materials, so that's
22 my interpretation and this is essentially half
23 a device that's been explicitly
24 characterized -- described not characterized.

25 Q. And are those the same materials

1 used in the Baldo paper?

2 A. The -- let me just take a look here.

3 The only material with certainty I
4 can say is the same is Ir(ppy), iridium
5 phenylpyridine.

6 Q. Okay. But none of the other ones?

7 A. Well, I can't say with certainty
8 because some of the other materials listed are,
9 again, proprietary materials. I assume they
10 are not the same but I don't know that for a
11 fact.

12 Q. They don't have the same
13 hole-transport materials, correct?

14 A. Baldo is not using the same
15 hole-transport materials but these materials
16 would be compatible with Baldo's device.

17 Q. Do you know why Baldo did not use
18 n-doped transport layer?

19 MR. LEE: Objection. Outside the
20 scope.

21 THE WITNESS: I can't say with
22 certainty why -- what Baldo was thinking.

23 I suspect it's because they were
24 trying to showcase just the emitter, those
25 two papers I cite are, basically, the first

1 two significant papers on phosphorescent
2 and OLEDs.

3 And so, you know, I think at the
4 time, they would have been focusing on just
5 showing the community that they had
6 phosphorescence rather than immediately
7 trying to incorporate as many different
8 components to the device as possible.

9 But if you look at the reply
10 declaration and the initial declaration,
11 the work of Pfeifer came soon after which
12 did combine p and n-doping with
13 phosphorescence.

14 BY MS. ZHONG:

15 Q. Okay. But they do not use aluminum
16 Q3?

17 (The Court Reporter requested
18 clarification.)

19 BY MS. ZHONG:

20 Q. They did not use aluminum Q3,
21 correct?

22 A. Pfeifer does not use aluminum Q3.

23 Q. Do you think Pfeifer represents an
24 advance compared to Baldo's structure?

25 MR. LEE: Objection. Outside the

1 scope. Relevance.

2 THE WITNESS: So I didn't
3 necessarily have to think about what one
4 event is over another. I think Pfeifer was
5 an advance in the sense that they
6 demonstrated the application of doping in a
7 phosphorescent OLED. So I think that was
8 the advance.

9 BY MS. ZHONG:

10 Q. Does Pfeifer -- is Pfeifer's
11 device -- strike that.

12 Did Pfeifer's devices have higher
13 performance than Baldo?

14 MR. LEE: Objection. Form.

15 THE WITNESS: So by a "higher
16 performance," can you specify what
17 particular parameter you're interested in
18 me comparing?

19 BY MS. ZHONG:

20 Q. What parameters do you typically
21 compare?

22 A. Several parameters, I might
23 typically compare. I'm just curious what you
24 would like me to think about in terms of
25 performance.

1 Q. What are those parameters?

2 A. So, again, as I've specified in my
3 declaration or reply declaration, you know,
4 efficiency, for example, would be a parameter
5 of interest in building an OLED.

6 Q. And what else?

7 A. Stability is another parameter of
8 interest in building an OLED.

9 Q. Anything else?

10 A. I think certain one would consider
11 voltage as well, but in many respects, that's
12 built into power efficiency.

13 Q. Okay. So why don't we compare the
14 efficiency of the Baldo device versus a Pfeifer
15 device.

16 And in the Pfeifer paper you're
17 referring to Exhibit 1016; is that correct?

18 (Exhibit 1016 was identified.)

19 THE WITNESS: I think that's
20 correct. I just have to pull it again now.
21 Yes, 1016.

22 MR. LEE: I'm going to object and
23 ask for a clarification on what the pending
24 question is? I don't think there were two
25 questions there.

1 BY MS. ZHONG:

2 Q. How does the efficiency of the Baldo
3 device compared to the Pfeifer device?

4 MR. LEE: Objection. Outside the
5 scope. Relevance.

6 THE WITNESS: So just give me a
7 moment to compare these two references.
8 That's not something that I considered in
9 preparing my reply declaration or my
10 initial declaration.

11 So comparing the quantum efficiency
12 of the Baldo device and Pfeifer device, I
13 think it's instructive -- just give me one
14 second. Sorry.

15 So look at Figure 3 of Pfeifer, the
16 quantum efficiency of Pfeiffer's device and
17 Baldo's device is actually very similar.

18 So Baldo's device is effectively
19 the -- the Baldo-type structure is
20 effectively the data in the squares which
21 shows a peak efficiency of nominally
22 10 percent.

23 And then Pfeifer's architecture
24 which has a different blocking layer and
25 thinner emissive layer is the circle data

1 which is also about 10 percent.

2 So in terms of --

3 (The Court Reporter requested
4 clarification.)

5 THE WITNESS: I'll try to say the
6 same thing.

7 So again, looking at Figure 3, the
8 data in the squares, the square symbols is,
9 basically, Baldo's device. Within an NPD,
10 HTL or CBP Ir(ppy) emissive layer.

11 The data in the circles is
12 effectively Pfeifer's structure with an
13 improved blocking layer of Ir(ppz) or at
14 least a different blocking layer, I guess,
15 I'd say of Ir(ppz). And that same emissive
16 layer of 5 nanometers.

17 And the quantum efficiency in both
18 cases is similar, it's about 10 percent.
19 And if one goes back to Baldo and looks at
20 Figure 2, that's very similar to what Baldo
21 reports for that same structure as well,
22 about 8 to 9 percent.

23 So from a quantum efficiency
24
25 perspective, the devices are very similar.

1 BY MS. ZHONG:

2 Q. What about stability-wise?

3 A. Neither of these publications report
4 on stability.

5 Q. Okay. So Diekmann didn't really
6 result in a better performing device as far as
7 efficiency is concerned; is that correct?

8 A. As far as the quantum efficiency is
9 concerned.

10 Q. What about current efficiency or
11 power efficiency?

12 A. So power efficiency would improve
13 with doping because power efficiency also
14 reflects turn-on voltage and so I don't
15 think -- let me just see if Pfeifer compares
16 that on an equal footing as well. Give me one
17 moment.

18 It's actually challenging to make a
19 direct comparison, Pfeifer's power efficiencies
20 are larger, presumably because the voltage has
21 been reduced, but I'd have to look more closely
22 at this because I think there's several
23 differences relative to Baldo device, including
24 both doping and also the blocking layer and
25 full transport layer as well.

1 So I think what I can confidently
2 say is that the quantum efficiency is
3 comparable, the power efficiency is likely
4 higher but this work is also three years later
5 than Baldo's and Baldo was the initial
6 demonstration and so it doesn't surprise me
7 that it would be higher.

8 Q. So as a researcher in the OLED
9 field, would you start -- for subsequent work,
10 would you start out with a Pfeifer structure or
11 a Baldo structure?

12 MR. LEE: Objection. Outside the
13 scope.

14 BY MS. ZHONG:

15 Q. In order to make better OLEDs?

16 MR. LEE: Objection. Form. Outside
17 the scope.

18 THE WITNESS: So I can start with
19 either structure. It would depend on what
20 my particular contribution was going to be
21 to -- to trying to improve the OLED.

22 So in my own work, we do build
23 structures still that are similar to
24 Baldo's from time to time with maybe
25 different transport layers, but it all

1 depends on what you're trying to showcase.

2 If what you're trying to showcase is
3 just the discovery of, say, a new emitter,
4 for example, and how efficient it is, you
5 might not go through the additional effort
6 of p- and n-doping a stack.

7 If your goal is to instead show the
8 absolute lowest possible voltage perhaps
9 for a device, then you might then say,
10 okay, now it's important to also try to
11 dope to make sure we're getting that full
12 reduction in voltage that comes with
13 doping.

14 So I think it really depends on what
15 it is you're trying to accomplish, what
16 your priorities are and you know, how the
17 project is being executed.

18 BY MS. ZHONG:

19 Q. So in your research, how often do
20 you use aluminum Q3 as electron transport
21 layer?

22 MR. LEE: Objection.

23 (The Court Reporter requested
24
25 clarification.)

1 BY MS. ZHONG:

2 Q. So in your research, how often do
3 you use aluminum Q3 as the electron transport
4 layer?

5 MR. LEE: Objection. Outside the
6 scope. Relevance.

7 THE WITNESS: So again, I'd have to
8 go back and consult my publication list to
9 see when we've used Alq and when we
10 haven't.

11 We frequently will make devices with
12 a variety of electron-transport materials,
13 depending on what we're trying to study.

14 So, again, I don't think there's
15 necessarily one that I would say is always
16 the winner because we might pick them for
17 different reasons. In fact, sometimes we
18 might pick the electron transport layer for
19 some interesting physical property it might
20 have and that might be what we're studying
21 in that particular incarnation.

22 We're not always looking to, say,
23 make a device that just has a record of
24 efficiency.

25 So, again, what I use in terms of my

1 ETL, in my opinion, is not relevant because
2 I think what's relevant is what a person
3 skilled in the art would have used at the
4 time of the '425 in constructing their
5 device.

6 BY MS. ZHONG:

7 Q. That's fair.

8 So in the 4200 rate, what kind of
9 ETL have you used in your group?

10 A. So, again, I'd have to go back and
11 look at publications. I've certainly we've
12 used Alq as an ETL and certainly have used
13 BPhen and DPVBi as ETLs as well. We've used
14 different materials depending on the
15 application.

16 Q. Which one of them have you used with
17 PHOLEDs?

18 MR. LEE: Objection. Outside the
19 scope.

20 THE WITNESS: I think I'd have to go
21 back and look at my publications to better
22 understand where I've used everything.

23 Sometimes it might just depend on
24 the, again, device or experiment we're
25 carrying out. So I don't think I can

1 exhaustively categorize that right now.

2 BY MS. ZHONG:

3 Q. Do you recall use Alq3 with PHOLED
4 in your research before 2008?

5 A. Again, I'd have to go back and look
6 at my prior publications to see if I used Alq
7 in a PHOLED prior to 2008.

8 Q. What about other research projects
9 in Dr. Forrest research group while you were
10 there?

11 MR. LEE: Objection. Outside the
12 scope. Relevance.

13 THE WITNESS: Again, I would have to
14 go back. That's more than 20 years now.
15 And all I'll point to is clearly Baldo --
16 Baldo's paper and Baldo was in the Forrest
17 group, they were using Alq with a
18 phosphorescent demonstrating that it is
19 certainly a possible example of a
20 phosphorescent OLED that precedes that 2008
21 period.

22 BY MS. ZHONG:

23 Q. Okay. But you have not cited any
24 references in which Alq3 is used as electron
25 transport layer in a white light-emitting

1 system; is that correct?

2 MR. LEE: Objection. Form.

3 THE WITNESS: No. As I said before,
4 I referenced two different papers by
5 Schwartz that talk about white OLEDs that
6 contain phosphorescent and florescent
7 materials but they do not use Alq as an
8 electron transport layer.

9 BY MS. ZHONG:

10 Q. Okay. So you cited Schwartz because
11 it's related to white light emission?

12 A. So Schwartz --

13 MR. LEE: Objection.

14 THE WITNESS: Schwartz is --

15 MR. LEE: Form.

16 THE WITNESS: Schwartz is an example
17 where p- and n-doping are successfully and
18 effectively applied in a white device that
19 contains phosphorescent emitters.

20 BY MS. ZHONG:

21 Q. Okay. Did you have a chance to
22 review your original -- the deposition
23 transcript?

24 A. I haven't looked at it since I
25 reviewed it for errors.

1 Q. And you've corrected all the errors,
2 right?

3 A. To the best of my knowledge,
4 everything's has been corrected.

5 Q. And you're not correcting any of the
6 testimony from that transcript, correct?

7 A. No.

8 Q. Does a blocking layer solve the
9 issue of metal diffusion into emission layer?

10 A. So a blocking layer helps to
11 mitigate the question of metal diffusion into
12 the interlayer and prior work, especially by
13 Pfeifer showing the first demonstration of p-
14 and n-doping with phosphorescent and OLEDs,
15 demonstrates how high efficiency can be
16 realized and essentially even with an n-doped
17 ETL as long as a blocking layer is present.

18 Q. Does a blocking layer blocks
19 diffusion by lithium that's generated from
20 disassociation of lithium quinolate?

21 A. So I don't know -- I haven't
22 specifically looked at the diffusion of
23 lithium -- from lithium quinolate, it's not
24 something I have quantitatively examined.

25 But a blocking layer would help to

1 mitigate such an issue, if that issue were
2 present, which it may not even be present.

3 Q. Does a blocking layer mitigate the
4 diffusion by cesium?

5 A. Again, when applied in a device with
6 a cesium n-dopes ETL, the blocking layer is
7 helping to mitigate issues related to diffusion
8 of cesium.

9 Q. And does it help mitigate issues
10 related to diffusion caused by cesium to the
11 extent as it would help with problem caused by
12 diffusion of the lithium anion or lithium metal
13 from in situ doping of lithium quinolate?

14 MR. LEE: Objection. Form.

15 THE WITNESS: Can you just ask that
16 again, please?

17 BY MS. ZHONG:

18 Q. Sure.

19 A. Thanks.

20 Q. It's your opinion that a blocking
21 layer will mitigate problems caused by cesium
22 diffusion, correct?

23 A. Yes, my opinion is that should there
24 be issues related to cesium diffusion, a
25 blocking layer will help to mitigate those

1 issues that high efficiency can be realized.

2 Q. Okay. And the same is true for
3 problems caused by lithium diffusion, correct?

4 A. Yes, the prior art literature
5 supports that a blocking layer also helps to
6 permit realization of high efficiency when
7 using a lithium dopant by helping to mitigate
8 any diffusion issue there.

9 Q. Okay. And does a doping layer
10 mitigate problems caused by cesium diffusion to
11 the same extent as that caused by the lithium
12 diffusion?

13 MR. LEE: Objection. Form.

14 THE WITNESS: So the prior art has
15 certainly shown that blocking layers can
16 function effectively in both cases, and
17 that, in the case of cesium, presumably by
18 virtue of the fact that it's a larger, less
19 diffusive atom, one can use a thinner
20 blocking layer.

21 BY MS. ZHONG:

22 Q. So a blocking layer for cesium would
23 have been thinner than the blocking layer for
24 lithium; is that correct?

25 MR. LEE: Objection. Misstates the

1 testimony.

2 THE WITNESS: So what I'm pointing
3 to is that prior art has suggested that the
4 blocking layer can be -- can be thinner.

5 BY MS. ZHONG:

6 Q. In which case? For cesium?

7 A. For cesium.

8 Q. Is there anything in the prior art
9 that indicates the blocking layer's thickness
10 that would be appropriate when lithium fluoride
11 is used as a dopant, for example?

12 MR. LEE: Objection. Form.

13 THE WITNESS: So I didn't look
14 extensively on what the specific blocking
15 layer thickness would be for lithium
16 fluoride.

17 In my exhibits, all I could do would
18 be to point to Choudhury, since they used a
19 BCP blocking layer in their device.

20 BY MS. ZHONG:

21 Q. Is that thinner or thicker when
22 compared to cesium-based system?

23 A. Again, it's not something I
24 considered in detail so I'd have to look at
25 Choudhury to even consider that question.

1 Q. Okay.

2 A. It appears to be similar to cesium.

3 Q. Okay. And at least by weight
4 percent, in Choudhury, the doping level is much
5 lower than in Ma, right, as far -- at least as
6 far as weight percentage is concerned?

7 MR. LEE: Objection. Outside the
8 scope.

9 THE WITNESS: So I'd like to review
10 Ma again.

11 BY MS. ZHONG:

12 Q. Sure.

13 A. I would say that the concentration
14 is different. Certainly, Ma and Choudhury have
15 some overlap in the range they are considering.

16 Q. In Ma, it gets 17 weight percent,
17 33 weight percent of 50 weight percent,
18 correct?

19 A. Yes.

20 Q. And in Choudhury, they did not go up
21 beyond 10 percent, correct?

22 A. So, yeah, Choudhury is certainly
23 looking at smaller concentration but Choudhury
24 looking up to 10 percent and Ma starting at
25 17 percent, I guess I wouldn't view those as

1 entirely incompatible.

2 It's not clear why Ma doesn't look
3 at smaller percentages as well but it's quite
4 possible those might have also been interesting
5 to consider.

6 Q. Okay. How do you convert weight
7 percentage to molar ratios?

8 MR. LEE: Objection. Outside the
9 scope.

10 THE WITNESS: So to convert molar
11 percent to weight ratios, so you'd have to
12 just consider the molecular weights of the
13 different components actually being looked
14 at.

15 BY MS. ZHONG:

16 Q. So, for example, 17 weight percent
17 is in quinolate in BPhen. In order to convert
18 that to molar ratio, I take 17 weight percent,
19 divide it by the molecular weight of lithium
20 quinolate and then take the 83 weight percent
21 divided by the molecular weight of BPhen, take
22 the sum of it and then calculate the respective
23 molar percentage; is that right?

24 MR. LEE: Objection. Outside the
25 scope. Relevance.

1 THE WITNESS: So again, I didn't
2 consider this in my reply declaration or my
3 initial declaration but if I'm going to
4 answer that question, I am going to have to
5 write down what you just said so that I can
6 assess whether or not I agree.

7 Can you just repeat what you just
8 said?

9 BY MS. ZHONG:

10 Q. Okay. So let's say you have a
11 mixture of X weight percent of lithium
12 quinolate in a mixture of lithium quinolate and
13 a BPhen. Do you have that?

14 A. Yes.

15 Q. So in order to calculate the molar
16 percentage, I take the X weight percent,
17 divided by the molecular weight of the lithium
18 quinolate and separately, I take the weight
19 percent, which is one minus the X percent of
20 BPhen, and divide it by the molecular weight of
21 BPhen, and then I summarize those two numbers
22 together. That will be my denominator.

23 And to calculate the molar percent
24 of the lithium quinolate, I take the 17 -- like
25 the X weight percent divided by BPhen and --

1 over that denominator; is that correct?

2 MR. LEE: Objection. Form. Outside
3 the scope. Relevance.

4 THE WITNESS: Just give me a moment
5 I'm just writing it out and I want to make
6 sure I get this correct.

7 So I'm not certain this is exactly
8 what you said or not, but if I were to try
9 and calculate the mole percent, yes, I
10 would take the weight percent of the
11 component of interest, divided by its
12 molecular weight and then divide that by
13 the sum of the weight percents of the first
14 component divided by its molecular weight,
15 plus the weight percent of the second
16 component divided by its molecular weight,
17 effectively, it would be moles over total
18 moles.

19 BY MS. ZHONG:

20 Q. Can you estimate the mole percent of
21 lithium fluoride in Choudhury's system when the
22 lithium fluoride doping level is about 4 weight
23 percent?

24 MR. LEE: Objection. Outside the
25 scope. Relevance.

1 THE WITNESS: I can't calculate that
2 unless I have the respective molecular
3 weights of the various components.

4 BY MS. ZHONG:

5 Q. Okay. You cite the molecular weight
6 of lithium fluoride in your declaration.
7 I thought you did. Exhibit 1056.

8 (Exhibit 1056 was identified.)

9 THE WITNESS: Yes, I see it.

10 BY MS. ZHENG:

11 Q. Okay.

12 A. So, so are you asking me to do the
13 arithmetic and calculate the mole fraction of
14 lithium fluoride in Alq?

15 Q. Yes. Do you have an estimate?

16 A. No.

17 MR. LEE: Objection. The same, the
18 same objections.

19 THE WITNESS: I'd need the molecular
20 weight of Alq3 in order to perform that
21 calculation.

22 BY MS. ZHONG:

23 Q. So I put it in the link to Ossila
24 website, can you click on that?

25 MR. LEE: Counsel, is this an

1 exhibit to the transcript or the
2 proceedings?

3 MS. ZHONG: So the URL link is
4 https://www.ossila. The
5 o-s-s-i-l-a.com/products/Alq3.

6 MR. LEE: Is this an exhibit to the
7 proceedings already? Counsel?

8 BY MS. ZHONG:

9 Q. Dr. Holmes, are you able to access
10 the link?

11 A. Yes, I have it open.

12 Q. Okay.

13 MR. LEE: Object to this line of
14 questioning based on this URL that has not
15 been made an exhibit to this deposition or
16 in the proceedings --

17 MS. ZHONG: Okay.

18 MR. LEE: -- as irrelevant, hearsay
19 and based on foundation and I object to the
20 inclusion of whatever testimony she is
21 trying to elicit from this website as
22 against the board's rules and improper and
23 run around the board rule regarding
24 submission of new exhibits with
25 sur-replies.

1 MS. ZHONG: Well, partly, that's
2 because you guys are withholding relevant
3 information. Clearly, you have documents
4 from June 2024 and you held it to your
5 chest to send back us.

6 BY MS. ZHONG:

7 Q. Dr. Holmes is Ossila a supplier of
8 OLED materials?

9 MR. LEE: Objection. Relevance.
10 Scope.

11 THE WITNESS: My understanding is
12 Ossila is a supplier of materials and
13 testing implements for OLEDs and solar cell
14 research.

15 BY MS. ZHONG:

16 Q. Okay. So do you think that the
17 information posted on its website regarding its
18 product is something that you can rely on?

19 MR. LEE: Objection. Relevance.
20 Outside the scope.

21 THE WITNESS: So I don't know that
22 for a fact. I'll point out that I have
23 found in the past references on Ossila's
24 website to things like HOMO-LUMO levels
25 that I don't necessarily agree with.

1 BY MS. ZHONG:

2 Q. What about molecular weight?

3 A. I've never use -- I don't think I've
4 used Ossila as a reference for molecular
5 weight. So, again, if I was trying to get the
6 molecular weight, I'd probably just calculate
7 it myself based on the formula.

8 Q. So what would be the molecular
9 weight for Alq3?

10 A. I'd have to look up the formula.
11 I don't know. Alq3 is short-hand for the
12 molecule. I don't know off the top of my head
13 the number of carbons and different species
14 that exist in Alq molecule.

15 Q. Well, there's a structure on page 2
16 of Exhibit 1049.

17 A. Okay. So would you like me to
18 calculate the molecular weight of Alq by hand
19 to check it against Ossila's data?

20 Q. Sure.

21 A. Fair enough. Is this a particular
22 periodic table that I should be using?

23 Q. I think aluminum is typically 27,
24 right?

25 MR. LEE: Objection. Outside the

1 scope.

2 BY MS. ZHONG:

3 Q. Hydrogen is 14. Oxygen is around
4 16.

5 A. Oh. So you don't want me to use the
6 actual atomic mass? You want me to use the
7 most common isotope? Is that what you're
8 asking me to do?

9 Q. I think it ends up to be around the
10 same.

11 MR. LEE: Objection. Form. Outside
12 the scope. Relevance.

13 THE WITNESS: Okay. I'll get to
14 work on that.

15 Am I permitted to use a calculator?

16 BY MS. ZHONG:

17 Q. Sure. It's not a test. So I get
18 27 carbons, 18 hydrogens and 1 aluminum,
19 3 nitrogen, 3 oxygen.

20 A. I've got that as well. I have
21 everything together.

22 Q. It might be around 459.

23 A. Going faster than I am.

24 Yes, I got 459 grams per mole.

25 Q. Okay. So the Alq is around 459 and

1 lithium fluoride, according to your exhibit, is
2 around 25ish, I think. It's 25.94. Let's
3 round it up to 26.

4 MR. LEE: Is there a question?

5 BY MS. ZHONG:

6 Q. So what will be the molar weight
7 percent of lithium fluoride in the 4 weight
8 percent mixture of lithium fluoride in aluminum
9 Q3?

10 MR. LEE: Objection. Outside the
11 relevance.

12 THE WITNESS: So let me write
13 down -- again, so you said 4 percent,
14 that's not a concentration used in
15 Choudhury but is that the one you're
16 interested in?

17 BY MS. ZHONG:

18 Q. I thought they used 4 weight
19 percent, didn't they?

20 A. They used 3, 6 and 10.

21 Q. Okay. We can use 3 weight percent
22 then.

23 A. All right. Give me a few moments.

24 (The Court Reporter requested
25 clarification.)

1 THE WITNESS: I'm going to
2 double-check my calculation.

3 BY MS. ZHONG:

4 Q. Okay.

5 A. Okay. Using the approach that --
6 that you discussed and we discussed earlier, I
7 get a mole percent of 0.353 mole percent.

8 (The Court Reporter requested
9 clarification.)

10 THE WITNESS: 0.353 mole percent.
11 I'll just note, though, that I'm doing this
12 a calculator built into Windows and I'm not
13 super confident in my ability to type into
14 this thing. But that is what I get right
15 now, that's my mole percent.

16 BY MS. ZHONG:

17 Q. It's pretty close to what I'm
18 getting. I'm getting 35.3 percentage, so...

19 A. 35.3?

20 Q. Yes.

21 A. No. I said 0.35.3. If you're
22 putting in weight percents as a percentage
23 already, you wouldn't multiply by 100 percent
24 again at the end.

25 Q. Yes, so it's 35.3 percent, right?

1 A. No. If you're going to do a
2 calculation of weight percent -- so, okay, when
3 you did the calculation, did you put 3
4 percent -- 3 weight percent in as 3 weight
5 percent or 0.03?

6 Q. I put it as 3.

7 A. So if you put it as three, you have
8 already accounted for the percentage. You
9 can't multiply by 100 twice.

10 Q. I'm not. So it's three divided by
11 26, divided --

12 A. Dividing by 3 over 26, plus 97 over
13 459.

14 Q. Correct. So you get 0.353, which
15 is --

16 A. Mole percent.

17 Q. I don't think that's right.
18 Because --

19 A. Yeah.

20 Q. -- three -- so if you have a mixture
21 of 100 grams, so 3 grams will be lithium
22 fluoride and 97 grams will be the aluminum Q3,
23 right?

24 A. I understand.

25 Q. And you can look at that mixture,

1 you get 35.3 percent -- 3.35 percent before you
2 take any of the percentage?

3 A. Yes.

4 Q. So when you convert it to the molar
5 percent, it's 35 point whatever that is saying,
6 right?

7 A. Yeah, I think I understand.

8 Q. So we agree that a 3 weight percent
9 mixture of lithium fluoride was Alq's 3 convert
10 to around 35 to 35.5 --

11 A. Yes.

12 Q. -- mole percent of lithium
13 quinolate?

14 A. Yes, because the Alq is heavier.

15 MS. ZHONG: Okay. We're going to
16 take a break. It's -- I don't know what
17 time it is. It's 12:30 Central Time right
18 now. Do you want to take a lunch break
19 or -- or we -- go off the record and
20 discuss that.

21 THE COURT REPORTER: I'm off the
22 record.

23 (A recess was taken.)

24 BY MS. ZHONG:

25 Q. So welcome back, Dr. Holmes.

1 So before the break, you estimated
2 that a 3 weight percent lithium fluoride in
3 aluminum Q3 would actually contain 35 mole
4 percent of lithium fluoride, correct?

5 A. Yes, that's what was calculated.

6 Q. Okay. You don't know the percentage
7 of disassociation of lithium fluoride?

8 A. No.

9 Q. Okay. And you don't know for cesium
10 and barium what is the typical loading,
11 correct?

12 MR. LEE: Objection to form.

13 THE WITNESS: No, I don't have a
14 typical loading for cesium or barium.
15 BY MS. ZHONG:

16 Q. Do you know any range of loading
17 that might happen?

18 A. No, if you look in the exhibits I
19 cite, in fact, they don't specify their
20 loading.

21 Q. So it could be 1 mole percent, 2
22 mole percent, 3 mole percent, we just don't
23 know, right?

24 A. As I already said, they didn't
25 specify their loading, so...

1 Q. And you have checked before the
2 break, that the blocking layer is about the
3 same thickness whether it's cesium or fluoride;
4 is that right?

5 MR. LEE: Objection. Misstates
6 testimony.

7 THE WITNESS: What I said before the
8 break, and maybe I'll just pull the exhibit
9 explicitly because I don't think I
10 mentioned it last time. Give me a moment.

11 Yes, in my Exhibit 1019, there's a
12 comment to the fact that the different size
13 and diffusivity of cesium emits a thinner
14 blocking layer than lithium doping.

15 In their particular device, they
16 have a 10 nanometer blocking layer of
17 BPhen, that happens to be the same
18 thickness as the same BCP layer in
19 Choudhury.

20 So these two references happen to
21 use the same blocking layer thickness for
22 cesium and lithium fluoride.

23 (Exhibit 1019 was identified.)

24 BY MS. ZHONG:

25 Q. Does BCP and the BPhen have very

1 similar chemical structures?

2 A. Yes.

3 Q. Is aluminum 3 used as blocking
4 layers?

5 A. Again, what's used as a blocking
6 layer depends on the device being made and the
7 emitter being selected.

8 Q. So it's context-dependent or
9 device-dependent?

10 A. Yes, it's device-dependent but there
11 are instances where it could be used.

12 Q. Can you please go to Exhibit 1049?
13 PDF, page 3.

14 A. Okay.

15 Q. Look to the right-hand column and
16 search for the word "We presume."

17 A. Hold on. I need to redownload it.
18 It's not letting me search. It doesn't appear
19 that the document, it's on the Veritext site,
20 it looks like it is a scanned document so it
21 can't be searched. So I'm going to open the
22 one in the Dropbox.

23 Q. I think it's the same.

24 A. It also can't be searched?

25 Q. Yes.

1 A. Then I'll just search the paragraph
2 then. Explain it to me again. Page 3 and what
3 was the second column.

4 Q. Right-hand column below the
5 figure --

6 A. Yes, I see it.

7 Q. -- 1, 2, 3, 4, 5, 6, 7.

8 Yeah, the eighth line --

9 A. Yeah, I see the line.

10 Q. So is the -- so the Endo paper is
11 assuming that the reduction of the lithium
12 compound occurs up to about 5 nanometers from
13 the cathode interface; is that correct?

14 MR. LEE: Objection. Misstates the
15 documents.

16 THE WITNESS: So that sentence says
17 that they presume that in the case of
18 lithium compound dopants, thermal reduction
19 by aluminum occurs to a thickness of
20 50 angstroms from the aluminum interface.

21 (The Court Reporter requested
22 clarification.)

23 THE WITNESS: Sorry.

24 Endo says: We presume that in the
25 case of lithium compound dopants, thermal

1 reduction by aluminum occurs to a thickness
2 of approximately 50 angstroms from the
3 aluminum interface, so I see that
4 statement.

5 BY MS. ZHONG:

6 Q. So 50 angstroms of 5 nanometer?

7 A. Yes.

8 Q. So you agree with my statement?

9 A. I don't remember what your statement
10 was.

11 MR. LEE: Objection.

12 BY MS. ZHONG:

13 Q. My statement is: The Endo paper
14 presumes that the reduction of the lithium
15 compound occurs up to about 5 nanometers from
16 the cathode interface; is that correct?

17 MR. LEE: Objection. Misstates the
18 documents.

19 THE WITNESS: So I agree to that
20 sentence is written on the paragraph we're
21 talking about in the Endo paper, yes.

22 BY MS. ZHONG:

23 Q. Now Endo also -- it says: Only at
24 the lithium compound cause lower electron
25 mobility of the electron transport layer due to

1 trapping electrons or stabilizing polarons by
2 their dipole.

3 Do you see that sentence?

4 A. I see that sentence, yes.

5 Q. Do you know what they mean by that?

6 A. I didn't think deeply about what
7 they would mean by that in the context of my
8 reply declaration.

9 Q. Do you have an understanding at all?

10 A. Any understanding of what?

11 Q. That sentence.

12 A. It seems that Endo is suggesting
13 that unreacted compounds might cause issues
14 with the electron mobility.

15 Q. What do they mean by "trapping
16 electrons"?

17 A. Trapping electrons would usually
18 mean electrons getting stuck in a lower energy
19 site.

20 Q. You mean the electrons get trapped
21 in the ETL sites?

22 A. I was trying to define "trapping"
23 without using the word "trapping." But
24 trapping simply means there's an impediment for
25 the electron and the electron getting caught

1 again in a lower energy site. That is what
2 "trapping" means, is that the electron is
3 falling into a lower energy site of being
4 trapped.

5 Q. Okay. Where is that lower energy
6 site?

7 A. I'm not necessarily agreeing that
8 that's what's going on. I'm just telling you
9 what trapping means.

10 Q. And what does stabilizing polarons
11 by their dipoling?

12 A. I haven't had to think about
13 specifically what stabilizing polarons by their
14 dipole would mean. And so I'd rather not
15 speculate on the fly as to what Endo might mean
16 by that comment.

17 Q. How would a POSITA understand that
18 sentence?

19 A. Stabilizing polarons might mean
20 that, so a polaron in an organic semiconductor
21 is a charge carrier, like a hole or an electron
22 that's effectively coupled to the dielectric
23 environment.

24 So when a charge moves through
25 organic semiconductor, it doesn't move in the

1 same way a carrier would through something like
2 silicon, it actually moves and the polarizes
3 the local dielectric of the material as it's
4 moving and there's some binding between the
5 charge and the dielectric environment because
6 of that polarization.

7 So I suspect that a more stabilized
8 polaron would be one that might be more bound
9 to the dielectric environment perhaps, so...

10 Q. Okay. So is Endo speculating that
11 the unreacted lithium is going to impede the
12 electron hopping so the electron transfer
13 layer?

14 MR. LEE: Objection. Misstates the
15 document.

16 THE WITNESS: Again, this was the
17 one sentence in Endo where they really
18 allude to this and I don't think there's
19 enough there to really understand exactly
20 what they may have meant by this comment.

21 BY MS. ZHONG:

22 Q. How many times have you reviewed
23 this document?

24 A. Several. I don't know the exact
25 number.

1 Q. And you have read this sentence
2 several times?

3 A. Yes.

4 Q. Okay. And you believe you have an
5 understanding of what the whole paper is about?

6 A. Yes, of course.

7 Q. Including this sentence?

8 A. I have an understanding of what
9 they're saying here, but this is a presumption
10 they clearly make. This is not something that
11 is supported extensively throughout the paper
12 by data. They are merely trying to offer some
13 additional hypothesis or potential model right
14 at the very end of the paper, right, this is
15 right before the conclusion of the paper and
16 certainly not the emphasis of the paper.

17 So I think what there is to
18 understand about this particular sentence is,
19 basically, just this particular sentence, which
20 is why there's not a lot I can really offer on
21 it.

22 Q. Okay. Do you know why the electrons
23 can tunnel to the BPhen better than aluminum
24 Q3?

25 MR. LEE: Objection. Outside the

1 scope.

2 THE WITNESS: Can you point to a
3 particular passage where you're referring
4 to tunneling of electrons through BPhen
5 versus through Alq3?

6 BY MS. ZHONG:

7 Q. Let me put it this way: It seems
8 that BPhen provides better performance than
9 aluminum Q3 at the same doping depth, correct?

10 MR. LEE: Objection to form.

11 THE WITNESS: I'd like to just look
12 at the figures again to make sure I agree
13 with that.

14 I would agree that BPhen provides a
15 slightly increase luminance in current when
16 dope Liq versus Alq.

17 BY MS. ZHONG:

18 Q. And do you see that before the "we
19 presume," that sentence, it says: Although the
20 increased thickness leads to the lower drive
21 voltage in metal-dope devices, the results
22 observed for metal complex-doped devices are
23 the opposite.

24 Do you see that sentence?

25 A. I see that sentence.

1 Q. Is Endo saying that typically if you
2 have a cesium, lithium or barium-doped device,
3 as the doping thickness increases, the driving
4 voltage decreases, but for the lithium
5 quinolate or -- and fluoride-based com- --
6 doping, as a thickness increases, the voltage,
7 the driving voltage increases?

8 A. I'm sorry, can you just maybe
9 restate that again?

10 Q. Okay. So when Endo states:
11 Although the increased thickness leads to the
12 lower drive voltage in metal-dope devices, the
13 results observed for metal complex-doped
14 devices are the opposite.

15 Do you see that?

16 A. Yes, I see that.

17 Q. So is Endo saying that when you
18 increase the doping thickness for an OLED
19 device with metal doping, for example,
20 cesium-doped, lithium-doped, ETL, the drive
21 voltage will actually decrease with increasing
22 thickness?

23 MR. LEE: Objection. Outside the
24 scope.

25 THE WITNESS: So I haven't reviewed

1 reference 11, which is the reference that's
2 tied to that statement regarding
3 metal-doped devices.

4 My general understanding of doping
5 is that when one uses conductivity doping,
6 the voltage becomes fairly insensitive on
7 thickness because you're reducing the
8 resistance of that layer.

9 So I'm not sure of the context of
10 that reference 11, I haven't reviewed it
11 before. But usually one uses conductivity
12 dopants to actually reduce the resistance
13 so that the device voltage eventually
14 becomes less dependent on the thickness of
15 that layer.

16 BY MS. ZHONG:

17 Q. So what is your understanding of the
18 increased thickness leads to lower drive
19 voltage in metal-doped devices?

20 A. Again, as I said, I haven't reviewed
21 that reference and that's actually not what I
22 would typically have thought would happen.

23 So there may be a different
24 architecture, there may be other things going
25 on in that prior work but I'd have to review it

1 to know the specifics of the comparison.

2 Q. Okay.

3 A. When I looked at Endo, if you
4 actually compare the thickness dependence, it's
5 pretty marginal if you look at the data for Liq
6 at 50 and Liq at 300.

7 Q. And metal-dope devices refers to
8 cesium, barium -- strike that.

9 So the metal-doping devices would be
10 understood to refer to OLEDs device whereas
11 electron-transport layers doped with metals
12 such as cesium, lithium, barium; is that
13 correct?

14 A. I think a person skilled in the art
15 would likely go and check 11 if they were
16 interested to understand more about that result
17 before making an assumption as to the range of
18 metals included.

19 I don't think Endo mentions cesium,
20 and so I guess I would be careful to make a
21 conclusion on what metals may or may not be
22 included in that metal-dope devices comment.

23 Q. Okay. But you did not check the
24 reference?

25 A. I didn't check the reference, no.

1 Q. Okay. Any reason you didn't?

2 A. Yeah, because looking at the data in
3 Figure 4 and Figure 5, the improvement with Liq
4 is quite clear and the thickness dependence is,
5 again, marginal. There really isn't much of a
6 thickness dependence between 50 and 300.

7 So I didn't see the need to go and
8 do an exhaustive comparison as a function of
9 thickness to the prior art.

10 Q. But one of your proposed
11 modification is to replace the ETL layer, in
12 the electron transport layer with lithium
13 quinolate, right?

14 MR. LEE: Objection.

15 THE WITNESS: So Diekmann is not
16 exclusively using metals, right --

17 (The Court Reporter requested
18 clarification.)

19 THE WITNESS: Yeah, that's one of
20 the of the premiere -- Diekmann's preferred
21 dopants, though not exclusive, are cesium,
22 barium, and lithium fluoride. So any of
23 those could be the dopant to be replaced in
24 Diekmann.

25 BY MS. ZHONG:

1 Q. Lithium fluoride. Which one has
2 worst diffusion, lithium fluoride or lithium
3 quinolate?

4 A. Again, I answered that this morning.
5 I don't have quantitative data on the
6 difference in diffusion between lithium
7 fluoride and lithium quinolate.

8 The motivation a person skilled in
9 the art would have would be that lithium
10 quinolate is a clearly a molecular dopant and
11 that's something that Diekmann explicitly
12 states would be desirable.

13 Q. But you don't know whether lithium
14 fluoride is a molecular dopant or not, right?
15 Would a POSITA view lithium fluoride as a
16 molecular dopant or not, right?

17 A. I haven't taken an opinion on
18 whether or not lithium fluoride is a molecular
19 dopant.

20 Q. Okay. Do you know if the lithium
21 fluoride, when it's used to dope the electron
22 transport layer, whether it exists as a single
23 pair of lithium and fluoride or some kind of
24 aggregate of lithium and fluoride pairs, right?

25 MR. LEE: Objection. Outside the

1 scope. Asked and answered.

2 THE WITNESS: That, again, is not
3 something that I considered. Doesn't
4 impact the opinion that I've drawn in this
5 case.

6 BY MS. ZHONG:

7 Q. Okay. The molecular weight for
8 lithium fluoride, one pair is around 26 AMU,
9 correct?

10 A. I think that's the number that we
11 used before lunch to calculate the mole
12 percent, yes.

13 Q. Okay. And lithium quinolate,
14 according to your exhibit, is around 137-ish --
15 150 -- let me see.

16 A. The 151.09 is what I cite.

17 Q. Okay, 151.

18 So if there are six lithium fluoride
19 pairs that's aggregated together, the molecular
20 weight would be around 150, correct?

21 MR. LEE: Objection. Outside the
22 scope.

23 THE WITNESS: I'm not sure what that
24 means, to have six lithium fluorides, I
25 don't know if I necessarily count lithium

1 fluorides in that way.

2 If you're just saying, does six
3 times lithium fluoride equal that number,
4 I'll assume it does based on what you're
5 saying.

6 BY MS. ZHONG:

7 Q. Okay. 26 times six is more than a
8 150, right, probably 156?

9 A. If you say so.

10 Q. Can you verify?

11 A. Sure.

12 Yes, 156.

13 Q. And 156 is greater than 151, right?

14 A. 156 is greater than 151.

15 Q. And you don't know whether lithium
16 fluoride exists as a monomer or hexamer or even
17 higher oligomers, right?

18 A. No.

19 Q. So the doping effect or conductivity
20 effect by lithium quinolate actually results
21 from the lithium metal?

22 A. So as I described in my original
23 declaration and then further, that's in my
24 reply declaration responsive to Dr. Pattison's
25 comments, Liq is a n-dopant that increases the

1 conductivity of the ETL, that's clear from Ma's
2 work, which I discussed extensively in my
3 initial declaration.

4 Dr. Pattison takes a narrow position
5 that an n-dopant must participate in direct
6 charge transfer with the ETL and in my reply
7 declaration what I point out is that Liq will
8 also perform this process at the cathode
9 interface as well.

10 In a way, very analogous to lithium
11 fluoride which is listed as a preferred dopant
12 by Diekmann.

13 Q. You didn't quite answer my question.

14 A. Okay, can you restate your question?

15 Q. So whatever the effect lithium
16 quinolate may have on the conductivity of the
17 electron transport layer, that is due to the
18 formation of lithium metal on the same cation;
19 is that correct?

20 A. No, I think that's incorrect and
21 isn't consistent with what I said.

22 As I point out in my initial
23 declaration, Ma demonstrates experimentally
24 that adding lithium quinolate to an electron
25 transport layer leads to an increase in

1 conductivity that Ma suggests is coming from a
2 change in the mobility of the ETL.

3 Dr. Pattison's testimony suggested
4 that n-doping must solely be related to a
5 charge transfer dopant, which is something I
6 don't agree with.

7 And in my reply, I demonstrate that
8 under this narrow definition, Liq would still
9 be an n-dopant by virtue of the fact that when
10 it sees the cathodes metal, it will ultimately
11 n-doped via lithium the ETL.

12 Q. Okay. In this mechanism of electron
13 donation, the electrons are donated from the
14 reduced lithium; is that correct?

15 A. So again, I didn't take that as a
16 specific position on the chemistry and the
17 reaction that actually occurs.

18 What I'm using is the prior art to
19 support my opinion that Liq will act as a
20 dopant that is disassociated at the interface.

21 Whether it's lithium or lithium
22 metal plus or anion that's formed, that's not
23 something that I've offered an opinion on.

24 Q. Do you recall your testimony earlier
25 that the prior art you have seen seems to be

1 suggesting a lithium quinolate is affecting the
2 conductivity due to in situ doping which
3 involves the release of metal lithium metal,
4 correct?

5 A. But whether it's lithium metal
6 neutral or lithium cadine is something that I'm
7 not taking a specific opinion on, is what I'm
8 saying.

9 Q. Okay.

10 A. You asked me about both for today.

11 Q. So the effect of lithium quinolate
12 on the number of negative charges, if any,
13 would be due to deformation of lithium and
14 lithium cadine; is that correct?

15 A. So, again, as I just said, I haven't
16 offered a reaction pathway for how lithium
17 quinolate goes from a neutral molecular
18 species, through intermediate states, to some
19 final dope ETL.

20 If I look at that question in the
21 context of Choudhury and Choudhury is
22 suggesting that the analogous lithium fluoride
23 is doping by forming lithium plus and a
24 corresponding anion.

25 Q. So are you taking -- is it your

1 opinion that lithium quinolate would react in a
2 similar fashion?

3 A. I think it's potentially consistent
4 with the fact that there's a doping effect
5 that's observed but I'm not committing to a
6 particular chemistry because I don't have
7 enough evidence to be able to propose a
8 reaction with an associated, say, delta G
9 associated with it.

10 Q. And in Choudhury's reaction
11 mechanism --

12 (The Court Reporter requested
13 clarification.)

14 BY MS. ZHONG:

15 Q. Choudhury --

16 (The Court Reporter requested
17 clarification.)

18 BY MS. ZHONG:

19 Q. Does Choudhury reaction mechanism
20 involve the release of either metal, iron or
21 metal -- strike that.

22 So does the Choudhury reaction
23 mechanism involve either the release of lithium
24 metal or lithium cadine?

25 A. Can you clarify what you mean by the

1 word "release"?

2 Q. Form.

3 A. So in Choudhury's reaction, there is
4 ultimately a complex formed, at least proposed
5 by the reaction between a lithium quinolate and
6 Alq anion.

7 Q. What about in Endo, they suggest
8 that there is reduction to form free metal; is
9 that correct?

10 A. Let me just open Endo again.

11 Yes, Endo is proposing that there's
12 thermal reduction of metal --

13 (The Court Reporter requested
14 clarification.)

15 THE WITNESS: Sorry. I understand.

16 Okay. Yeah, I can repeat it.

17 So Endo says that there's thermal
18 reduction of metal -- that thermal
19 reduction of metal ions occurs in Liq when
20 the cathode is deposited on to it.

21 BY MS. ZHONG:

22 Q. That means that there is lithium
23 metal forming?

24 A. Yeah, like, in looking at Endo's
25 description, they note that the reaction may

1 also produce byproducts derived from the
2 aluminum ion and the organic ligands liberated
3 from the complexes.

4 So I would say that there could be
5 several things formed based on Endo's
6 interpretation of their data.

7 Q. It involves at least the -- strike
8 that.

9 It involves, at least, the formation
10 of lithium metal; is that correct?

11 A. So Endo, in their abstract,
12 describes their results as being reduced to
13 free metal by thermally activated aluminum.

14 Q. And free metal means lithium; is
15 that right?

16 A. If it's a lithium complex, then I
17 would interpret "free metal" to be that lithium
18 is being released.

19 Q. Okay. Does Choi offer any theory on
20 the possible reaction of the mechanism?

21 A. I'll have to review Choi. Let me do
22 that now.

23 Choi doesn't offer details on the
24 reaction mechanism, they simply qualify it as
25 Liq as being an n-type doped ETL.

1 Q. Okay. But Choi speculates that
2 lithium Liq-doped to the ETL can be expected to
3 exhibit a lower electron barrier height,
4 correct?

5 A. Can you point to a particular
6 paragraph?

7 Q. PDF page 2.

8 A. Mm-hmm.

9 Q. The end of that -- the paragraph on
10 the right.

11 A. Yes, I see the line.

12 Q. And that's opposite from Endo,
13 correct?

14 A. I guess I'm trying to understand
15 what's opposite from Endo.

16 Q. So in Choi, lithium quinolate LUMO
17 is depicted as being lower than the LUMO of the
18 ETL; is that correct?

19 A. So, yes, we talked about this this
20 morning. They offer different perspectives on
21 the -- I think we talked about this this
22 morning, different perspectives on the LUMO of
23 Liq.

24 Q. Understood.

25 So according to Choi, Choi's view is

1 that lithium quinolate has a lower LUMO than
2 the ETL for that particular ETL they are using?

3 A. Yes, the energy levels Choi is
4 citing for Liq would place the LUMO within the
5 ETL and its graphic of Figure 2.

6 Q. So the LUMO of lithium quinolate in
7 Choi has a lower LUMO than the LUMO of the
8 electron transport layer?

9 A. That's what's shown in Figure 2 of
10 Choi.

11 Q. Okay. And in Endo, forget about the
12 absolute values, relatively, the lithium
13 quinolate has a higher LUMO than the aluminum
14 Q3 -- aluminum Q3 LUMO, correct?

15 MR. LEE: Objection.

16 A. That's what's noted in Endo.

17 BY MS. ZHONG:

18 Q. How does the LUMO level of -- strike
19 that.

20 How does a LUMO level of lithium
21 quinolate compare to BPhen?

22 A. I'd have to consult some of my
23 exhibits to remind myself of the LUMO level of
24 BPhen but I can do that.

25 Q. Sure.

1 A. So in Exhibit 10 -- 1030, he lists
2 the LUMO BPhen as 3.0 electron volts.

3 (Exhibit 1030 was identified.)

4 BY MS. ZHENG:

5 Q. So it would be would higher than
6 3.15 and lower than 2.5?

7 A. Yes, it would be similar to Alq as
8 noted by Endo.

9 Q. What is TTPI's LUMO level?

10 A. I don't recall TTPI's LUMO level off
11 the top of my head and I don't think it's in --
12 and I don't think I've pulled an exhibit that
13 has TTPI's LUMO, but I can check. I'm going to
14 search a couple of my exhibits.

15 I don't think I have a number for
16 TTPI'S LUMO in my exhibits.

17 Q. Can you please take a look at your
18 reply declaration, page 23?

19 A. Page 23?

20 Q. Uh-huh. Correct.

21 A. Okay. I'm looking at it.

22 Q. So the quote you have on Choudhury
23 is specific to the Alq3; is that correct?

24 A. The quote I have for Choudhury is
25 taken from the Choudhury paper, so that's for

1 Alq lithium fluoride.

2 Q. And you continue to say that:
3 Choudhury concludes that doping leads to a
4 gradual filling of intrinsic charge traps in
5 the material resulting in higher low field
6 carrier mobility compared to n-doped samples.

7 Do you see that?

8 A. Let me just find that passage.

9 Q. Last two lines on page 23.

10 A. I see that -- that text.

11 Q. What does it mean that, "doping
12 leads to gradual filling of the intrinsic
13 charge traps in the material"?

14 A. So when a material is deposited in
15 film, there's going to be some concentration of
16 intrinsic traps in the material, just from
17 potentially a disorder that might exist in the
18 films since these are amorphous --

19 (The Court Reporter requested
20 clarification.)

21 THE WITNESS: Since these are
22 amorphous in films. And so when one
23 introduces charge carriers in the way that
24 Choudhury is arguing, some of these traps
25 may be filled and once they are filled,

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1 they no longer impact subsequent electrons
2 traveling through the layer.

3 BY MS. ZHONG:

4 Q. And in the material, is that
5 referring to the electron-transport material?

6 A. Choudhury is talking about the
7 electron-transport material.

8 Q. And the filling of the intrinsic
9 charge traps, it's filling by the lithium
10 quinolate molecules, cations, electrons or
11 what?

12 A. It would be filling by electrons.

13 Q. So the electron fills all those
14 charge traps?

15 A. I think they're finding is that the
16 electrons would fill at least some of them,
17 which would increase the mobility of electrons
18 through the material.

19 Q. Okay. So those, because those
20 electrons then will no longer be trapped by
21 those traps in the material?

22 A. Any subsequently injected electron,
23 now that trap is filled and so it's not going
24 to have as -- as detrimental effect on the
25 transport.

1 Q. Is that the same mechanism as Ma's?

2 A. No. Well, not necessarily, it's
3 quite possible something like that could be
4 happening in Ma as well, but Ma speculates that
5 their change in mobility is related more to the
6 specifics of the hopping that exists in the
7 electron-transfer material.

8 In terms of the role of charge
9 generation, that's something that Ma doesn't
10 use as part of their explanation.

11 Q. And their hopping looks at the
12 relative normal LUMO levels of the lithium
13 quinolate resisting the electron-transfer
14 material; is that right?

15 A. I'm going to open Ma to better
16 answer that.

17 Yes. So Ma is looking at ultimately
18 LUMO and LUMO difference between BPhen and Liq
19 being small, and arguing that that ultimately
20 enables improved transport through the layer.

21 Q. So if Endo's LUMO and LUMO levels
22 are correct, does that mean this hopping
23 mechanism would not occur in aluminum Q3 and
24 lithium quinolate?

25 A. I didn't look into the details of

1 what Ma's hopping mechanism -- how it would
2 depend on, say, the energy difference between
3 the two materials in the ETL, so I don't think
4 I can speculate on that.

5 Q. So the newer papers you have cited,
6 they report the number of electrons in the
7 doped material versus the undoped materials or
8 are they just reporting the conductivity?

9 A. Can you point me to some specific
10 papers because there's several that I have
11 cited here?

12 Q. Exhibit 1049, Exhibit 1050, 51, 52.

13 A. I may be missing something but I
14 don't know that 1049 actually reports in detail
15 on the number of carriers. Can you direct me
16 to where in 1049 that's discussed?

17 Q. I'm just asking you whether they
18 discussed that.

19 A. Oh, I thought you made a statement
20 saying they report the number of carriers.

21 So 1049 is basing their conclusions
22 on device data, as is often the case with
23 doping, to look at the improvement in device
24 data; and in 1049, they are not doing an
25 explicit measurement of number of carriers.

1 What were the other exhibits?

2 Q. Exhibit 1050.

3 A. 1050. So Choi again, I don't think
4 they offer any direct measure of a carrier.
5 They base their assessment on improved device
6 performance here.

7 Q. What about for Choudhury,
8 Exhibit 1051?

9 A. So Choudhury, I'll look at it a
10 little more closer because they do talk about
11 concentrations but I want to make sure that I
12 get the context correct.

13 Yes. So Choudhury does, for at
14 least one sample, list their carrier
15 concentration in table 1.

16 Q. You mean -- are you referring to the
17 Number N?

18 A. Yeah, that's carrier concentration.

19 Q. Do you believe that the articles
20 after 2008 is reflective of the state of art at
21 the time of the invention?

22 A. Can you just clarify, you're saying
23 any article published since 2008? Or just
24 published today?

25 Q. Are articles published after 2008 in

1 your opinion -- strike that.

2 For articles published after 2008,
3 the priority date, in your opinion, do they
4 reflect the state of the art at the time of the
5 invention?

6 MR. LEE: Objection. It calls for a
7 legal conclusion.

8 THE WITNESS: So I didn't
9 consider -- I didn't consider that
10 question, what would reflect the state of
11 the art, in terms of material continuing
12 being published today.

13 In general if I look at the OLED
14 community, there's continual advancement;
15 and so I think, generally, if you're
16 looking almost 20 years after a piece of
17 work, it would be hard for that 20-year-old
18 piece of work to still be the state of the
19 art.

20 And for the material from today to
21 not have improved in some way on those
22 devices.

23 BY MS. ZHONG:

24 Q. So if a particular combination you
25 proposed did not appear until three or four

1 years after the invention date, does it -- does
2 that have any bearing on whether a person of
3 ordinary skill in the art would have arrived at
4 the invention at the time with --

5 MR. LEE: Objection. Calls for a
6 legal conclusion.

7 THE WITNESS: So the -- again, the
8 way I've built my opinion, my declaration
9 or reply declaration, is that in my
10 opinion, it would have been obvious for a
11 person skilled in the art prior to, like at
12 the time of the invention or prior to the
13 invention, to make the combinations that
14 I'm proposing.

15 And so, no, I don't think just
16 because that combination doesn't end up in
17 the literature shortly after the patent
18 date would -- that that weakens the opinion
19 any more on the combination. I don't think
20 so.

21 BY MS. ZHONG:

22 Q. So does the fact that the particular
23 combination does not appear in literature for
24 another five to six years, would that at least
25 indicate it lacks an interest in making that

1 combination?

2 MR. LEE: Objection. It calls for a
3 legal conclusion. Outside the scope.

4 THE WITNESS: So I never thought
5 about it in that way, and don't think that
6 that's true.

7 The way I've constructed my opinion
8 and the way I've looked at the prior art is
9 what would a person skilled in the art have
10 been able to see and what would they see as
11 fruitful combinations that would have a
12 highly likely of success?

13 And so I haven't thought at all
14 about how long after the '425 patent date
15 something would have to be reduced to
16 practice in the literature, to then back
17 influence my opinion on whether it would
18 have been obvious. My opinion is that
19 these combinations would have been obvious
20 at the time.

21 BY MS. ZHONG:

22 Q. Okay. I understand what your
23 opinion is. But let's see whether we can --
24 I want to get some factual basis.

25 Kido is a well-known group at the

1 time of the invention, right?

2 A. Yes.

3 Q. People working in the, in that
4 field, generally knows about that group,
5 correct?

6 A. Yes, that's correct.

7 Q. And do they follow their work
8 generally?

9 MR. LEE: Objection.

10 THE WITNESS: Again, the community
11 reads Kido's work, certainly.

12 BY MS. ZHONG:

13 Q. So there should be well-aware of
14 Exhibit 1049, for example?

15 A. Again, I think that the community
16 would follow Kido's work, certainly.

17 Q. They would be aware of Exhibit 1049,
18 for example, of Kido work?

19 A. Again, it would be -- if it's in the
20 literature if they are following the work, they
21 would be aware of all of his work. And so I'm
22 hesitant to single out 1049 versus the dozens
23 of other papers. But I think, in general, the
24 community is following Kido's work including
25 1049.

1 Q. Okay. And the fact is, the next
2 paper lithium quinolate or using lithium
3 quinolate in electron transport layer is the
4 Ma paper as far as you can locate, correct?

5 MR. LEE: Objection. Misstates
6 facts. Lacks scope.

7 THE WITNESS: As I said earlier, the
8 Ma paper and Endo paper are the only two
9 prior art references that I cite. I did
10 not exhaustively look for additional
11 references but those are the two that
12 I cite in my declaration and reply.

13 BY MS. ZHONG:

14 Q. Is there anything preventing you
15 from doing a more exhaustive search?

16 A. No.

17 MR. LEE: Objection. Relevance.
18 Outside the scope.

19 THE WITNESS: No.

20 BY MS. ZHONG:

21 Q. Did you ask counsel to help you with
22 the search?

23 MR. LEE: Objection to the extent it
24 calls for privileged communications.

25 THE WITNESS: I'll also answer that,

1 then, no.

2 BY MS. ZHONG:

3 Q. Okay. Do you consider yourself to
4 be a pretty good researcher as far as locating
5 the relevant literature?

6 A. Yes, I do.

7 Q. Okay. So if you want to find a
8 particular paper on a particular topic, you
9 usually find them, right?

10 A. Well, again, that -- there's some
11 truth to that but you have to remember as well
12 that p- and n-doping was something that was
13 still emerging in the early 2000s, and so, you
14 know, you might have to sometimes look harder
15 than other times to find the paper. Sometimes
16 the terminology is different, sometimes you
17 have to search for particular molecules, so --
18 but, yes, I think I'm effective in finding
19 literature.

20 Q. Okay. And the priority for the '425
21 is, you used with the 2008, right?

22 A. As I note in my original
23 declaration, yes.

24 Q. Okay. And so that's not early 2000,
25 that's more the end of 2000s, right?

1 A. Again, I was referring more to the
2 time period where the Endo paper resides, in
3 2002.

4 Q. Okay. But I assume that when you
5 were searching for prior art, you did not limit
6 yourself to 2002, right? You looked all the
7 way through 2008; is that correct?

8 MR. LEE: Objection. Relevance.
9 Outside the scope.

10 THE WITNESS: Yes, I didn't limit
11 myself to 2002, but I also, given the scope
12 of my opinion and the scope of the
13 questions involved, I also felt that in my
14 original declaration, Ma supported my
15 opinion to the level that it needed to be
16 supported.

17 BY MS. ZHONG:

18 Q. Okay.

19 A. So looking at Ma already, as a known
20 n-dopant showing good performance of an OLED,
21 to me that was already sufficient to make the
22 combination with Diekmann.

23 And so my objective was not to
24 provide an exhaustive review on doping and
25 organic semi-conductors up to the year 2008.

1 Q. Do you think that it's relevant to
2 find literature where lithium quinolate is used
3 as a n-dopant in the electron-transfer layer?

4 A. Yes.

5 Q. Okay. And the more you can find,
6 the more it will support your theory, correct?

7 MR. LEE: Objection. Outside the
8 scope. Lacks relevance.

9 THE WITNESS: Yes.

10 BY MS. ZHONG:

11 Q. But the fact is, you searched and
12 besides Ma, you only located the Endo paper,
13 correct? Or at least the -- only cited to the
14 Endo paper?

15 A. Those are the two references I'm
16 citing to support the doping of Liq into an
17 ETL.

18 Q. Did you locate other papers?

19 A. None that I'm aware of at the
20 moment.

21 Q. Okay. So I just want to make sure
22 that there's not another lithium quinolate --
23 strike that.

24 There's not another reference
25 involving lithium quinolate as a dopant in the

1 electron-transfer layer that you're aware of
2 but did not cite; is that correct?

3 A. There's no other --

4 MR. LEE: Objection to form of the
5 question.

6 THE WITNESS: There isn't another
7 reference that I'm aware of at the moment
8 that I could have cited.

9 BY MS. ZHONG:

10 Q. Okay. And --

11 (The Court Reporter requested
12 clarification.)

13 BY MS. ZHONG:

14 Q. So the use of lithium quinolate as
15 an electron injection layer, those papers
16 include the Liu paper, the (indecipherable)
17 paper, and the Schmitz Exhibit 2027; is that
18 correct?

19 A. That's correct. Those three are
20 included, but I just want to consult my exhibit
21 list to make sure one wasn't missed. Just give
22 me a moment.

23 I think Endo should be on that list
24 as well, because in addition to showing the
25 doping of the ETL, Endo also demonstrates LI --

1 or Liq and Li derivatives or Li complexes as
2 EILs, as well but those would be the references
3 I cite.

4 Q. Do you know why both Ma and Choi
5 used a separate electron injection layer in
6 addition to the doped electron transfer layer?

7 A. So in Ma, this is something I talk
8 about and talked about in my original
9 declaration and in original deposition, Ma is
10 doing that, in my opinion, to remove the effect
11 of Liq or at least minimize the effect of Liq
12 on injection.

13 And so in Ma's device, they're
14 looking at trying to show a change in
15 conductivity of the ETL and the cleanest way to
16 do that is to go and actually remove or
17 minimize changes in injection due to whatever
18 you're doing to the electron transport layer.
19 So by including lithium fluoride as an EIL,
20 they've already improved injection largely and
21 can then better focus the analysis of their
22 increased current flow to the doping effect of
23 Liq in the ETL.

24 Q. But when Ma was making its
25 electron-only device, it did not include any

1 electron injection layer, correct?

2 A. Let me go back and look at Ma.

3 That's true. In the electron-only
4 device, there is no additional LiF layer, it's
5 in the OLED.

6 Q. Okay. So if they want to evaluate
7 purely the effects of lithium quinolate doping,
8 shouldn't they be doing that in the
9 electron-only device?

10 A. They could. In this case, the
11 electron-only device is also fairly thick which
12 is a another way to focus an attention to the
13 bulk transport and the transport layer rather
14 than to injection.

15 And so normally when, you know, one
16 tries to evaluate bulk transport, one would try
17 to make the resistance of the ETL, the biggest
18 resistance that the electron sees. And so at
19 50 nanometers, they've probably realized that.

20 And so I would say they're still
21 showcasing the bulk transport of the film.

22 Q. So based on their electron-only
23 device met test results, how many
24 (indecipherable) of conductivity increase is
25 there?

1 A. I'm sorry, I missed that. How many
2 what of conducted in increase?

3 Q. What's the amount of the
4 conductivity increase based on the
5 electron-only device?

6 A. I don't think they actually
7 calculate their conductivity, but let me
8 just --

9 Q. From the electron-only device test
10 result from the current -- Figure 5, for
11 example?

12 A. No, I can't estimate just from
13 Figure 5.

14 Q. So you don't think that you can
15 estimate the increase in bulk conductivity of
16 the doped film from Figure 5 of Ma?

17 A. No, what I said is I can't give you
18 a specific number. I can see clearly that the
19 conductivity is going up, but I don't know the
20 specific numerical value by which it's going
21 up.

22 Q. Can you give me a range of number?
23 Is it like two to three fold increase, in order
24 of magnitude, two orders of magnitude, three
25 orders of magnitude? Can you tell?

1 A. No, not just from that data.

2 Q. What else do you need?

3 A. So to get conductivity from current
4 density, you'd have to first calculate the
5 field across the device and you might also need
6 to think about what regime you're in.

7 So I'd probably want to have the
8 data on like a logarithmic plot versus voltage
9 as well so that I could see the full range of
10 the current voltage behavior.

11 Q. So you cannot make any estimate,
12 based on Figure 5, as to the -- the degree of
13 improvement in conductivity; is that correct?

14 A. Again, I wouldn't be comfortable
15 pulling a number out of the data without being
16 able to see the full range.

17 What I can say is, qualitatively,
18 there is an increase based on the fact that the
19 electron current is improving as a result of
20 doping here, at least up to 33.

21 Q. Can you even estimate as to the
22 order of magnitude of improvement?

23 MR. LEE: Objection. Asked and
24 answered.

25 THE WITNESS: Again, I'm not able to

1 estimate a quantitative number. So no, I
2 wouldn't be comfortable estimating an order
3 of magnitude improvement or even a factor
4 of whatever number.

5 BY MS. ZHONG:

6 Q. What about based on the plotting of
7 the figures?

8 A. Again, I think that there's -- well,
9 my opinion is there's sufficient data here,
10 first of all, in the electron device that a
11 person skilled in the art would see an
12 improvement in electron transport and an
13 improvement in conductivity even if the exact
14 number isn't known. And then importantly, too,
15 would see the favorable device performance that
16 comes from using Liq as an n-dopant.

17 Q. So does the fact that the current
18 density increased by about two to threefold
19 means that conductivity increases only two to
20 threefold?

21 A. So just so I'm clear, tell me which
22 data you're pointing to. Which concentrations
23 are we looking at here?

24 Q. Do you see -- is it true that the
25 current density increased from about

1 130 milliamp per -- per centimeter squared to
2 around 370 milliamp percentage squared?

3 MR. LEE: Objection. Form.

4 THE WITNESS: Again, for which
5 concentrations are we talking about?

6 BY MS. ZHONG:

7 Q. Figure 5.

8 A. There's four curves there, I just
9 want to know which two you want me to compare.

10 Q. The n-doped that says 33 percent.

11 A. Okay. And you're looking at 12
12 volts, presumably, here?

13 Q. Sure.

14 A. For the n-doped at 12 volts, it
15 looks like, yeah, approximately 335. We only
16 have per centimeter squared. And for the 33,
17 yeah, maybe three, 370, something like that.

18 Q. Okay. So does the fact that current
19 density increases by like, say, threefold means
20 the conductivity increased by a threefold in
21 the bulk?

22 A. So, again, it depends on -- so
23 conductivity is a proportionality effectively
24 between current and field. And so the current
25 density here is plotted as a function of

1 voltage. And so in terms of comparing exact
2 currents at a specific voltage, what you'd
3 really like to know is what the electrofield is
4 of those voltages rather than the voltage
5 itself.

6 And so I'm hesitant to pick two
7 points of the same voltage because I don't know
8 if they're at the same electric field
9 necessarily.

10 So I can say with certainty that the
11 current is going up and the conductivity is
12 improving but in terms of picking two precise
13 points to compare, I'd want to see more of the
14 data and I'd want to think a little bit about,
15 what would the field be in this device?

16 Q. And the field is a function of the
17 thickness?

18 A. Field is a function of the
19 thickness, the voltage applied but it can also
20 be a function of the conductivity of the layer
21 as well.

22 Q. And so, again, you don't believe
23 that, just by looking at the current density
24 curb, you can conclude that the conductivity
25 only went up by two to threefold; is that

1 right?

2 A. I don't think I'm comfortable making
3 a quantitative assessment of the conductivity
4 just from this data alone, but I can
5 confidently say that the conductivity has
6 increased.

7 Q. But you can't tell whether the
8 conduct of the increase is by a factor of 10, a
9 factor of 100, a factor of 1,000 or --

10 MR. LEE: Asked and answered.

11 THE WITNESS: As I said before, I'm
12 not comfortable assigning some numerical
13 value to what that increase would be and
14 I'll just note as well that I don't think a
15 person skilled in the art would need to
16 have the numerical value in order to see
17 value in using Liq as an n-dopant.

18 BY MS. ZHONG:

19 Q. Based on this graph, is it possible
20 that the increasing conductivity is three
21 orders of magnitude?

22 A. So as I've already said, I can't
23 assign a specific quantitative value to the
24 increase in conductivity, it's not something
25 that I've sought to do in my declaration or

1 reply declaration, so I'm not comfortable doing
2 that now or trying to bookend it based on some
3 very large or very small numerical range.

4 Q. So you can't exclude the possibility
5 that the conductivity increase is over three
6 orders of magnitudes, for example, correct?

7 A. So, again, that's not how I would
8 phrase it, but I'm not willing to give a
9 quantitative number just based on this data.

10 THE COURT REPORTER: We've been
11 going an hour and a half, I could use a
12 break.

13 MS. ZHONG: Sure.

14 (A recess was taken.)

15 BY MS. ZHONG:

16 Q. Can you please turn to your reply
17 declaration, paragraph 35?

18 A. Sure. Let me just open it. Okay.

19 Q. The supposed additional benefits you
20 stated in paragraph 35, those were not stated
21 in your original declaration; is that correct?

22 A. Let me reread paragraph 35.

23 Q. Okay.

24 A. I'm going to open my original
25 declaration as well.

1 Q. Let me point you to, for example,
2 paragraph 144. Actually starting on 142.

3 A. Let me read this quickly.

4 Q. I think 144 is where you were trying
5 to justify the use of lithium quinolate.

6 A. What is the specific inconsistency
7 you're pointing out?

8 Q. I'm just asking you, the new theory
9 that -- the additional benefits, you did not
10 state them in your original declaration,
11 correct?

12 MR. LEE: Objection. Calls for a
13 legal conclusion.

14 THE WITNESS: So I'll just note
15 first that in my original declaration and
16 I'll just read this explicitly:

17 It was well-understood that metal --
18 dopant metal lines could diffuse in the
19 OLED, during film, growth and operation
20 compromising performance.

21 So this is essentially noting that a
22 dopant with a reduced diffusion constant in
23 the ETL would lead to an overall
24 improvement in performance. And when
25 looking at my reply --

1 BY MS. ZHONG:

2 Q. Does your original declaration
3 mention anything about --

4 MR. LEE: If you could just let the
5 witness finish his testimony.

6 THE WITNESS: Yeah, let me just
7 finish my thought. I had so many PDF
8 documents open here, I needed to find my
9 reply.

10 So I would say that when looking at,
11 for instance, the quote I pull from Zheng,
12 et al., talking about the stability of
13 elemental metals and how that's an issue,
14 that certainly is consistent with the
15 deterioration in device performance.

16 Lifetime is a part of performance,
17 in addition to efficiency.

18 And so I don't think there's an
19 inconsistency there and I don't think
20 there's a new theory there. It's just
21 additional support for Diekmann's stated
22 objective of -- or stated preference for a
23 molecular dopant.

24 BY MS. ZHONG:

25 Q. Where in your report is mentioned

1 the missing calcium, magnesium, et cetera, and
2 not stabling air?

3 A. Let me go back. In my initial
4 report, I don't explicitly call out that
5 lithium and magnesium and calcium are not
6 stable in air.

7 What I say is that the dope
8 preference preferably has a low diffusion
9 constant within the stack as is usually the
10 case with large atoms or molecules, for
11 example.

12 Q. So --

13 A. In looking -- pardon me.

14 Looking at Diekmann, the discussion
15 of Diekmann is also about trying to move away
16 from more diffusive atomic species like
17 lithium, for example.

18 Q. So is there a connection between
19 diffusivity and air stability?

20 A. Let me just open my reply again.

21 Again, I'm not pointing to -- I'm
22 noting, obviously, the air instability of those
23 metals just because that's part of the
24 quotation from Zheng.

25 But I'm also noting that, "and

1 sometimes may react with and diffuse into
2 organic material and deteriorate the device."

3 I think Zheng explicitly calls out
4 diffusion as a challenge. Right? The fact
5 that Zheng also calls out the air stability is
6 something that I'm including, just because of
7 the fact that it's part of Zheng's discussion.

8 But what I'm pointing to here in
9 this discussion is that the diffusion issue is
10 something that Diekmann raises. The diffusion
11 issue is a problem for performance is something
12 I raised in my original declaration and I'm
13 just further commenting on that here in the
14 reply.

15 Q. Okay. So your original declaration
16 did not comment on the air stability of the
17 calcium barium versus the lithium quinolate,
18 correct?

19 A. Let me go back to my original
20 declaration.

21 Again, I don't think I commented
22 specifically on the air stability of those
23 materials. I mention the use of calcium in the
24 context of view, but again, it's been a while
25 since I've gone through my original declaration

1 in detail but I don't think I have commented
2 specifically on air stability.

3 Q. You did not -- you also did not
4 comment on the advantage of using lithium
5 quinolate versus lithium fluoride, such as
6 lithium fluoride needs higher temperature for
7 evaporation and the thickness control issue,
8 correct?

9 A. I didn't comment explicitly on that.

10 Q. Okay. What's the air stability of
11 lithium fluoride versus lithium quinolate?

12 MR. LEE: Objection. Form.

13 THE WITNESS: I didn't consider the
14 what the air stability of lithium fluoride
15 versus lithium quinolate as part of my
16 declaration or reply.

17 BY MS. ZHONG:

18 Q. Have you done any experiment to
19 determine the relative diffusivity of lithium
20 quinolate versus lithium fluoride?

21 A. No, I haven't done any experiments
22 to measure that exclusively.

23 Q. Have you done any literature search
24 to determine the relative diffusivity of
25 lithium quinolate versus lithium fluoride?

1 A. I'm not aware of any literature that
2 compares the diffusivity of those two species.

3 Q. Now, can you please take at that
4 look at your paragraph 38?

5 A. Is this in the reply or the original
6 declaration?

7 Q. Reply.

8 A. Reply, okay.

9 I'm there.

10 Q. Now, you quoted in paragraph 38,
11 certain passages from Exhibit 2003, Kim from --
12 2011, correct?

13 (Exhibit 2003 was identified.)

14 THE WITNESS: That's correct.

15 BY MS. ZHENG:

16 Q. Okay. And according to your
17 excerpt, Kim's structure again has a two
18 nanometer lithium quinolate injection layer,
19 correct?

20 A. That's correct.

21 Q. Okay. For the Exhibit 2024
22 structure, Kim 2013, do you know if there's a
23 separate lithium quinolate layer or not?

24 (Exhibit 2013 was marked.)

25 MR. LEE: Objection. Form.

1 THE WITNESS: I'll have to just have
2 a look at Exhibit 2024. Is that not in the
3 Veritext?

4 (Exhibit 2024 was identified.)

5 BY MS. ZHONG:

6 Q. It should be.

7 A. Oh, I see. None of the -- it
8 doesn't look like the Pictiva exhibits are
9 there. I can go to Dropbox. It is fine.

10 Q. The Dropbox is more complete. And
11 I'll direct your attention to Figure 1.

12 A. Okay. I'm looking at Figure 1.

13 Q. Does that indicate to you that
14 there's a separate lithium quinolate neat
15 layer, like injection layer between the dopant
16 TPBi layer and the aluminum cathode?

17 A. Yes, there is a separate lithium
18 quinolate layer there.

19 Q. And this one is not a white
20 light-emitting OLED, correct?

21 A. You're referring to Exhibit 2024
22 still?

23 Q. Correct.

24 A. No, this was presumably a green
25 lighting-emitting device.

1 Q. Okay. What about Exhibit 2003?
2 (The Court Reporter requested
3 clarification.)

4 THE WITNESS: Green light-emitting
5 device, green.

6 BY MS. ZHONG:

7 Q. What about Exhibit 2003?

8 A. 2003. Let me just remind myself if
9 the emitters are there.

10 Yeah, 2003 is also not a white
11 light-emitting device.

12 Q. Are you aware of any literature
13 where this lithium quinolate doped layer is
14 used with three stacked emission layer?

15 A. No, I'm not.

16 Q. Does the fact that lithium quinolate
17 is known to be a good electron ejector like --
18 strike that.

19 Does the fact that lithium quinolate
20 was known to be a good electron -- strike that.

21 Does the fact that lithium quinolate
22 was known to have good electron injection
23 property make it an n-dopant?

24 MR. LEE: Objection. Outside the
25 scope.

1 THE WITNESS: So what I'm relying on
2 to decide that Liq is an n-dopant is not
3 that it's been used as an EIL. It
4 certainly had been previously used as an
5 EIL. I'm relying on the fact that it's
6 previously been used as n-dopant in the
7 ETL.

8 And so I hesitate to generalize that
9 any EIL is automatically a dopant.

10 BY MS. ZHONG:

11 Q. Now, the Endo devices, that involves
12 lithium quinolate doped electron transport
13 layer, they did not use a separate lithium
14 quinolate or some kind -- some other electron
15 injection layer, correct?

16 A. So Endo's devices can be considered
17 as really, there's probably, I guess, you could
18 say, two class of devices that's covered in
19 Endo.

20 One is a series of devices where
21 there is essentially a neat layer of an EIL
22 material. And then the other is a class of
23 devices where the ETL has been doped with the
24 lithium complex and they investigate both of
25 them.

1 So when they dope the ETL with the
2 lithium complex, they don't include an
3 additional EIL.

4 Q. Okay. But since Endo, the four
5 papers that we have lithium quinolate ETL, they
6 all use a separate electron injection layers,
7 correct?

8 MR. LEE: Objection. Form.

9 THE WITNESS: So what are the four
10 papers again? I just want to make sure I'm
11 clear. The two Kim papers and --

12 BY MS. ZHONG:

13 Q. The Ma paper. So the Ma paper, the
14 Kim paper, maybe both of them are Kim's. So
15 the two Kim papers and the Choi paper.

16 A. In those four papers, in their
17 OLEDs, use an EIL.

18 Q. Okay. So since Endo, at least for
19 the paper that we can find between 2008 and
20 2013, those devices are included as separate
21 electron injection layer for the lithium
22 quinolate doped electron transport layer; is
23 that correct?

24 MR. LEE: Objection. Misstates the
25 testimony and outside the scope.

1 THE WITNESS: So those four papers
2 you have lusted, the two Kim papers, Ma,
3 and Choi, all include an EIL.

4 BY MS. ZHONG:

5 Q. Did you find any other papers on the
6 use of lithium quinolate doped electron
7 transport layer between 2008 and 2013?

8 MR. LEE: Objection. Outside the
9 scope.

10 THE WITNESS: I didn't look
11 explicitly for papers that are
12 post-priority date.

13 BY MS. ZHONG:

14 Q. But the papers of record in that
15 time period, they are included, lithium
16 quinolate electron injection layer, correct?

17 A. So, again, if we're referring to
18 those same four papers, the two Kim papers, the
19 Ma paper and Choi paper, they include an EIL.

20 I just want to make sure that that's
21 clear because Ma isn't including Liq as an EIL,
22 they are including lithium fluoride.

23 Q. But they all include some kind of
24 electron injection layer separate from the
25 doped electron transport layer?

1 A. Those four papers all include an
2 EIL.

3 Q. Do you have any theory on why they
4 are including a separate electron injection
5 layer --

6 MR. LEE: Objection.

7 (The court reporter requested
8 clarification.)

9 BY MS. ZHONG:

10 Q. Do you have a theory as to why those
11 four devices are -- include a separate electron
12 injection layer when lithium quinolate
13 supposedly has good electron injection
14 property?

15 MR. LEE: Objection. Outside the
16 scope.

17 THE WITNESS: So with regard to Ma,
18 I think I've already stated my opinion
19 regarding the EIL in Ma.

20 I haven't thought about developing a
21 theory or opinion on why these other papers
22 utilize Liq as an EIL.

23 BY MS. ZHONG:

24 Q. Is there a reason why Endo did not
25 include a separate electro injection layer when

1 it dopes its electron transport layer?

2 MR. LEE: Objection. Outside the
3 scope.

4 THE WITNESS: So I would rely on
5 what I've said previously and what I said
6 in my initial declaration, which is, since
7 the electron transport layer is doped, it
8 doesn't need to improve injection. It
9 already is. It doesn't need a separate
10 electron injection layer.

11 BY MS. ZHONG:

12 Q. Doesn't it want to separate the
13 effects of electron injection from the doping
14 effects on conductivity?

15 MR. LEE: Objection. Outside the
16 scope. Calls for speculation.

17 THE WITNESS: Again, I don't know
18 the motivation of Endo. Their objective
19 may have been just been to show a high
20 efficiency and that you can get a good
21 working OLED using these different lithium
22 complexes, but I am not going to speculate
23 on what they might have been thinking.

24 BY MS. ZHONG:

25 Q. But for whatever reason, the papers

1 after Endo, at least those of record, or used a
2 separate electron injection layer together with
3 lithium quinolate doped electron transport
4 layer, right?

5 A. Those four papers we have discussed,
6 the two Kim papers, the Ma paper and Choi, all
7 used an electron injection layer in their OLED.

8 Q. And the structure you relied on,
9 Diekmann doesn't have a separate electron
10 injection layer, right?

11 A. No. In my opinion, an electron
12 injection layer isn't necessary.

13 Q. What about Suzuki, is there a
14 separate electron injection layer?

15 A. No, I don't think an electron
16 injection layer is necessary there as well.

17 Q. So in the four structures with a
18 separate electron injection layer, is lithium
19 quinolate providing electron injection?

20 MR. LEE: Objection. Form.

21 THE WITNESS: So the Ma structure
22 where lithium fluoride is being used as the
23 electron injection layer, lithium fluoride
24 is likely providing most of the injection
25 benefit in that device by design.

1 In the other three structures,
2 lithium quinolate being used as an EIL, it
3 could very well be assisting an injection.
4 That's presumably why it might be used
5 there, but it's hard to know what the
6 balance might be between that layer and the
7 doped ETL.

8 BY MS. ZHONG:

9 Q. Does a reaction between -- so
10 there's a reaction from the deposit aluminum
11 cathode, does that happen to the lithium
12 quinolate if there is an intervening pure
13 electron injection layer?

14 MR. LEE: Objection. Form.

15 THE WITNESS: So that's not
16 something that I've -- if I had to consider
17 because the combinations that I'm proposing
18 would not have an EIL. So I haven't
19 developed an opinion on specifically how
20 much the doped ETL might be activated when
21 there's an EIL present in the path.

22 BY MS. ZHONG:

23 Q. Do you know what Ma's device
24 performance will be if it removed the lithium
25 fluoride layer?

1 MR. LEE: Objection. Outside the
2 scope.

3 THE WITNESS: Let me just open Ma
4 again.

5 So if lithium fluoride was simply
6 removed from the device, what would be the
7 performance be?

8 BY MS. ZHONG:

9 Q. Uh-huh.

10 A. I suspect it would be very similar.

11 Q. Have you done any experiments to
12 verify it?

13 A. No, I haven't constructed Ma's
14 device to verify that.

15 Q. And have you conducted an experiment
16 to see what the effects would be if lithium
17 quinolate is removed as an electron injection
18 layer from Choi and the two Kim papers?

19 MR. LEE: Objection. Outside the
20 scope.

21 THE WITNESS: I haven't carried out
22 any experiments to look at that issue in
23 Choi and the two Kim papers.

24 BY MS. ZHONG:

25 Q. And you do agree that Ma does not at

1 least -- strike that.

2 And you agree that Ma does not
3 expressly mention anything about increased
4 electron density due to lithium quinolate
5 doping in the electron transport layer,
6 correct?

7 A. Ma attributes the increase in
8 electron conductivity to the mobility effect
9 that we've discussed earlier.

10 MS. ZHONG: So thank you very much.
11 Dr. Holmes, I'll pass the witness.

12 MR. LEE: Let me just take 15 to
13 check my notes and then go back on the
14 record at 3:15 Central. Around there?

15 MS. ZHONG: Sure.

16 (A recess was taken.)

17 EXAMINATION

18 BY MR. LEE:

19 Q. So, Dr. Holmes, earlier today, you
20 were asked by counsel whether you have cited
21 any references in which Alq3 is used as an
22 electron transport layer in a white
23 light-emitting phosphorescent OLED; do you
24 recall that that?

25 A. Yes, I recall that.

1 Q. Does Diekmann, which is
2 Exhibit 1004, teach a white light-emitting
3 phosphorescent OLED?

4 (Exhibit 1004 was identified.)

5 THE WITNESS: Yes, Diekmann does.

6 BY MS. LEE:

7 Q. And does Diekmann teach Alq3 as an
8 electron transport layer?

9 A. That's one of the electron-transport
10 materials in Diekmann as an ETL, yes.

11 Q. And does Suzuki, which is
12 Exhibit 1006, teach a white light-emitting
13 phosphorescent OLED?

14 A. Yes. Suzuki is also teaching a
15 white device --

16 Q. And does Suzuki teach Alq3 as
17 electron transport layer?

18 A. I'll just go back to Suzuki and
19 double-check.

20 Yes, Suzuki also teaches Alq3 as
21 electron-transport material.

22 MR. LEE: Those are all the
23 questions I have. Thank you, Dr. Holmes.
24 I'll repass the witness.

25 EXAMINATION

1 BY MS. ZHONG:

2 Q. Dr. Holmes, does Diekmann expressly
3 combine Alq3 with the materials you cited in
4 your paragraph 104 of the original declaration?

5 A. So I'll go and consult my original
6 declaration.

7 So in paragraph 104 and 105, I am
8 referring to the emissive layers that Diekmann
9 is proposing.

10 In paragraph 91 of Diekmann,
11 Diekmann describes the hole transporting side
12 of the device on the emissive layer.

13 Q. So for that particular structure,
14 you're (indecipherable) --

15 (The Court Reporter requested
16 clarification.)

17 BY MS. ZHONG:

18 Q. So for the specific structure you're
19 relying on in your original declaration,
20 nothing expressly states the particular
21 structure you're relying on is using an Alq3 as
22 the electron transport layer; is that correct?

23 A. Paragraph 91 doesn't list any
24 electron transport layer, but Diekmann does
25 list Alq along with Blq and TPBi as possible

1 electron transport layers.

2 Q. Okay. In your original declaration,
3 you never analyzed whether Alq3 can be used as
4 an electron injection layer for the white
5 light, correct?

6 A. I did not analyze whether Alq can be
7 use as electron injection layer in my original
8 declaration.

9 Q. And the same for Suzuki, correct?

10 A. I didn't analyze Alq as an electron
11 injection layer in Suzuki.

12 Q. So in Suzuki, if you pull up
13 Exhibit 1006, it's in the Dropbox.

14 (Exhibit 1006 was identified.)

15 THE WITNESS: Yes, I have it.

16 BY MS. ZHENG:

17 Q. Go to paragraph 333, that will be
18 PDF page 49.

19 A. I'm getting there.

20 Okay. I'm there.

21 Q. Okay. That is a paragraph where
22 Suzuki mentioned its electron transport layer
23 was a high-end in nature, doped with
24 impurities, that's a paragraph where it's
25 talking about what you believe is to be the

1 n-doped transport layer; is that correct?

2 MR. LEE: Objection. Misstates
3 testimony.

4 THE WITNESS: In paragraph 333,
5 Suzuki is talk about n-doped electron
6 transport layer.

7 BY MS. ZHONG:

8 Q. And Suzuki cited some specific
9 references there, correct?

10 A. There's several references in that
11 paragraph.

12 Q. Do any of them use aluminum Q3?

13 A. I didn't consult the Japanese patent
14 references.

15 Q. You did or you did not? Sorry?

16 A. I did not.

17 Q. Okay.

18 A. The Journal of Applied Physics Paper
19 is one of my exhibits by He and it uses BPhen,
20 if memory serves me.

21 Q. Okay. So in the examples that
22 Suzuki mentioned to have the n-doped electron
23 transport layer, the specific example you're
24 able to locate is using BPhen, not aluminum Q3;
25 is that correct?

1 MR. LEE: Objection. Misstates the
2 reference.

3 THE WITNESS: So I guess I want to
4 make sure I understand the question that
5 you're asking or can you restate that?

6 BY MS. ZHONG:

7 Q. Sure.

8 So in Suzuki, the paragraph 333 that
9 describes the supposedly n-doped electron
10 transport layer, the only specific reference of
11 the electron transport layer that's suitable
12 for electron doping is in the He paper and
13 that's used BPhen and not aluminum Q3; is that
14 correct?

15 MR. LEE: Objection. Misstates
16 reference.

17 THE WITNESS: The He paper uses
18 BPhen, but I think that's an overly narrow
19 reading of what Suzuki is showing there.

20 As I show in my declaration and I
21 think I comment in my reply declaration as
22 well, at this point in time, many ETLs and
23 many dopants have been combined
24 successfully in OLEDs, including in
25 phosphorescent devices.

1 And so I don't read paragraph 333 as
2 specifically pointing only to BPhen.

3 BY MS. ZHONG:

4 Q. Have you cited any single example
5 where aluminum Q3 is used in white lighting,
6 expressly as such?

7 A. So in both Diekmann and Suzuki, it
8 is one of the possible electron transport
9 layers that can be utilized.

10 Q. Not the question I'm asking.

11 A. Okay.

12 Q. Do you have any specific example, an
13 expressively disclosed device, white lighting
14 device that uses aluminum Q3, do you cite any
15 single one such example?

16 A. I don't cite a single example in
17 that way.

18 Q. Okay. So you don't have a single
19 example of a white lighting device that
20 expressly uses aluminum Q3; is that correct?

21 MR. LEE: Objection. Misstates the
22 testimony.

23 THE WITNESS: In the exhibits that
24 I'm presenting, I don't have a white
25 light-emitting device outside of Diekmann

1 and Suzuki that has an explicit structure
2 with an Alq ETL. However, that doesn't
3 prevent the use of Alq as a doped ETL
4 especially since Diekmann --

5 (The Court Reporter requested
6 clarification.)

7 THE WITNESS: I don't know if I said
8 "exclusive," but that it has an Alq ETL.

9 And what I was going to continue to
10 say is that that doesn't prevent the use of
11 an n-dope Alq layer as the ETL, especially
12 given the prior art that -- as a multitude
13 of examples of blocking layer devices and
14 that Diekmann also has that and so does
15 Suzuki in their structure.

16 BY MS. ZHONG:

17 Q. Okay. Can you point me to where
18 Diekmann discloses a complete device structure
19 where aluminum Q3 where is used for white
20 lighting?

21 A. So Diekmann doesn't disclose a
22 complete structure in the way you're asking.

23 Q. Okay. And Suzuki doesn't describe
24 such a structure either, correct?

25 A. In both of these patents, there's a

1 large number of possible materials that could
2
3 be combined to make the stated device.
4

5 MS. ZHONG: Okay. I don't have any
6
7 further questions. Thank you very much.
8

9 MR. LEE: Nothing for me either. So
10
11 I think we can go off the record and, maybe
12
13 there's more spellings we can resolve while
14
15 we are here.
16

17 THE COURT REPORTER: I'm off the
18
19 record.
20

21 (The deposition of RUSSELL HOLMES
22
23 concluded at 1:46 p.m. Pacific Daylight
24
25 Time.)

DEPOSITION ERRATA SHEET

Our Assignment No. 7567672

Case Caption: SAMSUNG DISPLAY VS. PICTIVA DISPLAYS

DECLARATION UNDER PENALTY OF PERJURY

I declare under penalty of perjury that I have read the entire transcript of my deposition taken in the above-captioned matter or the same has been read to me, and the same is true and accurate, save and except for changes and/or corrections, if any, as indicated by me on the DEPOSITION ERRATA SHEET hereof, with the understanding that I offer these changes as if still under oath.

Signed on the _____ day of _____ 20____.

RUSSELL HOLMES

Subscribed and sworn to on the ____ day of _____ 2025 ____ before me.

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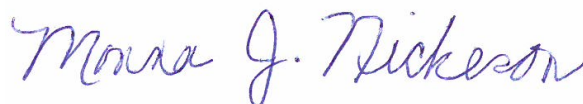
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I, MONNA J. NICKESON, CCR, CSR, CLR, RPR, CRR,
the undersigned Certified Court Reporter, authorized
to administer oaths and affirmations in and for the
states of Washington (3322), Oregon (16-0441), Idaho
(1045), and California (14430), do hereby certify:

That the sworn testimony and/or
proceedings, a transcript of which is attached, was
given before me at the time and place stated therein;
that the witness was duly sworn or affirmed to
testify to the truth; that the testimony and/or
proceedings were stenographically recorded by me and
transcribed under my supervision. That the foregoing
transcript contains a full, true, and accurate record
of all the testimony and/or proceedings occurring at
the time and place stated in the transcript.

That I am in no way related to any party to
the matter, nor to any counsel, nor do I have any
financial interest in the event of the cause.

IN WITNESS WHEREOF I have set my hand on
September 4, 2025



MONNA J. NICKESON, CCR, CSR, CLR, RPR, CRR

1 KEE LEE

2 Kylee@cov.com

3 September 4, 2025

4 RE: Samsung Display Co., LTD. v. Pictiva Displays International
5 9/3/2025, Russell J. Holmes, Ph.D, (#7567672).

6 The above-referenced transcript has been
7 completed by Veritext Legal Solutions and
8 review of the transcript is being handled as follows:

9 ___ Per CA State Code (CCP 2025.520 (a)-(e)) - Contact Veritext
10 to schedule a time to review the original transcript at
11 a Veritext office.

12 _XX_ Per CA State Code (CCP 2025.520 (a)-(e)) - Locked .PDF
13 Transcript - The witness should review the transcript and
14 make any necessary corrections on the errata pages included
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16 The witness should then sign and date the errata and penalty
17 of perjury pages and return the completed pages to all
18 appearing counsel within the period of time determined at
19 the deposition or provided by the Code of Civil Procedure.
20 Contact Veritext when the sealed original is required.

21 ___ Waiving the CA Code of Civil Procedure per Stipulation of
22 Counsel - Original transcript to be released for signature
23 as determined at the deposition.

24 ___ Signature Waived - Reading & Signature was waived at the
25 time of the deposition.

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1 ___ Federal R&S Requested (FRCP 30(e)(1)(B)) - Locked .PDF
2 Transcript - The witness should review the transcript and
3 make any necessary corrections on the errata pages included
4 below, notating the page and line number of the corrections.
5 The witness should then sign and date the errata and penalty
6 of perjury pages and return the completed pages to all
7 appearing counsel within the period of time determined at
8 the deposition or provided by the Federal Rules.
9 ___ Federal R&S Not Requested - Reading & Signature was not
10 requested before the completion of the deposition.

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Samsung Display Co., LTD. v. Pictiva Displays International
Russell J. Holmes, Ph.D (#7567672)

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(Russell J. Holmes, Ph.D)

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California Code of Civil Procedure

Article 5. Transcript or Recording

Section 2025.520

(a) If the deposition testimony is stenographically recorded, the deposition officer shall send written notice to the deponent and to all parties attending the deposition when the Original transcript of the testimony for each session of the deposition is available for reading, correcting, and signing, unless the deponent and the attending parties agree on the record that the reading, correcting, and signing of the transcript of the testimony will be waived or that the reading, correcting, and signing of a transcript of the testimony will take place after the entire deposition has been concluded or at some other specific time.

(b) For 30 days following each notice under subdivision (a), unless the attending parties and the deponent agree on the record or otherwise in writing to a longer or shorter time period, the deponent may change the form or the substance of the answer to a question, and may either approve the transcript of the deposition by signing it, or

refuse to approve the transcript by not signing it.

(c) Alternatively, within this same period, the deponent may change the form or the substance of the answer to any question and may approve or refuse to approve the transcript by means of a letter to the deposition officer signed by the deponent which is mailed by certified or registered mail with return receipt requested. A copy of that letter shall be sent by first-class mail to all parties attending the deposition.

(d) For good cause shown, the court may shorten the 30-day period for making changes, approving, or refusing to approve the transcript.

(e) The deposition officer shall indicate on the original of the transcript, if the deponent has not already done so at the office of the deposition officer, any action taken by the deponent and indicate on the original of the transcript, the deponent's approval of, or failure or refusal to approve, the transcript. The deposition officer shall also notify in writing the parties attending the deposition of any changes which the deponent timely made in person.

(f) If the deponent fails or refuses to approve the transcript within the allotted period, the

deposition shall be given the same effect as though it had been approved, subject to any changes timely made by the deponent.

(g) Notwithstanding subdivision (f), on a seasonable motion to suppress the deposition, accompanied by a meet and confer declaration under Section 2016.040, the court may determine that the reasons given for the failure or refusal to approve the transcript require rejection of the deposition in whole or in part.

(h) The court shall impose a monetary sanction under Chapter 7 (commencing with Section 2023.010) against any party, person, or attorney who unsuccessfully makes or opposes a motion to suppress a deposition under this section, unless the court finds that the one subject to the sanction acted with substantial justification or that other circumstances make the imposition of the sanction unjust.

DISCLAIMER: THE FOREGOING CIVIL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY. THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE STATE RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the deposition officer. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the deposition officer and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

PICTIVA DISPLAYS)
INTERNATIONAL, LTD.,)
)
Plaintiff,) Civil Action Nos.:
) 2:23-cv-00495-JRG
vs.) 2:24-cv-00532-JRG
)
SAMSUNG ELECTRONICS CO.,)
LTD., SAMSUNG ELECTRONICS)
AMERICA, INC.,)
)
Defendants.)
-----)

ATTORNEYS EYES ONLY - HIGHLY CONFIDENTIAL
VIDEOTAPED VIDEOCONFERENCE DEPOSITION OF:
THOMAS KATONA, Ph.D.
FRIDAY, JUNE 13, 2025

Reported by: Monice K. Campbell, CRR, RMR,
NV CCR No. 312, CA CSR No. 14171
Job No.: 7408143

1 VIDEOCONFERENCE DEPOSITION OF THOMAS KATONA, PhD,
2 held remotely, on Friday, June 13, 2025, at 9:10
3 a.m., before Monice K. Campbell, Certified Court
4 Reporter, in and for the State of California.

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I N D E X

	THOMAS KATONA, PhD	PAGE
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E X H I B I T S

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Exhibit 1	Expert Report Of Thomas Katona, Ph.D., Regarding The Validity Of U.S. Patent Nos. 6,949,389, 8,314,547, and 11,828,425	12
Exhibit 2	Rebuttal Expert Report of Thomas Katona, Ph.D.	12
Exhibit 3	U.S. Patent No: 11,828,425, PICTIVA00000191 - PICTIVA00000298	28
Exhibit 4	Technical Report "The Best Choice For OLED Materials", issued by DOOSAN, dated 8/21/20	48
Exhibit 5	Samsung Display Confidential Document, dated 9/22/22	48

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Exhibit 6	Research Article "Unraveling the complexation effect of electron transporting materials with Liq on the charge transport properties: A theoretical perspective", dated 11/20/22; PICTIVA00030235 - PICTIVA00030242	48
Exhibit 7	Transcript of Jihyung Seo dated 1/22/25	55
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Exhibit 9	IRiver Clix2 OLED Characterization Project Report, V1QWL906	59

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2	NUMBER	DESCRIPTION	PAGE
3	Exhibit 10	Research Article "Appending	59
4		triphenyltriazine to	
5		1,10-phenanthroline: a robust	
6		electron-transport material for	
7		stable organic light-emitting	
8		diodes", dated 10/14/20;	
9		PICTIVA00041202 - PICTIVA00041207	
10			
11	Exhibit 11	Research Article "Appending	59
12		triphenyltriazine to	
13		1,10-phenanthroline: a robust	
14		electron-transport material for	
15		stable organic light-emitting	
16		diodes", dated 10/14/20;	
17		PICTIVA00041202 - PICTIVA00041207	
18			
19	Exhibit 12	Schanze Rebuttal for U.S. Patent	68
20		No. 11,828,425	
21			
22	Exhibit 13	U.S. Patent Application	78
23		Publication No: US 2007/0001587	
24		AI, PICTSAMSUNGEDTX012711 -	
25		PICTSAMSUNGEDTX012749	

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2	NUMBER	DESCRIPTION	PAGE
3	Exhibit 14	Translated Japanese Patent	78
4		Application Publication, SDC EXH.	
5		1006 1 through 65	
6			
7	Exhibit 15	Research Article "Very	78
8		high-efficiency and low voltage	
9		phosphorescent organic	
10		light-emitting diodes based on a	
11		p-i-n junction", dated 5/15/04;	
12		SDC EX. 1019	
13			
14	Exhibit 16	U.S. Patent Application	94
15		Publication No: US 2003/0048074	
16		A1, "Method For Packaging Organic	
17		Electroluminescent Components	
18		With Polymer Passivation Layer	
19		And Structure Thereof", dated	
20		3/13/03	
21			
22	Exhibit 17	Thin Film Encapsulation (TFE)	94
23		Overview, SDC_00071194 -	
24		SDC_00071255	
25			

1	E X H I B I T S		
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3	Exhibit 18	Transcript of Jinho Kwack	94
4			
5	Exhibit 19	[REDACTED]	[REDACTED]
6		[REDACTED] SDC_00033820 -	
7		SDC_00033889	
8			
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20		"Passive Matrix OLED Display",	
21		dated 5/30/00	
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19		Publication No.: US 2007/0023734	
20		A1, "Phosphor, Optical Device,	
21		and Display Device," dated	
22		2/1/2007; PICTIVA00016556 -	
23		PICTIVA00016576	
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9		Publication No.: 2003/0146696 A1,	
10		"Active Matrix Organic	
11		Electroluminescent Display And	
12		Fabricating Method Thereof",	
13		dated 8/7/03;	
14		PICTSAMSUNGEDTX012330 -	
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**Exhibit 34 Skipped

* * * * *

FRIDAY, JUNE 13, 2025

9:10 A.M.

* * * * *

(Exhibit Numbers 1 and 2 were
marked.)

THE VIDEOGRAPHER: Good morning.

We are going on the record at 9:10 a.m. on
June 13th, 2025. Please note that this
deposition is being conducted virtually.
Audio and video recording will continue to
take place unless all parties agree to go off
the record.

This is Media Unit 1 of the
video-recorded deposition of Thomas Katona,
Ph.D., taken by counsel for the plaintiff in
the matter of Pictiva Displays International,
Ltd, et al., versus Samsung Electronics
Company, Ltd, et al., filed in the United
States District Court, Eastern District of
Texas, Marshall division, civil action
numbers 2:23-cv-000945-JRG and
2:24-cv-00532-JRG.

My name is Cassia Leet from
Veritext Legal Solutions and I am the

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1 videographer. I am not related to any party
2 in this action, nor am I financially
3 interested in the outcome.

4 Would counsel please state your
5 appearances and affiliations for the record
6 beginning with the noticing attorney.

7 MR. SHEASBY: Jason Sheasby for
8 plaintiff.

9 MR. STAFFORD: Patrick Stafford
10 from Quinn Emanuel for the defendants.

11 THE VIDEOGRAPHER: Will the court
12 reporter please introduce yourself and
13 administer the oath to the witness and
14 counsel may proceed.

15 THE COURT REPORTER: Monice
16 Campbell, certified court reporter, number
17 14171, in the state of California.

18
19 EXAMINATION

20 BY MR. SHEASBY:

21 Q. Good morning, sir. Can you state
22 your full name for the record?

23 A. Dr. Thomas M. Katona.

24 Q. How many hours have you worked on
25 this project for Samsung?

1 A. I don't know the exact number of
2 hours that I've worked on this project.

3 Q. Give me an estimate.

4 A. Maybe 100 to 200.

5 Q. Did you write the report yourself?

6 A. Yes, I wrote the report in
7 collaboration with counsel.

8 Q. I asked if you had written the
9 report yourself. Did you actually type it
10 out?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I didn't type every
13 single word in the report, but all the
14 opinions in the report are mine and I worked
15 on writing -- authoring the report.

16 BY MR. SHEASBY:

17 Q. What percentage of the report did
18 you actually type yourself?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I don't know the
21 exact percentage that I typed myself.

22 BY MR. SHEASBY:

23 Q. Was it more than 10 percent?

24 A. I don't know.

25 Q. Was it more than 5 percent?

1 A. I said I don't know the exact
2 percentage that I typed myself.

3 Q. Okay. Have you ever had any
4 previous engagements on behalf of Samsung?

5 A. I don't recall if I've had any
6 previous engagements on behalf of Samsung
7 Electronics.

8 Q. Any Samsung entity?

9 A. Yes, I have.

10 Q. What previous engagements have you
11 had on behalf of a Samsung entity?

12 A. I was an expert witness on an ITC
13 case for Samsung display.

14 Q. How many years ago was that?

15 A. That was last year.

16 Q. And you were -- Samsung was being
17 accused -- Samsung displays -- products were
18 being accused of infringing products; is that
19 correct?

20 A. That's not correct.

21 Q. Samsung was asserting its patents?

22 A. Samsung was asserting a trade
23 secret violation.

24 Q. Anything else other than that
25 project?

1 A. There was a case probably maybe
2 10 years ago, roughly, that I don't remember
3 if I ever officially began work or not, that
4 I remember Samsung came up, but I don't
5 recall whether I actually did any work on it
6 or not or if it got settled before I did.

7 Q. Does any of your research funding
8 come from any Samsung entity?

9 A. No, none of my funding comes from
10 any entity of Samsung.

11 Q. Okay. Have you done any
12 element-by-element analysis of any
13 third-party patent, any Samsung Electronics
14 Company patent, core patent, or any Samsung
15 display code patent to determine whether it's
16 practiced by the products at issue in this
17 case?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: Sorry, you're asking
20 if I looked at patents that are not asserted
21 and tried to do an element-by-element
22 comparison of those patents to the asserted
23 patents?

24 BY MR. SHEASBY:

25 Q. Close. There's a group of products

1 that are accused of infringement in this
2 case, correct?

3 A. Correct.

4 Q. I'm asking have you done an
5 element-by-element analysis to determine if
6 any Samsung entity or any third party has any
7 patents that are implemented by those accused
8 products?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: So I'm not sure the
11 distinction that you made between what I
12 asked, so I understand the part about the
13 products, but you're asking about patents
14 owned by the people that make the products?
15 BY MR. SHEASBY:

16 Q. Patents owned by Samsung entities
17 or by third parties.

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: I don't believe that
20 I have, although I'm not sure I completely
21 understand the question, but I don't believe
22 that I have done that.

23 BY MR. SHEASBY:

24 Q. You understand that to determine if
25 a patent is practiced or implemented, you're

1 supposed to do an element-by-element analysis
2 comparing the elements of the claims to the
3 features in the product, correct?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: Yes, I understand
6 that I need to do an element by element to
7 the features of a product, but you've asked
8 about separate patents, not the products.

9 BY MR. SHEASBY:

10 Q. Right. And now I'm asking have you
11 done an element-by-element analysis between
12 any patents other than the asserted patents
13 in this case and the Samsung accused
14 products?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: So, again, I don't
17 believe that I've done it to other patents,
18 which is the question that you keep asking
19 about products, so I'm -- yeah. I don't -- I
20 think the answer is I don't believe so, but
21 I'm not sure I fully understand your
22 question.

23 BY MR. SHEASBY:

24 Q. Have you looked at Samsung's
25 accused products and compared them to any

1 third-party patents on an element-by-element
2 analysis to determine that those third-party
3 patents or other Samsung patents are
4 implemented by the Samsung accused products?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: So I have looked at
7 products and third-party patents and
8 understand that there are claims practiced
9 within the products.

10 BY MR. SHEASBY:

11 Q. Not the question I asked.

12 Have you actually done an
13 element-by-element analysis?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I don't -- I think
16 you have a very specific legal meaning that
17 I'm not sure that I understand, but I think
18 the answer is -- so the standard you're
19 specifying, I'm not sure that I've done that.
20 I've looked at the products that are being
21 accused. I've looked at patents that are
22 owned by Samsung Electronics and other
23 entities and looked for areas where those
24 patents are being practiced, but I don't know
25 that what you described as an

1 element-by-element analysis, I've done that.

2 BY MR. SHEASBY:

3 Q. So just to be crisp and clear, for
4 any third-party patent or any Samsung patent,
5 have you done an element-by-element analysis
6 comparing the claims of those patents to the
7 features of the accused products?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I think I've answered
10 the same question multiple times. You don't
11 seem to be happy with the answer, but it's
12 the answer that I have.

13 BY MR. SHEASBY:

14 Objection. Form.

15 Is the answer yes or no?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: The answer is that I
18 have looked at third-party patents. I've
19 looked at the accused products. I've seen
20 areas where the -- there's evidence that the
21 accused products practiced the inventions of
22 the third-party patents, and I don't know for
23 the element-by-element analysis you're
24 describing, whether I've done that or not.

25 / / /

1 BY MR. SHEASBY:

2 Q. Have you done -- can you point to
3 me anywhere in your report where you've done
4 an element-by-element analysis comparing the
5 accused products to any third-party or
6 Samsung patent?

7 A. In my report, I highlight a number
8 of patents that are owned by the third party,
9 and I describe the benefits of those patents
10 and reference that the accused products use
11 at least parts or have technology that is
12 involved in those inventions that I believe
13 is practiced to gain those benefits.

14 BY MR. SHEASBY:

15 Q. Objection. Form.

16 Can you point to anywhere in your
17 report you do an element-by-element analysis
18 comparing the accused products to any
19 third-party patent or any Samsung patent?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: I can only point to
22 the sections that describe the patents that
23 are owned by the third parties, and I
24 highlight the benefits that are given by
25 those -- those patents relative to the

1 benefits that are described by the asserted
2 patents here.

3 BY MR. SHEASBY:

4 Q. Objection. Form.

5 Did you ask any Samsung display
6 employee or any Samsung entity employee
7 whether they implement any of the patents
8 you've identified in your reports?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I don't believe that
11 I asked specifically whether -- of any
12 employees whether the asserted products
13 practice any other patents that are described
14 in my reports.

15 BY MR. SHEASBY:

16 Q. Now, do you know how to do an
17 element-by-element analysis of the
18 third-party patents and the Samsung entity
19 patents you listed in your reports to
20 determine if they actually practice --
21 they're actually practiced by the accused
22 products?

23 A. So I suppose that I would have to
24 go through each of the claims and each of the
25 products and do an analysis.

1 Q. Did you do that analysis?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: As I said, I went
4 through and highlighted the benefits of the
5 products or of the patents that are described
6 relative to the technology that is involved
7 in the asserted patents and the products that
8 are being accused.

9 BY MR. SHEASBY:

10 Q. Objection. Form.

11 Did you do the analysis?

12 MR. STAFFORD: Objection. Form.

13 BY MR. SHEASBY:

14 Q. And by claim analysis?

15 MR. STAFFORD: Same objection.

16 THE WITNESS: As I have said
17 several times, I think that for what you've
18 described, I haven't done that. I described
19 a couple times what I have done.

20 BY MR. SHEASBY:

21 Q. All right. Let me ask the next
22 question, which is, is there anything that
23 prevented you from doing an
24 element-by-element analysis to determine if
25 any of the patents you identify were actually

1 implemented by Samsung products?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: I mean, I guess
4 there's nothing that physically prevented me
5 from doing that.

6 BY MR. SHEASBY:

7 Q. Okay. Let me ask you the next
8 question. The accused products include
9 OLEDs; is that correct?

10 A. Yes, the accused products include
11 OLEDs.

12 Q. What is an OLED?

13 A. An organic light-emitting diode.

14 Q. Can multiple pixels be described as
15 an OLED?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I guess it would
18 depend on the context by which they're being
19 described.

20 BY MR. SHEASBY:

21 Q. The context is the accused products
22 in this case.

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: So there are organic
25 LEDs. There are organic LED panels. There

1 is arrays of organic LEDs. So, again, it
2 depends on the specific context you're using.

3 BY MR. SHEASBY:

4 Q. Do the accused products include
5 organic light-emitting diodes?

6 A. Yes, they do.

7 Q. What's encapsulation?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I don't have the
10 exact description right in front of me right
11 now that's used for this case, but I think
12 it's described as something that seals and
13 wraps around something roughly as I'm
14 paraphrasing. But there is an agreed upon
15 construction which I would refer to for this.

16 BY MR. SHEASBY:

17 Q. You think there's an agreed upon
18 construction?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: Possibly not. I
21 don't remember. There are some terms that
22 are agreed to and some that are not.

23 BY MR. SHEASBY:

24 Q. What's the plain and ordinary
25 meaning of encapsulation in the context of

1 OLEDs?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: So, I guess, at this
4 point, is it okay for me to look at the claim
5 construction part of my report so that I
6 don't misquote myself?

7 BY MR. SHEASBY:

8 Q. Do you have that in front of you?

9 A. There is a hard copy here, but I'm
10 looking at the one in the file share.

11 Q. You should be welcome to look at
12 whatever you want. The only rule is you have
13 to tell me the section that you're looking
14 at.

15 A. So I'm opening the Exhibit 1 from
16 the file share.

17 Q. So that's your first report, if
18 memory serves.

19 A. Yes.

20 Q. And I believe the section you want
21 begins on page 65. You should obviously turn
22 to whatever section you so desire. And I
23 believe the definition of encapsulation is on
24 page 67, plain and ordinary meaning of
25 material for surrounding or sealing something

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1 else.

2 A. Sorry. It's taking a second to
3 download the file.

4 Q. It may be faster to use your -- oh,
5 you want to search. Is that why you want to
6 use the electronic version?

7 A. It's just the computer is right in
8 front of me and there is not a lot of table
9 space for these big reports.

10 So, yeah, it is the section on
11 agreed constructions. So material for
12 surrounding or sealing something -- something
13 else.

14 Q. And do you know what the phrase
15 "an" means in patent parlance?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: A-N or A-N-D?

18 BY MR. SHEASBY:

19 Q. A-N.

20 A. It sounds like there's a legal
21 definition, so I wasn't -- I didn't go to law
22 school to answer your question.

23 Q. Did you understand that the phrase
24 "an" in, for example, the element "an organic
25 light-emitting diode" means one or more

1 organic light-emitting diodes?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: If you'd like to
4 point me where that's used, I can answer the
5 question. Yeah, I don't know where you're
6 looking.

7 BY MR. SHEASBY:

8 Q. That's no problem. I can do that.
9 Do you have the patents in front of
10 you?

11 A. I don't.

12 (Exhibit Number 3 was marked.)

13 BY MR. SHEASBY:

14 Q. So I've just marked Exhibit 3 as
15 the '425 patent. Let me know when you get
16 it.

17 A. I don't see an Exhibit 3 in here.

18 Q. Just give it a second. It takes a
19 little while for it to push through.

20 And while that is happening, let me
21 ask another question. Do you know what a
22 carrier is in the field of OLEDs?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: I mean, there are
25 different types of carriers in the field of

1 OLEDS.

2 BY MR. SHEASBY:

3 Q. What are some examples of carriers?

4 A. There could be a carrier substrate.
5 There could be a charge carrier at a minimum.

6 Q. Is there such thing as a PI as an
7 example of a flexible carrier?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: There is such a thing
10 as polyamide if that's what you're asking.

11 BY MR. SHEASBY:

12 Q. I am. Is a polyamide an example of
13 a carrier?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: In what form are you
16 asking?

17 BY MR. SHEASBY:

18 Q. In the -- is a polyamide an example
19 of a carrier that's used for OLEDS?

20 A. Yeah. I think in most cases a -- I
21 don't know specifically which one you're
22 pointing to, but in most cases, polyamide is
23 a pretty flexible layer. It doesn't provide
24 much support. So I don't think of it as a
25 carrier in the same way you would think of as

1 a lunch tray can carry your lunch.

2 Q. A polyamide is flexible; is that
3 correct?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: I guess it depends on
6 how thick the polyamide would be, how
7 flexible it would be.

8 BY MR. SHEASBY:

9 [REDACTED]
[REDACTED]; is that
11 correct?

12 A. [REDACTED]
[REDACTED]

14 Q. What makes something a carrier in
15 the context of -- that has a light-emitting
16 diode on it or an OLED on it?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: As I said, I would
19 imagine the carrier would have to be the
20 supportive material.

21 BY MR. SHEASBY:

22 Q. [REDACTED]
[REDACTED]

24 A. [REDACTED]
[REDACTED]

1 Okay. I have Exhibit 3 open now.

2 Q. Let's look at Claim 1.

3 It says:

4 "An organic light-emitting diode."

5 Do you see Claim 1, Column 87?

6 A. Okay. Yes, I'm there.

7 Q. And did you understand an organic
8 light-emitting diode to mean one or more
9 organic light-emitting diodes?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: So I believe in my
12 report, what I have pointed out is that it's
13 not specified what -- for the infringement --
14 not the infringement contentions, I mean
15 infringing report, infringement reports for
16 Pictiva's experts, they don't specify what
17 they're pointing to for an organic
18 light-emitting diode.

19 BY MR. SHEASBY:

20 Q. Totally understand. Not the
21 question. Let me reclarify it.

22 When you look at Claim 1, did you
23 understand and apply -- did you apply and
24 understand in Claim 1 that the phrase "an
25 organic light-emitting diode" means one or

1 more organic light-emitting diodes? There
2 can be more than one?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: My understanding is
5 it could take multiple meanings, but the
6 burden was for the other side to demonstrate
7 what you're pointing to. So I wasn't sure
8 what it was.

9 BY MR. SHEASBY:

10 Q. Objection. Form.

11 As a person of ordinary skill in
12 the art, what does "an organic light-emitting
13 diode" mean to you?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: So I wasn't asked to
16 look through these and try to determine
17 whether -- what part of Samsung's products
18 were an organic light-emitting diode. I
19 merely responded to what Pictiva's expert was
20 either not or pointing to or not or what it
21 is. My job was to look at that and try to
22 understand whether what they were saying was
23 accurate in terms of infringement.

24 BY MR. SHEASBY:

25 Q. Objection. Form.

1 As a person of ordinary skill in
2 the art, does an organic light-emitting diode
3 mean one or more organic light-emitting
4 diodes?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: And as I said, the
7 way that it's written, it could mean multiple
8 things. It could mean more than one. It's
9 not clear that it does mean more than one,
10 and so for claiming infringement, I think you
11 have to specify what it actually means.

12 BY MR. SHEASBY:

13 Q. And did you come to an
14 understanding as to what it actually means?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I think I came to an
17 understanding of what was not specified.

18 BY MR. SHEASBY:

19 Q. Did you come to an understanding of
20 what the claim means to a person of ordinary
21 skill in the art?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: As I said, it could
24 mean one. It could mean more than one. And
25 it was never determined what it was meant in

1 the context of alleging infringement to the
2 products that were accused.

3 BY MR. SHEASBY:

4 Q. Objection. Form.

5 What is your understanding when you
6 applied this claim, what did you apply it as
7 referring to? Can it cover multiple organic
8 light-emitting diodes?

9 A. As I said, it could cover one. It
10 could cover more than one. And we need to
11 understand alleging infringement which we're
12 talking about.

13 Q. I'm not asking about infringement,
14 just for clarification. You applied analysis
15 of this claim for validity; is that correct?

16 A. I did.

17 Q. So what does this claim mean to a
18 person of ordinary skill in the art?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: So I think I've said
21 multiple times it could be one or it could be
22 more than one.

23 BY MR. SHEASBY:

24 Q. Okay. Now, same for an organic
25 layer sequence. Can that be more than one

1 organic layer sequence?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: Well, the sequence
4 needs to be a sequence of organic layers.

5 BY MR. SHEASBY:

6 Q. I understand.

7 Can there be more than one
8 sequences, though?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: In theory, there
11 could be more than one organic layer
12 sequence, but whether -- I think my opinions
13 related to the products are that in the
14 context of the patents, there is not more
15 than one organic layer sequence when we're
16 talking about the claims that reference that
17 phrase.

18 BY MR. SHEASBY:

19 Q. Objection. Form.

20 Are you saying an organic layer
21 sequence is limited to one organic layer
22 sequence in the claim?

23 A. I don't believe I said that at all.
24 I specified that, in theory, you can have
25 more than one organic layer sequence in the

1 world. What I added was that in the context
2 that I was asked to provide opinions that
3 were related to how it's used for the
4 products, I didn't see that there was more
5 than one organic layer sequence.

6 Q. That's not the question I asked.

7 Objection. Form.

8 The question I asked is: When you
9 understood the scope of the claim to apply it
10 in this case, did you understand that the "an
11 organic light emitting diode comprising," and
12 it says "an organic layer sequence, a
13 radiation exit area and an encapsulation," it
14 can have more than one organic layer
15 sequence, more than one radiation exit area,
16 and more than one encapsulation?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: So I understood it in
19 the context of organic layer sequence that
20 has to be configured to generate
21 electromagnetic radiation, which is also part
22 of the claim. And so the organic layer
23 sequence would have to include everything
24 that allows it to generate electromagnetic
25 radiation.

1 BY MR. SHEASBY:

2 Q. Objection. Form.

3 Can the organic light-emitting
4 diode comprise multiple -- more than one
5 organic layer sequences, more than one
6 radiation exit areas, and more than one
7 encapsulations?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: Again, in theories,
10 if they also are configured to generate
11 electromagnetic radiation in a spectral range
12 from infrared radiation to UV radiation
13 during operation, then the answer's yes, and
14 I don't think that that is --

15 BY MR. SHEASBY:

16 Q. Hang on. Let me ask the next
17 question.

18 A. (Inaudible.)

19 Q. Objection. Form.

20 I'm purely just asking about the
21 scope of the claim that you applied for your
22 validity analysis.

23 Did you apply a scope of the claim
24 in which the organic light-emitting diode can
25 be one or more diodes that comprise one or

1 more organic layer sequences, one or more
2 radiation exit areas, and one or more
3 encapsulations?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: Yes. Wherein the
6 organic layer sequence comprises at least one
7 radiation emitting region configured to
8 generate electromagnetic radiation to
9 spectral range from infrared to UV during
10 operation.

11 BY MR. SHEASBY:

12 Q. Let me ask the next question, which
13 is: If you go to -- is there any limits on
14 how -- let's go to Column 49, lines 4 through
15 10.

16 A. You said lines 4 through 10? Okay.

17 Q. The patent contemplates the use of
18 a flexible carrier, correct?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: So there's language
21 in this section that references flexible
22 organic light-emitting diodes.

23 BY MR. SHEASBY:

24 Q. And it also contemplates the use of
25 a film as a carrier, correct?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: I'm just going back
3 to look at the figures that are references.

4 BY MR. SHEASBY:

5 Q. I was actually referring to
6 Column 49, line 7.

7 A. I understand, and that is reference
8 to it says Figures 10 through 19
9 specifically. So yes. It says the carriers
10 130 to 131 could be a thin glass layer, a
11 laminate, or a film.

12 Q. What is n-doping?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: It's a dopant that's
15 added to organic or inorganic light-emitting
16 diodes to help with conductivity.

17 BY MR. SHEASBY:

18 Q. How does it help with conductivity?

19 A. I guess there are a couple of
20 mechanisms that it could possibly help with
21 conductivity.

22 Q. Is one of -- does n-doping achieve
23 an increase of conductivity by increasing the
24 number of electrons?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: That's one way that
2 it could do that.

3 BY MR. SHEASBY:

4 Q. What are the other ways that
5 n-doping can increase the number of
6 electrons?

7 A. Well, so increasing the carrier
8 concentration is not the only way to increase
9 conductivity in material.

10 Q. What are the other ways?

11 A. So anything that would presumably
12 aid electron transport would reduce the
13 resistance or increase the conductivity in a
14 material.

15 Q. So what are the other ways in which
16 n-doping can increase the conductivity of the
17 material other than increasing the number of
18 electrons?

19 A. So like, I guess, if you're
20 thinking about it with respect to current
21 flow, you can have more current using an
22 analogy of like cars on a road. You can have
23 a higher number of cars or you can have the
24 same number of cars that have the ability to
25 go faster.

1 So the only way to increase the
2 conductivity is not necessarily to increase
3 the number of cars on the road or carriers in
4 the material.

5 Q. The ETL layers in the accused
6 products include [REDACTED] as a material, correct?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: Yeah. I believe that
9 some of the -- at least some of the products
10 do -- [REDACTED] is in the ETL layer.

11 BY MR. SHEASBY:

12 Q. And the presence of [REDACTED] in the ETL
13 layer necessarily results in n-doping,
14 correct?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: The presence of [REDACTED]
17 doesn't necessarily lead it to be n-doped.

18 BY MR. SHEASBY:

19 Q. Increasing the number of electrons
20 in an organic or semiconductor material is an
21 act of n-doping. You agree with that,
22 correct?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: If you increase the
25 number of electrons, that would be a form of

1 n-doping, yes.

2 BY MR. SHEASBY:

3 Q. Does the plain and ordinary meaning
4 of encapsulation require that each individual
5 pixel be separately encapsulated?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: It depends on what
8 you're asking to be encapsulated.

9 BY MR. SHEASBY:

10 Q. In the context of OLEDs?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: Well, you've already
13 said that an OLED can be one or many, so if
14 it's an OLED that were being encapsulated,
15 then you would have to encapsulate that OLED.
16 If it's a whole bunch of them, you'd have to
17 encapsulate a whole bunch. So I guess it
18 depends.

19 BY MR. SHEASBY:

20 Q. How do you encapsulate a whole
21 bunch of OLEDs?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: Well, theoretically,
24 there are many ways you can do that.

25 / / /

1 BY MR. SHEASBY:

2 Q. Do you have to do each one of them
3 separately?

4 A. That's one method to do it.

5 Q. Is one way to -- one way to
6 encapsulate them in bulk?

7 A. Again, I mean, we're talking
8 outside of the specifics of anything that in
9 the patents. But, I mean, if you're just
10 asking in general are there different ways to
11 encapsulate OLEDs, then the answer is yes,
12 there are different ways to do it.

13 Q. Objection. Form.

14 Plain and ordinary meaning of
15 encapsulation in the context of OLEDs, does
16 it allow for the encapsulation of OLEDs
17 together?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: So the encapsulation
20 language we're using here is to seal or
21 surround. So if you're asking if there's a
22 way to seal or surround many OLEDs, there are
23 ways to do that.

24 BY MR. SHEASBY:

25 Q. Let me ask the next question, which

1 is: Did you speak to any Samsung engineers
2 about the operation or design or manufacture
3 of the products that are accused of
4 infringement in this case?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: So I had a call with
7 I believe it was three different Samsung
8 display employees that are all referenced in
9 my report.

10 BY MR. SHEASBY:

11 Q. Right. And that was relating to
12 something different. That was relating to a
13 prior art reference, correct?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: So there -- one of
16 the calls was related to the Clix2 and maybe
17 all three were related to the -- so, I guess,
18 the process for making it -- that device,
19 yes.

20 BY MR. SHEASBY:

21 Q. I'm asking as to the accused
22 products, did you speak to any Samsung
23 engineers about how the accused products are
24 manufactured?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: So I didn't -- I
2 don't believe I relied upon the opinions of
3 any conversations that aren't cited in my
4 report.

5 Q. Objection. Form.

6 Did you speak to any Samsung
7 engineers about how the products that are
8 accused of infringement in this case are
9 manufactured? Yes or no?

10 A. I don't believe I spoke with any
11 Samsung engineers about that.

12 Q. Did you speak to any Samsung
13 engineers about whether they agreed with your
14 analysis of non-infringing alternatives or
15 technical benefits?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I'm sorry, whether
18 they agreed with my analysis?

19 BY MR. SHEASBY:

20 Q. Of non-infringing alternatives and
21 technical benefits?

22 MR. STAFFORD: Same objection.

23 THE WITNESS: No, I don't believe I
24 spoke with any engineers regarding my
25 opinions.

1 BY MR. SHEASBY:

2 Q. Did you speak -- you cite a number
3 of Samsung license agreements; is that
4 correct?

5 A. Yes. I looked at a number of
6 Samsung license agreements.

7 Q. Did you speak to any Samsung
8 employees who negotiated those agreements or
9 implemented products to determine if they
10 felt the technology in those agreements was
11 comparable to the technology in the patents
12 in suit?

13 A. No, I didn't speak with anybody at
14 Samsung about those license agreements.

15 Q. Have you ever designed any
16 commercial OLEDs?

17 A. Commercial OLEDs?

18 Q. Commercial OLEDs.

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I haven't designed
21 any commercial OLEDs. My history is that
22 I've worked on inorganic OLEDs for many
23 years. As a grad student, I worked with
24 another grad student who we were looking at
25 joints or a hybrid organic/inorganic

1 light-emitting device.

2 I've got years of cleaner and
3 processing doing deposition techniques using
4 inorganic and organic films. I've reviewed
5 proposals for the Department of Energy
6 related to organic OLEDs, but I haven't
7 designed any commercial organic OLEDs.

8 Q. Objection. Form. Have you
9 designed any commercial organic OLEDs? Yes
10 or no?

11 A. I believe the last part of my
12 answer answered your question.

13 Q. The answer is no; is that correct?

14 A. That's right. I specified all of
15 the relevant history that I have in the
16 subject matter, including similar processes,
17 but I have not designed a commercial organic
18 LED.

19 Q. You've never designed a commercial
20 organic LED -- OLED. Have you ever consulted
21 on the design of a commercial organic LED?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I suppose I don't
24 know for sure that the project that I worked
25 on in graduate school never got

1 commercialized, but I'm not aware that it
2 did.

3 BY MR. SHEASBY:

4 Q. Are you aware of researchers in
5 your field who have designed commercial OLEDs
6 or designed, consulted on the design of
7 commercial OLEDs?

8 A. I mean, there are commercial OLEDs
9 out there, so certainly there are people who
10 have done this.

11 (Exhibit Numbers 4 through 6 were
12 marked.)

13 BY MR. SHEASBY:

14 Q. Okay. Let's go to -- I marked
15 Exhibit 5 -- Exhibit 4, 5, 6, and if you want
16 to pull those down.

17 A. Which one specifically do you want
18 me to go to?

19 Q. Pull them all down and we will work
20 through all of them.

21 A. I have downloaded all of them; I
22 just haven't opened any of them.

23 Q. Let's start with the first one.

24 A. Four?

25 Q. Yes. Have you examined Exhibit 4

1 before?

2 A. I can't verify right now if this
3 was the exact file I looked at, but I do
4 remember looking at a file from [REDACTED].

5 Q. What is [REDACTED]?

6 A. My understanding is they're a
7 material supplier.

8 Q. What material do they supply?

9 MR. STAFFORD: Objection. Form.

10 BY MR. SHEASBY:

11 Q. In the accused products.

12 MR. STAFFORD: Same objection.

13 THE WITNESS: So my understanding
14 is they're a supplier for -- of [REDACTED].

15 MR. SHEASBY: Hold on for one
16 second. I'll be right back.

17 THE WITNESS: Just to be clear,
18 actually, looking at this document, I don't
19 know they're a supplier of [REDACTED] or one of the
20 materials that are in here, I believe.

21 BY MR. SHEASBY:

22 Q. Okay. That's fine. We will look
23 into it. [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] ?

1 A. Yes. That's my understanding.

2 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 [REDACTED] [REDACTED]

4 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

5 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6 [REDACTED]

7 BY MR. SHEASBY:

8 Q. Let's go to Exhibit 7. Sorry, not
9 Exhibit 7, Exhibit 6. Is that --

10 MR. STAFFORD: Given we're
11 discussing confidential information, I want
12 to mark the deposition transcript
13 confidential, attorneys' eyes only.

14 MR. SHEASBY: Sure.

15 THE WITNESS: I'm looking at the
16 document, Exhibit 6.

17 BY MR. SHEASBY:

18 Q. Yes. This is an article by Kang,
19 et al. It's Samsung Display Co employees.

20 Do you see that?

21 A. Yes, I see that.

22 Q. And did you interview Mr. Kang?

23 A. I'm sorry, I don't remember the
24 three people that I talked with, their names.
25 I could go back to my report if you'd like.

1 Q. Did you discuss this article with
2 him? Maybe that's an easier way of doing it.

3 A. So presumably if Mr. Kang was one
4 of the three that I talked with, I did not
5 speak with him specifically about this
6 article.

7 (Reporter clarification.)

8 BY MR. SHEASBY:

9 Q. Does n-doping result in the
10 injection of electron carriers from a
11 cathode?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: No. Presumably, a
14 bias would.

15 BY MR. SHEASBY:

16 Q. Let me ask it differently. Does
17 the effect of -- is the injection of [REDACTED] does
18 it result in the injection of electron
19 carriers from the cathode in the interruption
20 of the transport of large amounts of electron
21 carriers to the emissive layers?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: So [REDACTED] can be used as
24 a -- as an n-dopant or not as an n-dopant as
25 the -- the patent references itself that it

1 can be a host or matrix material.

2 BY MR. SHEASBY:

3 Q. Sure. I understand that.

4 So you understand that the -- is
5 increasing the amount of electrons entering
6 the ETL layer an example of n-doping?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: Yeah. I believe
9 we've covered this. If you are to increase
10 the number of electrons, that that is an
11 increase in carrier concentration or doping.

12 BY MR. SHEASBY:

13 Q. So that's an example of n-doping?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I believe that's an
16 example of n-doping.

17 BY MR. SHEASBY:

18 Q. Okay. Now let's go back to
19 Exhibit 4. Let's go to page 44387. And for
20 assistance, I'll just pull it up so we can
21 talk about and we can share the screen.

22 MR. SHEASBY: And, Madam
23 Videographer, if you can make sure the screen
24 as well as the witness are both captured at
25 this time, I would appreciate it.

1 BY MR. SHEASBY:

2 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

4 Do you see that?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED]

9 BY MR. SHEASBY:

10 Q. Yes.

11 A. I don't believe this is Samsung's
12 device.

13 Q. What is this document, then?

14 A. This is a document from a vendor.

15 Q. And what is that vendor providing
16 to Samsung?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: Well, presumably, the
19 vendor could be providing their materials.

20 BY MR. SHEASBY:

21 Q. The question I'm asking is: [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

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BY MR. SHEASBY:

Q. Did you ask Samsung if they use ██████
to dope the ETL as described in this
document?

MR. STAFFORD: Objection. Form.

THE WITNESS: I didn't question
anybody from Samsung specifically regarding
this document, no.

BY MR. SHEASBY:

Q. Do you know of any Samsung ETLs
that do not include ██████ in them for the
accused products?

MR. STAFFORD: Objection. Form.

THE WITNESS: So I reviewed a lot
of documents for this case, so I can't
definitively say that I'm not aware of any,
but I know that at least -- at least some of
them if not most that I looked at do include
██████ as part of the mETL.

BY MR. SHEASBY:

Q. Have you seen any Samsung document
evidencing that ██████ used in the ETL of the
accused products does not result in n-doping?

MR. STAFFORD: Objection. Form.

1 THE WITNESS: I didn't see any
2 evidence either way that it does or does not.
3 So as I said, this document shows [REDACTED] doped
4 ETL and the patent specifically specifies
5 that Liq can be a matrix or host material.
6 So Liq can both be a n-dopant or not, and I
7 didn't see any documents verifying one way or
8 another whether it was or wasn't.

9 BY MR. SHEASBY:

10 Q. Did you read the deposition of
11 Miss Seo?

12 A. If it was in my materials, then
13 yes, I did.

14 Q. What did she say about the subject?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I don't remember off
17 the top of my head.

18 BY MR. SHEASBY:

19 Q. Let's go to Exhibit 7.

20 THE VIDEOGRAPHER: This is the
21 videographer. I'll continue to record the
22 exhibit as well.

23 MR. SHEASBY: Yes, ma'am.

24 THE VIDEOGRAPHER: Thank you.

25 (Exhibit Number 7 was marked.)

1 BY MR. SHEASBY:

2 Q. Let's go to 147, 9 through 11.

3 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

7 Do you see that? 147, lines
8 9 through 11.

9 A. I see that statement.

10 Q. Did you see any data that
11 contradicts Miss Seo's testimony?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I didn't see any
14 evidence either supporting or refuting the
15 testimony, so I think -- if I look at this,
16 she says she believes so. I don't know how
17 she would know that it actually does versus a
18 change of conductivity, which I referenced
19 earlier, and I didn't see anyone showing
20 proof that the [REDACTED] actually does add
21 electrons as are stated here.

22 BY MR. SHEASBY:

23 Q. Who knows more about the Samsung
24 process, you or Miss Seo?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I believe that she
2 does.

3 BY MR. SHEASBY:

4 Q. Let me ask you the next question.
5 So she knows more about it, and she says:

6 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

10 Do you see that?

11 A. I do. She said she believes so.
12 She didn't say yes.

13 Q. Was she lying?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I didn't say she was
16 lying. She just didn't say yes.

17 BY MR. SHEASBY:

18 Q. She said "I believe so"?

19 A. She said "I believe so."

20 Q. And she knows more about the
21 Samsung process than you, correct?

22 A. She does.

23 Q. And did she correct her deposition
24 transcript after having discussions with you?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I don't know if she
2 corrected her deposition transcript.

3 BY MR. SHEASBY:

4 Q. Were you even aware of this
5 testimony under oath when you wrote your
6 report saying that the [REDACTED]
7 does result in n-doping in Samsung's current
8 products?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: As I said earlier, if
11 it was in my materials considered, then yes.
12 At that time, I received a lot of documents
13 for review, so I don't remember this specific
14 data that I would have looked at this. If it
15 was not in my materials considered, then I
16 didn't rely on it.

17 BY MR. SHEASBY:

18 Q. You reviewed every page of every
19 materials considered you received?

20 A. I went through a lot of documents.

21 Q. You reviewed every page of every
22 materials -- every page of the materials
23 considered you received?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: I stand by I went

1 through a ton of documents for this case.

2 BY MR. SHEASBY:

3 Q. Do you read Miss Seo's testimony,
4 this specific testimony?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: I don't remember
7 specifically reading this, but like I said, I
8 don't remember a lot of things that I read,
9 specifically.

10 MR. SHEASBY: Okay. Why don't we
11 take a break.

12 (Recess.)

13 THE VIDEOGRAPHER: Going off the
14 record. The time is 10:17 a.m.

15 (Recess.)

16 (Exhibit Numbers 8 through 11 were
17 marked.)

18 THE VIDEOGRAPHER: Back on the
19 record. The time is 10:36 a.m.

20 BY MR. SHEASBY:

21 Q. Let's go to Exhibit 8.

22 First of all, do you recognize
23 Exhibit 8?

24 A. I mean, I don't remember it off the
25 top of my head, but like I said, I looked at

1 a lot of documents.

2 Q. If you turn to page 2 of this
3 document.

4 A. Okay.

5 Q. It refers to -- in the EIL, it
6 refers to [REDACTED].

7 Do you see that?

8 A. Yes, I see that.

9 Q. In the ETL, it refers to a mixture
10 of [REDACTED] [REDACTED] [REDACTED].

11 Do you see that?

12 A. Yes, I see that.

13 Q. Do you cite any data indicating
14 that in this design the [REDACTED] is acting as an
15 n-dopant?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I can go through my
18 report and see if I happen to cite it. I
19 don't recall off the top of my head.

20 BY MR. SHEASBY:

21 Q. Sitting here today, do you have any
22 data indicating that the [REDACTED] is acting as an
23 n-dopant in this design?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: Sitting here today,

1 looking at only this document, I don't have
2 any information to indicate that it's acting
3 as an n-dopant or not.

4 BY MR. SHEASBY:

5 Q. And did you run any experiments to
6 determine whether [REDACTED] was acting as an
7 n-dopant in this design?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I didn't run any
10 experiments on any products that contained
11 this structure.

12 BY MR. SHEASBY:

13 Q. Did you do any simulations or speak
14 to any engineers to establish that [REDACTED] in
15 this design was acting as an n-dopant?

16 A. No. I believe that in my report
17 this references this document in reference to
18 the Clix2 device, so I didn't do any tear
19 down on the Clix2 device. But there was work
20 that was -- there was work done by an outside
21 group, Evans Analytical Group.

22 Q. Objection. Form.

23 Did you do any analysis to
24 determine whether the [REDACTED] is acting as an
25 n-dopant in this design?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: I didn't do -- I
3 didn't do any analysis to determine whether
4 it was -- on the layer to determine whether
5 it was an n-dopant. I just looked at the
6 fact that [REDACTED] can -- as I've said before, can
7 be an n-dopant. And in this design, it
8 appears to have been used in that way in
9 Clix2.

10 BY MR. SHEASBY:

11 Q. Objection. Form.

12 Did you do any analysis to
13 determine whether the [REDACTED] in this design was
14 actually resulting in an n-dopant effect?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I believe, as you can
17 see in my report, I referenced that there was
18 work done on the Clix2, which is what's
19 referenced with respect to this document, and
20 state that [REDACTED] can be used as an n-dopant and
21 then also cite several references that show
22 it can be. And as we've discussed, [REDACTED] can
23 or cannot be an n-dopant.

24 BY MR. SHEASBY:

25 Q. Objection. Form.

1 Did you perform any simulations or
2 testing to determine whether in this process
3 the [REDACTED] was acting as an n-dopant?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: Again, I didn't
6 personally perform any testing on this.
7 There was testing that was performed by an
8 outside group at Evans Analytical Group.

9 BY MR. SHEASBY:

10 Q. Objection. Form.

11 So did you perform any simulations
12 to determine if the [REDACTED] in this design was
13 acting as an n-dopant?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I didn't do any
16 simulation work.

17 BY MR. SHEASBY:

18 Q. Did you ask this outside group who
19 tore down the Clix2 to do any testing to
20 determine if the [REDACTED] was acting as an
21 n-dopant?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I did not instruct
24 the Evans engineers to make a determination
25 on whether it was an n-dopant.

1 BY MR. SHEASBY:

2 Q. Can you cite to me any analytical
3 evidence that the [REDACTED] in this design was
4 acting as an n-dopant?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: I think what I've
7 cited is several references showing that [REDACTED]
8 can be an n-dopant, and that it is contained
9 in here, and so that's what I've cited in the
10 report.

11 BY MR. SHEASBY:

12 Q. Objection. Form.

13 Did you cite any analytical studies
14 of the actual Clix2 display to see if it's
15 performing the function -- the [REDACTED] is
16 performing the function of an n-dopant?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: No, I didn't cite any
19 analytical studies on the Clix2. I merely
20 cited, as is shown in my report, that the
21 Clix2 does contain this layer that we
22 specified and that layer can act as an
23 n-dopant.

24 BY MR. SHEASBY:

25 Q. Objection. Form.

1 Did you cite any analytical studies
2 specifically on the Clix2 display to
3 determine if the [REDACTED] was acting as an
4 n-dopant? Yes or no?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: Other than the study
7 that was done by Evans Analytical Group, I
8 didn't cite any studies on them.

9 BY MR. SHEASBY:

10 Q. Does the Evans Analytical Group
11 study conclude that the [REDACTED] was acting as an
12 n-dopant?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: The EAG study shows
15 the presence of [REDACTED] in the ETL mixed layer.

16 BY MR. SHEASBY:

17 Q. Does it show that the [REDACTED] is acting
18 as an n-dopant?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: It shows that it's in
21 the ETL layer and the additional sources show
22 it can be an n-dopant.

23 BY MR. SHEASBY:

24 Q. Does it show that it's acting as an
25 n-dopant? Yes or no?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: I believe I've
3 answered the question.

4 BY MR. SHEASBY:

5 Q. Objection. Form.

6 Can you cite any study anywhere in
7 the world that shows that in the Clix2 device
8 the [REDACTED] was performing the function of an
9 n-dopant?

10 MR. STAFFORD: Objection. Form.

11 BY MR. SHEASBY:

12 Q. Specifically?

13 A. I believe I've cited studies that
14 show it can be an n-dopant and it's contained
15 in the ETL layer in the Clix2.

16 Q. Objection. Form.

17 I'm asking whether you can identify
18 any study anywhere in the world as to whether
19 in the Clix2 the [REDACTED] is performing the
20 function of an n-dopant, in an actual
21 analytic or simulation study specific to the
22 device that you're relying on?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: I'm just citing that
25 it is contained in the mixed ETL layer and

1 it's commonly used as an n-dopant as cited in
2 other studies.

3 BY MR. SHEASBY:

4 Q. Objection. Form.

5 Did you ask Samsung if they have
6 any studies showing that the [REDACTED] in the Clix2
7 display was acting as an n-dopant?

8 A. I'm looking back at my report. I
9 don't remember all the specific questions
10 that I asked of the Samsung engineers. So I
11 don't -- I don't see a place where that
12 specific question was asked of the Samsung
13 engineers.

14 Q. Do you know if Samsung actually
15 produced all its analytical studies of the
16 displays that you are relying on for your
17 Clix2 invalidity theory?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: You mean am I
20 asked -- are you asking me whether I'm aware
21 of everything that Samsung has on Clix2,
22 whether it was produced as evidence in the
23 case?

24 BY MR. SHEASBY:

25 Q. Yeah. In other words, it's

1 specifically on analytical studies relating
2 to [REDACTED]. Do you know if it was actually even
3 produced?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: I'm not sure whether
6 they have documents that were produced --
7 they have internally that were not produced.
8 I can't answer that question.

9 BY MR. SHEASBY:

10 Q. Okay. Let's go to Exhibit 12.

11 A. Okay.

12 (Exhibit Number 12 was marked.)

13 BY MR. SHEASBY:

14 Q. This is Dr. Schanze's report?

15 A. It's one of the exhibits from his
16 report, yes.

17 Q. And if you would turn to page 27 of
18 this report.

19 A. Page number or PDF page number?

20 Q. Page number. So it's around
21 paragraph 65.

22 A. I'm on page 27.

23 Q. For the good of the record, I'll go
24 ahead and pull it up. Okay. Digging into
25 the contents too, so first off, if you turn

1 to page 27, did you investigate whether the
2 Clix2 that was sold in the United States used
3 a different type of display than the Clix2
4 sold outside of the United States?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: Sorry, the question
7 is whether I investigated whether the Clix2
8 sold in the US had a different display than
9 the Clix2 sold outside the US?

10 BY MR. SHEASBY:

11 Q. Yes.

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I'm not sure what you
14 mean by did I investigate it.

15 BY MR. SHEASBY:

16 Q. Well, did you look for records to
17 determine whether it was the same display
18 inside the US and outside the US?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: So I'm going back to
21 my report. My recollection of the
22 conversation was that they were the only
23 supplier, but I'm double-checking to see what
24 was said in my report.

25 / / /

1 BY MR. SHEASBY:

2 Q. Let me make this easier. If you
3 go -- you can look at whatever you want. But
4 if you go to page 27 of Dr. Schanze's report,
5 he cites evidence from Dreamus that the
6 display used in the [REDACTED] is actually an
7 LCD.

8 Do you see that?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: Which paragraph is
11 that?

12 BY MR. SHEASBY:

13 Q. It's paragraph 66. 65 to 66.

14 A. Okay. I see the paragraph you're
15 looking at.

16 Q. Did you investigate whether the --
17 well, I want to go back to -- the easiest way
18 to do this is Exhibit 8, which you cite in
19 your report, [REDACTED]. It has a date of
20 8/5/2014.

21 A. Yes.

22 Q. Do you see that?

23 A. Yes.

24 Q. Do you have any documentary
25 evidence that this reflects the design of the

1 displays that are used in the Clix2 sold in
2 the United States?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: I just know that the
5 documents supports that this design was used
6 in a Clix2.

7 BY MR. SHEASBY:

8 Q. That's what I'm asking. What is
9 the evidence that Exhibit 8 was used in a
10 Clix2 display that was sold in the United
11 States?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I don't recall if I
14 have any evidence specifically citing that
15 this device with this configuration was sold
16 in the United States.

17 BY MR. SHEASBY:

18 Q. Now, I want to go to the claim --
19 Claim 1. And it says -- it has a recitation
20 that says:

21 "At least one radiation-emitting
22 region configured to generate
23 electromagnetic radiation in a spectral
24 range from infrared radiation to UV
25 radiation during operation."

1 Do you see that?

2 A. Claim 1 of which patent now are you
3 looking at?

4 Q. '425.

5 A. Or which exhibit, I guess.

6 Q. It's Claim 1 of the '425 patent.

7 A. So Exhibit 3?

8 Q. Does the Clix2 display that you
9 focused on satisfy that limitation?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: So I believe, as it
12 says in my report, it only -- it only meets
13 that limitation per Pictiva's understanding
14 of that claim construction.

15 BY MR. SHEASBY:

16 Q. Is a buffer the same as an
17 encapsulation layer? It is, correct?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: Not necessarily. I
20 guess -- I mean, I wouldn't necessarily take
21 someone who says a buffer and say that it's
22 always an encapsulation.

23 BY MR. SHEASBY:

24 Q. A buffer is necessarily an
25 encapsulation layer, correct?

1 MR. STAFFORD: Objection.

2 THE WITNESS: No, it's not. You
3 can use buffering in a lot of different
4 contexts. That word is not uniformly
5 encapsulation.

6 BY MR. SHEASBY:

7 Q. Sir, a buffer layer is an
8 encapsulation layer in an OLED, correct?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: You can use buffer in
11 a lot of different contexts. So if you want
12 to point me specifically to where you're
13 looking, I can answer the question, but
14 buffer layers can be many things.

15 BY MR. SHEASBY:

16 Q. Do you know what -- you relied on a
17 reference called Diekmann -- Diekmann; is
18 that correct?

19 A. Yes, I do.

20 Q. Do you know if -- and you for a
21 number of claims -- do you know if the
22 Diekmann reference was ever developed into an
23 actual commercial product?

24 A. Whether the patent was ever
25 developed into a commercial product?

1 Q. Yes.

2 A. There are a lot of products in the
3 world. I don't know specifically if there
4 are one -- that was developed in that
5 reference.

6 Q. There's a difference between an
7 electron injection layer and an electron
8 transport layer, correct?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: There can be, yeah.

11 BY MR. SHEASBY:

12 Q. And just because something is an
13 electronic injection layer doesn't
14 necessarily mean it's an electron
15 transporting layer, correct?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: It doesn't mean it
18 necessarily is or is not?

19 BY MR. SHEASBY:

20 Q. Is.

21 A. I think it doesn't necessarily mean
22 that it is. It doesn't preclude it's not.

23 Q. Did you do any studies of
24 simulation in -- for the Diekmann reference?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I didn't take apart
2 any products related to the Diekmann
3 reference, if that's what you're asking.

4 BY MR. SHEASBY:

5 Q. No, I'm asking if you did any
6 simulations or analysis.

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: I didn't do any
9 simulations. I guess I looked through the
10 patent, and so that would be a form of
11 analyzing it.

12 BY MR. SHEASBY:

13 Q. For a number of the dependent
14 claims, you combine references together; is
15 that correct?

16 A. You mean in the invalidity report?

17 Q. Yes, sir.

18 A. Yes. There are a number of
19 references that have combinations.

20 Q. In the real world, have you ever
21 observed those references having been
22 combined together?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: In an end product?

25 / / /

1 BY MR. SHEASBY:

2 Q. Yes. To produce a design.

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: So I haven't taken
5 any end products and taken them apart to see
6 what combination -- there are millions of
7 products in the world, so I don't know how
8 anyone would be able to answer that question.

9 BY MR. SHEASBY:

10 Q. Let me ask you this: Have you ever
11 investigated whether anyone would combine the
12 references in the way you say they could have
13 been combined? Had anyone ever done that in
14 the real world?

15 A. Again, I would -- to answer that
16 question, I would have to know what everybody
17 in the world has ever done. I don't know how
18 I could do that.

19 Q. Has anyone in the world ever
20 combined those references?

21 A. I don't know everyone in the world.

22 MR. STAFFORD: Objection. Form.

23 BY MR. SHEASBY:

24 Q. You don't know anyone in the world?

25 A. I said I don't know everyone in the

1 world.

2 Q. Did you speak to any Samsung
3 engineers or any engineers with commercial
4 experience whether -- to ask them whether
5 they would combine the references as you
6 proposed for them to be combined?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: I think that the
9 references are all relevant references in the
10 field of OLEDs, so they're relevant to one
11 another and a POSITA who is working on OLEDs
12 would understand how to combine references in
13 their field.

14 BY MR. SHEASBY:

15 Q. Objection. Form.

16 Have you spoken to any Samsung
17 engineer or any engineer who's actually
18 commercially designed OLEDs to ask them if
19 they agree with your analysis that these
20 references would have been combined with a
21 reasonable expectation of success?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I didn't speak with
24 anyone from Samsung to verify my opinions,
25 which I think we covered earlier in the

1 deposition.

2 BY MR. SHEASBY:

3 Q. All right. I marked a new exhibit.
4 It's Exhibit 13. It's Hatwar. Let me know
5 when you get it.

6 (Exhibit Number 13 was marked.)

7 THE WITNESS: Okay. I have it.

8 BY MR. SHEASBY:

9 Q. Why don't you go ahead and download
10 13, 14, and 15 while you're at it.

11 (Exhibit Numbers 14 and 15 were
12 marked.)

13 BY MR. SHEASBY:

14 Q. All right. Exhibit 13 is Hatwar.
15 Was a commercial product ever created using
16 Hatwar?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: I don't know if a
19 commercial product was ever created using
20 Hatwar. I see that -- at least it lists
21 Eastman Kodak Company. I don't know if
22 Eastman ever created a product or eventually
23 sold these patents off to somebody who did.

24 BY MR. SHEASBY:

25 Q. Okay. Let's go to Hatwar and why

1 don't we go ahead and look at Figure 1.

2 A. Okay.

3 Q. What's the organic layer sequence
4 in Hatwar?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: So I think in my
7 report when asked about the organic layer
8 sequence, I refer to Figure 3, not Figure 1.

9 BY MR. SHEASBY:

10 Q. That's fine. I'm asking you what's
11 the organic layer sequence in Figure 1.

12 A. I didn't provide an opinion on
13 that.

14 Q. What is the organic layer sequence
15 in Hatwar?

16 A. Also, if we look at Figure 3, which
17 I do refer to in my report, it shows the
18 sequence between 150 to 170, which is also in
19 Figure 1. So I guess I would say that would
20 be the organic layer sequence.

21 Q. All of 150 to 170; is that correct?

22 A. So it would be all of the layers
23 that emit light and those that are required
24 to generate the light emission during
25 operation.

1 Q. So --

2 A. The figure you're showing, Figure 1
3 is an abbreviated version of the more
4 stretched out one which is shown in Figure 3.

5 Q. And I guess my question is: The
6 following -- the n-doped -- if you look at
7 Claim 1, "the organic layer sequence
8 comprises an electronic transport layer that
9 is n-doped."

10 Do you see that?

11 What's the electronic transport
12 transfer layer in Hatwar?

13 A. I'm sorry, where in Claim 1 are you
14 reading that the electronic transport layer
15 is n-doped?

16 Q. I'm just asking you: What is the
17 organic layer sequence in Hatwar?

18 A. I understand, but you referred to a
19 claim and looking at the claim, I don't see
20 the language.

21 Q. I'm asking what's the electronic
22 transport layer in Hatwar?

23 A. So you're no longer referring to
24 the claim?

25 Q. I am not.

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: So in looking,
3 there's at least 20 references to electron
4 transport layers in Hatwar, but I don't see
5 any -- at least right now -- any that refer
6 back to this figure.

7 BY MR. SHEASBY:

8 Q. What is the electron transport
9 layer in Hatwar?

10 A. Are you asking what the electronic
11 transport in Hatwar is or what the electronic
12 transport layer in this figure is?

13 Q. In Hatwar. Whatever part of Hatwar
14 you rely on.

15 A. Well, I mean, as an example,
16 paragraph 34 references that it has an
17 electronic transport layer.

18 Q. Right. I'm saying what is it?
19 What are you pointing to? So let me give you
20 an example. If you go to the report --
21 you're looking at your report, right?

22 A. The Exhibit 1 report?

23 Q. Yes. Your report. Yes. Your
24 invalidity report.

25 A. I was just clarifying which of the

1 two reports you were referencing. So yes,
2 Exhibit 1, my invalidity report.

3 Q. Yeah. If you go to paragraph 64.

4 A. Okay.

5 Q. Where is the emission layer?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: So I think the patent
8 refers to the 120N, which are any number of
9 devices as the -- they call them EL units or
10 electro -- the emission units.

11 BY MR. SHEASBY:

12 Q. Okay. Is there any analytical data
13 indicating that that layer contains an
14 iridium-containing compound?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I think iridium is
17 just referenced as one of the possible
18 options. I don't know that it says that the
19 layer does contain it.

20 BY MR. SHEASBY:

21 Q. Where does it reference the EL --
22 an emission layer, which is the broad-band EL
23 unit, as optionally containing an
24 iridium-containing compound?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: So in paragraph 94,
2 it gives examples of phosphorescent materials
3 that are used in the light-emitting layers
4 and it does list iridium as one of those.

5 BY MR. SHEASBY:

6 Q. And is it necessarily the case that
7 that iridium-containing material will act as
8 an n-dopant?

9 A. It just says they're useful
10 phosphorescent dopants.

11 Q. Where does it teach that that
12 iridium-containing material will operate as
13 an n-dopant within the emission layer, the
14 120N layer that you point to?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I don't know -- I
17 don't see a specific example right now that
18 calls it out as an n type dopant. It just
19 refers to it as a dopant, which could be N
20 type.

21 BY MR. SHEASBY:

22 Q. Or not N type?

23 A. Presumably, it could be either.
24 One skilled in the art could know that you
25 would -- could dopant nop (audio error).

1 Q. Well, it says:

2 "Examples of useful phosphorescent
3 materials that are used in
4 light-emitting layers in the present
5 invention include but are not limited
6 to" -- a very long list. "Useful
7 phosphorescent dopants include but are
8 not limited to transition metal
9 complexes such as iridium and platinum
10 complexes."

11 You see that, sir?

12 A. Is this back in 94?

13 Q. Yes.

14 A. Yes, I see that.

15 Q. And my question is: Where is it
16 necessarily the case that that is creating an
17 n-doped emission layer for the layer 120 --
18 the broad-band BL unit?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: It doesn't explicitly
21 state there that it's a n-dopant or a
22 p-dopant. It says it's a dopant. And one of
23 skill in the art would know that it could be
24 an n-dopant.

25 / / /

1 BY MR. SHEASBY:

2 Q. Or it could be a p-dopant, correct?

3 A. Potentially.

4 Q. And it also discusses the use of
5 Liq; is that correct?

6 A. I believe this reference does talk
7 about Liq.

8 Q. In paragraph 151, correct?

9 A. I'm not seeing it in paragraph 151.

10 Q. 149, check that, and 150. We can
11 go to your report. Maybe that's another way
12 of doing it.

13 A. Just to be clear, so I didn't see
14 it in 149 or 151, but I do see it in 150.

15 Q. So you referred to paragraph 150
16 and 151 to supply elements 1E and 1F of the
17 claims, correct? If you look at 1165 and
18 1166.

19 A. Yes, I did.

20 Q. But you don't identify those as
21 referring to a discussion of the N broad-band
22 EL unit, correct?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: So the EL unit, I
25 don't reference it regarding the emission

1 layer.

2 BY MR. SHEASBY:

3 Q. Okay. Let's go to Park, which is
4 Exhibit -- let's go to page 548 of your
5 report.

6 A. Okay.

7 Q. Let me know when you're there.

8 A. I'm there.

9 Q. Simply because Liq is used in an
10 electron transport layer doesn't mean it will
11 be used as an n-dopant; is that correct?

12 A. I think we covered that Liq can be
13 used as an n-dopant or not as an n-dopant.

14 Q. Its mere presence in the ETL
15 doesn't mean it's being used as an n-dopant.
16 For example, it could be used as a host
17 material, correct?

18 A. Yeah. I believe the '425 specifies
19 it can be used as a host material.

20 Q. And so the question is did you do
21 any simulations to see if in the Park design,
22 the Liq in what you identify as the ETL layer
23 will act as an n-dopant?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: No, I didn't -- as it

1 says in paragraph 1384, I merely stated that:

2

3

█

█

█

█

8 BY MR. SHEASBY:

9 Q. Objection. Form.

10

11

12

Did you do any simulation to
determine if the Liq in the Park design would
operate as an n-dopant?

13

MR. STAFFORD: Objection. Form.

14

15

THE WITNESS: I didn't do any
simulations. As I state in the report:

16

█

█

█

█

21 BY MR. SHEASBY:

22 Q. Objection. Form.

23

24

25

Did you do any simulations to
determine if Liq in the Hatwar reference or
the Park reference would operate as an

1 n-dopant in the emission layer?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: No. I referred to
4 multiple references that show that Liq does
5 act as an n-dopant at times, [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

9 BY MR. SHEASBY:

10 Q. Objection. Form.

11 Let's go to -- let's go to Miller,
12 which I believe you discuss beginning on
13 page 567.

14 A. Okay.

15 Q. Did you do any simulations to
16 determine if in the design in Miller any Liq
17 would act as an n-dopant in the emission
18 layer?

19 A. I'm sorry, I'm just confirming that
20 you haven't introduced Miller, correct?

21 Q. I have not. It's just your report.

22 A. Okay. I think similar to Park, in
23 1443, paragraph 1443, I state that:

24 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

1

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3

4

Q. So the answer to my question is you have not done any simulations?

6

A. I pointed to other references that show Liq is commonly an n-dopant. We've talked about the fact it can be an n-dopant or it cannot, and Miller discloses Liq in the device.

10

11

Q. Objection. Form.

12

Is there anything that prevented you from performing simulations on Miller, Suzuki, Hatwar, or Diekmann to determine whether Liq in that design would have any n-dopant functionality?

13

14

15

16

17

MR. STAFFORD: Objection. Form.

18

THE WITNESS: I think for the purposes of the report here, I provided the analysis I did based on prior art references that I was able to find, and that is a form of analysis.

19

20

21

22

23

BY MR. SHEASBY:

24

Q. Objection. Form.

25

Is there anything that prevented

1 you from performing a simulation of the
2 designs for Miller, Kondakova, Park, Clix2,
3 or Hatwar to determine if the Liq referenced
4 in those designs would perform an n-dopant
5 functionality?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: So I think it's
8 possible I would have needed more information
9 to do that, given that we've established Liq
10 can sometimes be an n-dopant and sometimes
11 not, and I don't know that the patents get
12 into enough detail that would have allowed a
13 simulation.

14 BY MR. SHEASBY:

15 Q. Did you ask any actual engineers
16 who design OLEDs whether the designs in these
17 references would result in the [REDACTED] performing
18 an n-dopant functionality?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I think the prior art
21 references reference a lot of engineers that
22 develop OLEDs that show Liq as an n-dopant at
23 times and not as an n-dopant at other times.

24 BY MR. SHEASBY:

25 Q. Objection. Form.

1 Did you speak to any engineers to
2 ask any engineers who actually design
3 commercial OLEDs to see whether in these
4 designs [REDACTED] would have an n-dopant
5 functionality?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I didn't ask any
8 engineers to look at these patents to answer
9 whether Liq would act as an n-dopant nor do I
10 know that they could have conclusively
11 answered that question given that Liq can be
12 an n-dopant and can act not as an n-dopant.
13 BY MR. SHEASBY:

14 Q. Did you actually take the steps to
15 investigate whether you could have simulated
16 the designs in these references?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: I don't know what you
19 mean take the steps to determine.

20 BY MR. SHEASBY:

21 Q. Well, did you analyze them to
22 determine whether they had enough information
23 for you to conclude that the Liq would act as
24 an n-dopant?

25 A. I think what I've concluded is that

1 they disclosed Liq's presence and that Liq
2 can be an n-dopant, but I did not
3 definitively say it is an n-dopant. It might
4 not be an n-dopant, but its presence, given
5 that it is commonly an n-dopant, would
6 indicate it might be.

7 Q. You said it's commonly an n-dopant.
8 Do you know if at the time of the patent
9 there was concerns about whether Liq should
10 be used as an n-dopant?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I don't know at the
13 time of reference what everybody in the field
14 might have thought.

15 BY MR. SHEASBY:

16 Q. Were you designing these types of
17 OLEDs at the time of the patent?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: I don't have the date
20 of this patent in front of me right now.

21 BY MR. SHEASBY:

22 Q. Well, the date of the patent is the
23 2008 time period. In the 2008 time period,
24 were you designing OLEDs in which there was a
25 consideration of whether to use Liq as an

1 n-dopant material?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: So in the 2008
4 time frame, I believe around that time frame,
5 I would have been doing work for the DOE
6 related to some OLED proposals. I don't
7 remember the specific details to know if any
8 of them discussed Liq as a dopant.

9 BY MR. SHEASBY:

10 Q. Do you know what the state of the
11 art was in terms of whether Liq was
12 considered a desirable or undesirable
13 n-dopant in 2008? Did you do that research?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I did not look to see
16 what every -- I mean, people take different
17 technology development trajectories, so I
18 didn't go through to see what everybody may
19 have been doing and/or reporting. A lot of
20 this work was done by companies in industries
21 that don't always publish everything. Don't
22 publish a lot of what they're doing, quite
23 honestly.

24 BY MR. SHEASBY:

25 Q. Did you do anything to investigate

1 the industry's views of Liq as an n-dopant at
2 the time of the patent?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: Well, as I said, the
5 industry's views would have been, in many
6 cases, challenging to know because, to the
7 extent that they would have thought this was
8 advantageous, they tend to not disclose those
9 details.

10 BY MR. SHEASBY:

11 Q. Did you speak to any Samsung
12 engineers about what their views were of Liq
13 as an n-dopant at the time of the patent?

14 A. I did not speak to any Samsung
15 engineers about their views of Liq in 2008.

16 MR. SHEASBY: Why don't we break
17 for lunch.

18 THE VIDEOGRAPHER: This marks the
19 end of Media Unit 1 of the deposition of
20 Thomas Katona, Ph.D. The time is 11:47 a.m.
21 We are off the record.

22 (Recess.)

23 (Exhibit Number 16 was marked.)

24 (Exhibit Numbers 16 through 21 were
25 marked.)

1 THE VIDEOGRAPHER: We are back on
2 the record at 12:50 p.m. This marks the
3 beginning of Media Unit 2 of the deposition
4 of Thomas Katona, PhD.

5 Please continue.

6 BY MR. SHEASBY:

7 Q. Sir, can you turn to your validity
8 report, which I believe is Exhibit 1?

9 A. Okay.

10 Q. And you can turn to paragraph 104?
11 Actually, 103 and 104. Let me know when
12 you're there. 1003 and 1004.

13 A. 1003 or 103?

14 Q. 1003. 1,003 and 1,004.

15 A. I'm there.

16 Q. What is the barrier layer that
17 you're identifying in N(i)?

18 A. It appears to be the green
19 highlighted area on the Figure 3(d) at the
20 bottom of page 419.

21 Q. And that green highlighted is a
22 combination of two sublayers; is that
23 correct?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: There are two

1 different layers there, a metallic layer and
2 a dielectric layer.

3 BY MR. SHEASBY:

4 Q. Which one is the barrier layer?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: So Ni discloses a
7 dielectric layer or metallic layer and the
8 image shows both layers.

9 BY MR. SHEASBY:

10 Q. Right. And you marked both layers
11 as green?

12 A. The highlight represents either/or
13 as the spec says.

14 Q. So can a layer be made up of
15 sublayers?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I think a layer is a
18 layer.

19 BY MR. SHEASBY:

20 Q. Okay. What's the definition of a
21 "layer"?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: In the context of a
24 patent -- the patents we're discussing or
25 just in general?

1 BY MR. SHEASBY:

2 Q. In the context of OLED, what is a
3 layer?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: I think it's a layer.
6 I don't know what -- it's not multiple
7 layers, it's a layer.

8 BY MR. SHEASBY:

9 Q. "A" means one or more. Were you
10 aware of that fact?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I think in the
13 context of what you're wanting to ask about,
14 it's pretty specific to a layer.

15 BY MR. SHEASBY:

16 Q. Right. And what's the plain and
17 ordinary meaning of "a layer" in OLED?

18 A. Not many layers.

19 Q. Can you give me a definition of
20 "layer"?

21 MR. STAFFORD: I think we lost
22 audio for a minute. Can we go off the
23 record?

24 MR. SHEASBY: I don't think we lost
25 any audio.

1 MR. STAFFORD: No. On our main
2 speaker between the two of us.

3 THE VIDEOGRAPHER: Shall I go off?

4 MR. SHEASBY: Sure.

5 THE VIDEOGRAPHER: Going off the
6 record. The time is 12:55 p.m.

7 (Recess.)

8 THE VIDEOGRAPHER: Back on the
9 record. The time is 12:56 p.m.

10 BY MR. SHEASBY:

11 Q. Sure. What's the plain and
12 ordinary meaning of "layer" in the context of
13 OLEDs?

14 MR. STAFFORD: Objection. Form.
15 BY MR. SHEASBY:

16 Q. And just for the record, you need
17 to describe what you're doing, sir.

18 A. So I'm looking at the agreed-upon
19 and not agreed-upon claim constructions
20 before I answer the question.

21 Q. Okay.

22 A. So it appears that layer isn't
23 defined, so I'll go back to it's a layer.
24 There is a dispute over what a planarization
25 layer specifically is. And in 1003, back to

1 that section, the claim specifically talks
2 about at least one barrier layer over said
3 planarization layer, and I believe that the
4 figure in 3D shows at least one barrier
5 layer.

6 Q. Does the fact that it has two
7 layers that can operate as a barrier layer
8 mean it doesn't meet the claim limitation?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I believe the figure
11 shows that it has at least one barrier layer.
12 BY MR. SHEASBY:

13 Q. So it can have more than one layer
14 making up the barrier layer?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: It says "at least one
17 barrier layer." So if it had two, that would
18 be two barrier layers.

19 BY MR. SHEASBY:

20 Q. And does a barrier layer, does it
21 have to be homogeneous? Does it have to have
22 the same material in it, only one type of
23 material in it?

24 A. I don't know. In the context of
25 this figure that you're showing me, I don't

1 know why you would deposit the same thing
2 twice and call it two different things unless
3 they were different in some way.

4 But, again, in the instance we're
5 looking at here, one is a dielectric layer,
6 one is a metallic layer. So I would say
7 those are two different layers. It even
8 distinguishes, it calls them out as each
9 layer.

10 Q. Not the question I asked.

11 Objection. Form.

12 I said does a single layer have to
13 be homogeneous material?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: You're asking me
16 specifically about paragraph 1003 and a
17 figure that you're showing me, and it's
18 showing two layers.

19 BY MR. SHEASBY:

20 Q. I'm not.

21 A. You are.

22 Q. No, I'm not. I'm now asking you a
23 question. You don't need to fight with me.
24 I was just asking you a question.

25 A. So just to be clear, so we're not

1 looking at this figure or this paragraph
2 anymore?

3 Q. No, we're not. Do you understand
4 that?

5 A. I do now.

6 Q. Does a layer have to be
7 homogeneous?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: In all contexts in
10 the world, maybe not.

11 BY MR. SHEASBY:

12 Q. Does -- in OLED context, are layers
13 always homogeneous?

14 A. I can't speak to every OLED
15 structure or design in the world.

16 Q. In the context of the OLED, did --
17 would a person of ordinary skill in the art
18 in the field of OLED believe that a layer has
19 to be homogeneous?

20 A. I guess it would depend on how the
21 layer's being described.

22 Q. If it's just described as a barrier
23 layer, for example, does it have to be
24 homogeneous?

25 A. Well, a barrier layer in the

1 absence of any context, then, I don't know
2 what you're asking me to answer.

3 Q. Okay. Does the plain and ordinary
4 meaning of barrier layer mean it has to be a
5 homogenous material?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I mean, the plain and
8 ordinary meaning of barrier layer would be a
9 layer that provides a barrier.

10 BY MR. SHEASBY:

11 Q. And does that layer have to be only
12 one material?

13 A. Again, it depends on the context
14 that you're using it.

15 Q. I'm using it in the context of the
16 patents in suit in this case.

17 A. Then I would say the planarization
18 layer is a layer.

19 Q. Does it have to be only one
20 material?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: It has to be only one
23 material.

24 BY MR. SHEASBY:

25 Q. A planarization layer can only be

1 one single material. Is that your testimony?

2 A. The testimony I would give is a
3 planarization layer has to meet the
4 definition that's been agreed upon.

5 Q. I understand that. And does that
6 definition say it can only be one material?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: The definition
9 doesn't explicitly state that it has to be
10 one material, but it does define -- can I
11 finish?

12 BY MR. SHEASBY:

13 Q. I thought you were done.

14 A. No.

15 Q. I'll ask it again as clean as I
16 can. Point to me where in the patent
17 specification of any of the patents in suit
18 in the case it states that a barrier layer or
19 planarization layer can only be made up of
20 one homogeneous material.

21 A. So the planarization layer, that is
22 the composite planarization layer that
23 Pictiva's expert points out consists of
24 layers that don't meet the definition of a
25 planarization layer.

1 Q. Not the question asked.

2 Objection. Form.

3 I said point to me where in the
4 specifications of the patents in suit it says
5 that a layer or planarization layer or
6 barrier layer has to made up of only one
7 material.

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: And I'm pointing out
10 that the layer or barrier layer or
11 planarization layer has to be made of
12 materials that meet the definition that's
13 been defined.

14 BY MR. SHEASBY:

15 Q. Objection. Form.

16 Point out where in the
17 specification it says a barrier layer or a
18 planarization layer can only be made up of
19 one homogeneous material.

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: So you're talking
22 about specifically now the '389 patent?

23 BY MR. SHEASBY:

24 Q. Yes, sir.

25 A. Okay. I don't think I have that

1 patent to be able to look at the
2 specification.

3 Q. You actually do have it. It's in
4 the list of exhibits you were downloading.

5 A. Okay. Which exhibit is it?

6 Q. I believe it's the last one. It's
7 Exhibit 21, but let me ask it in a different
8 way.

9 Does the plain and ordinary meaning
10 of barrier layer or planarization layer
11 require that the layer be made up of only one
12 homogenous material?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: I'm looking back at
15 the claim construction. So a planarization
16 layer says that it's a layer of material that
17 planarizes such that the propagation of
18 defects from one layer to another layer is
19 interrupted and the topography of the
20 underlying layer is not reproduced.

21 BY MR. SHEASBY:

22 Q. Does it say that material has to be
23 homogeneous?

24 A. It doesn't say materials.

25 Q. Does it say the material has to be

1 homogeneous? Yes or no?

2 A. It doesn't.

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: It actually says
5 material in the singular.

6 BY MR. SHEASBY:

7 Q. And you're interpreting that as
8 being a single homogeneous material; is that
9 correct?

10 A. I believe in the context of the
11 '389 patent, that's correct.

12 Q. Do you know what a hybrid layer is?

13 A. I'm not sure I remember the
14 terminology of hybrid layer but I remember
15 the use of composite layer.

16 Q. Do you understand what the context
17 of a hybrid layer is? It's a layer of
18 multiple materials. Do you understand that
19 concept?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: I understand the
22 concept of multiple materials.

23 BY MR. SHEASBY:

24 Q. And have you seen and observed
25 hybrid planarization in barrier layers?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: I mean, if you're
3 asking whether multiple materials can
4 planarize something, I didn't --
5 hypothetically, a lot of things can happen.
6 BY MR. SHEASBY:

7 Q. I'm saying do you understand --
8 you're not familiar with the concept of
9 hybrid layers, correct?

10 A. I didn't say that. You did.

11 Q. You don't know what a hybrid layer
12 is, correct?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: If you want to point
15 me to where a hybrid layer is discussed in
16 the reports, I can comment on that.

17 BY MR. SHEASBY:

18 Q. I'm talking about as a person who
19 purports to be an expert in the field of
20 OLEDs, do you understand what the concept of
21 a hybrid layer is?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: You're basically
24 saying that anything with multiple layers is
25 a hybrid layer. Some people call it a

1 multilayer stack. There is different words
2 used for it. I understand what multiple
3 layers stacked on top of each other are.

4 BY MR. SHEASBY:

5 Q. And you understand that those are
6 oftentimes referred to as hybrid layers?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: I don't know if I
9 would agree to oftentimes, but you could call
10 that a hybrid layer or a composite layer or a
11 multilayer stack or many other things.

12 BY MR. SHEASBY:

13 Q. Have you seen hybrid layers, these
14 multilayer stacks being used for barrier
15 layers and planarization layers in the field?

16 A. The '389 patent specifically
17 references prior art, the polymer multilayer
18 which is a multilayer stack.

19 Q. Okay. Not the question I asked.

20 Objection. Form.

21 In the field, have you seen -- do
22 you have personal knowledge of using hybrid
23 layers, the multilayer stacks?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: You're saying have I

1 personally used multilayer stacks?

2 BY MR. SHEASBY:

3 Q. Yes. Do you have -- let me ask it
4 this way: Do you have personal knowledge and
5 understanding of the concept of a hybrid
6 layer, this idea of multilayer stacks?

7 A. As I described earlier, I worked on
8 multiple devices and processed stuff in clean
9 rooms for years, so I've used multilayer
10 stacks, yes.

11 Q. So you've used hybrid layers before
12 for barriers and passivization --

13 MR. STAFFORD: Objection. Form.

14 BY MR. SHEASBY:

15 Q. -- or planarization?

16 MR. STAFFORD: Objection. Form.

17 BY MR. SHEASBY:

18 Q. Remember our rule, sir.

19 A. I'm searching for "hybrid" in my
20 reports to see where you're referencing the
21 use of it.

22 Q. I'm not asking about your report.
23 It's not used in your report, which makes me
24 think you don't understand the concept.
25 That's why I'm asking you the question.

1 A. What you're describing is just a
2 multilayer stack, and then you're -- I said
3 that the '389 patent does describe such a
4 stack, and you're saying I don't understand
5 it, but I believe I do.

6 Q. You don't understand the concept of
7 a hybrid layer which is to say a multilayer
8 stack, correct, sir?

9 A. That's not correct.

10 MR. STAFFORD: Object to form.

11 BY MR. SHEASBY:

12 Q. Have you observed hybrid layers
13 before that are used for planarization and
14 barrier purposes?

15 A. I have seen devices with multilayer
16 stacks.

17 Q. And it's your position that the
18 patent does not cover hybrid layers, correct,
19 for planarization and barrier?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: Again, I have taken
22 no opinion on that because, as you said, the
23 use of hybrid layers was never used in any of
24 the documents.

25 / / /

1 BY MR. SHEASBY:

2 Q. I didn't say it wasn't used in any
3 documents. I said it wasn't used in your
4 report. So are you taking the position that
5 the patents don't encompass the use of a
6 hybrid layer?

7 MR. STAFFORD: Objection.

8 THE WITNESS: I think I've taken
9 the position that they do not use what the
10 expert referred to as a composite layer.

11 BY MR. SHEASBY:

12 Q. Not the question I asked.

13 Are you taking the position that
14 the patent -- the '389 patent doesn't cover
15 hybrid planarization and buffer layers?

16 A. So the composite layer that is
17 referred to in the reports is a multilayer
18 stack, and I'm taking the position that that
19 is not a planarization layer.

20 Q. Not the question I asked.

21 Objection. Form.

22 The question I asked is: Does the
23 patent encompass hybrid layers for
24 planarization and buffering? Yes or no?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: The patent doesn't
2 encompass a multilayer stack that doesn't
3 perform the functions of a planarization
4 layer.

5 BY MR. SHEASBY:

6 Q. I'm not asking -- putting aside the
7 functions of a planarization layer, I'm
8 actually asking a much more basic question.
9 If the layer performs the recited functions
10 of planarization or buffering, can it be
11 multilayer and meet the claim limitation?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I wasn't asked to
14 provide an opinion on the theoretical layer
15 you're describing.

16 BY MR. SHEASBY:

17 Q. Does a person of ordinary skill in
18 the art understand that a planarization layer
19 and a buffer layer can have multiple
20 different layers in it, it can be hybrid,
21 composite?

22 A. Again, you can have a multilayer
23 stack, and depending on what it's supposed to
24 be doing, how you define where the division
25 lines in that stack are would matter.

1 Q. Objection. Form.

2 Can a planarization layer or a
3 buffer layer be a composite or hybrid layer?

4 MR. STAFFORD: Objection. Form.

5 BY MR. SHEASBY:

6 Q. If it meets the requirements of
7 planarization or buffering?

8 A. Which the composite layer does not,
9 then I suppose maybe.

10 Q. Objection. Form.

11 To a person of skill, plain and
12 ordinary meaning, can a planarization layer
13 or a buffer layer be a composite, i.e., a
14 hybrid layer?

15 MR. STAFFORD: Objection.

16 THE WITNESS: So, again, if the
17 layers are performing the function that's
18 described by whatever definition you're
19 giving it, then potentially, yes. And I
20 repeated that that is not what's happening in
21 the context of the '389 patent for the layers
22 that you're referring to.

23 BY MR. SHEASBY:

24 Q. Objection. Form. I'm not
25 referring to any layers. I'm not referring

1 to any infringement analysis. I'm referring
2 to your understanding in the claims that you
3 apply in the context of validity as well as
4 infringement. Do you understand?

5 A. Yes. But you're asking me about
6 specific -- you've used the word
7 "functionality" which implies that -- it has
8 to have some context to understand what the
9 function is. The only context that I'm
10 currently given is the '389 patent, so I'm
11 referring back to that.

12 Q. -- upper layer or barrier layer.
13 Excuse me?

14 A. The audio just cut out for a
15 second. Could you repeat that.

16 Q. What's the function of the barrier
17 layer in the '389 patent?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: The barrier layer has
20 at least a function of keeping out -- kind of
21 providing a chemical barrier.

22 BY MR. SHEASBY:

23 Q. Can that be performed by a
24 composite or hybrid layer?

25 A. I'm sorry, your audio cut out again

1 there.

2 Q. Can that be performed by a
3 composite or hybrid layer?

4 A. Am I the only person that's missing
5 the first two words of the sentence?

6 Q. Can that be performed by a
7 composite or hybrid layer?

8 A. I mean, I don't know. It's called
9 a barrier layer. In the devices that I've
10 looked at, and I guess I'll refer back and
11 say that there can be multiple barrier
12 layers. There's examples of that are shown.

13 Q. Okay. And so -- objection. Form.
14 Can a planarization layer and a
15 buffer layer be a hybrid, i.e., a composite
16 layer?

17 A. So as we have talked about,
18 multilayer stacks or hybrid layers or
19 composite layers exist, and -- so in theory,
20 out in, you know, the infinite realm of
21 things can things have multiple layers, yes.
22 If we're talking about specifically a
23 planarization layer in the context of the
24 patents here, then I think that it's clear
25 that that's a layer.

1 Q. So in the context of the patents,
2 which is what I'm asking about, can the
3 planarization layer or the barrier layer in
4 the '389 patent be a hybrid layer?

5 A. I think -- in the context of the
6 patents and the products that I've looked at,
7 the planarization layer is a single layer.

8 Q. I understand that. I'm not asking
9 about the products. I'm asking about the
10 patent. Do you understand?

11 A. Okay.

12 Q. So can the planarization layer and
13 the barrier layer in the patent be a hybrid
14 layer?

15 A. I don't know that the patent speaks
16 to it.

17 Q. Would a person of ordinary skill in
18 the art, would they understand that the
19 planarization layer or barrier layer as used
20 in the patent could be a hybrid layer, which
21 is to say a composite layer?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I'm going to open up
24 the patent. Is that okay since you're
25 referring to?

1 BY MR. SHEASBY:

2 Q. You can do whatever you want to
3 answer the question. And you might try 428
4 through -30.

5 A. I don't see the '389 patent. Can
6 you tell me what exhibit number that is? I'm
7 sorry. 21, I see.

8 So the spec refers to a hybrid
9 planarization layer in one place I see.

10 Q. So does the patent cover hybrid
11 layers?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I don't know that
14 every implementation or claim covers that,
15 but there is a mention of hybrid
16 planarization layers in the spec.

17 BY MR. SHEASBY:

18 Q. When you were analyzing the claims,
19 did you conclude that the claims did not
20 cover hybrid layers?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: I concluded that the
23 claims as applied to the allegedly infringing
24 products didn't include a hybrid or composite
25 planarization layer with respect to the

1 definition that was defined for planarization
2 layer in this case.

3 BY MR. SHEASBY:

4 Q. Objection. Form.

5 Did you conclude that the patents
6 excluded hybrid layers, the claims excluded
7 hybrid layers?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I don't think
10 anywhere I said that I concluded that it
11 excluded those. As I said, I looked at the
12 claims in the product and how they were
13 alleged to be infringed and concluded that
14 planarization as described didn't have a
15 composite planarization layer.

16 BY MR. SHEASBY:

17 Q. Objection. Form.

18 I'm asking you: Did you conclude
19 that the claim, for example, Claim 1 of the
20 patent, '389 patent, excludes hybrid layers
21 for planarization and buffering or barriers?

22 A. And as I said, I didn't
23 definitively exclude it. I analyzed the
24 products using the claim construction for
25 planarization layer that was agreed upon and

1 that the specified or the composite layer
2 that's described by Pictiva's expert was not
3 indeed the planarization layer.

4 Q. Objection. Form.

5 For your analysis of the scope of
6 the patent claims which you conduct for both
7 infringement and invalidity, correct?

8 A. Correct.

9 Q. And you understand the same
10 construction has to apply in both contexts,
11 correct?

12 A. Yes, I understand that.

13 Q. Did you conclude that the claims
14 exclude hybrid planarization and barrier
15 layers? Is that the rule you applied?

16 A. And as I just said, I didn't
17 exclude those with respect to --

18 Q. Let me ask the next question, which
19 is when you go to the patent -- let's turn to
20 the '389 patent. Let's look at Claim 1. It
21 says:

22 "Fabricating a plurality" --

23 Let's start with the --

24 "A method of encapsulating a
25 plurality of devices fabricated in a

```
1      substrate."
```

2 Do you see that?

3 A. Yes, I see that.

4 Q. Do the accused products satisfy
5 that requirement?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: So am I allowed to
8 reference Exhibit 2?

9 BY MR. SHEASBY:

10	Q. You can look at whatever you want.
----	---------------------------------------

11 A. Okay. I'm just notifying you. You
12 said I should do that.

13 Q. Yes. I can't preclude you from
14 looking at anything, I just can ask you to
15 disclose what you're looking at. That's all
16 I can do. You don't have to ask my
17 permission. You just need to tell me what
18 you're looking at, if that makes sense. Let
19 me try to get it this way because this is
20 taking longer than I had anticipated.

21

■ ■ ■ ?

23 A.

[REDACTED] [REDACTED]

1 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

2 [REDACTED] [REDACTED]

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED]

5 [REDACTED] [REDACTED] [REDACTED].

6 BY MR. SHEASBY:

7 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

8 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

11 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

12 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

13 BY MR. SHEASBY:

14 Q. And why don't we look at
15 Exhibit 19.

16 A. Okay.

17 Q. Why don't you turn to page PDF 14,
18 which is SDC33833. Let me know when you're
19 there.

20 A. I'm there. And you pulled it up on
21 the screen.

22 Q. Right. For assistance, I did that.
23 I'm looking at the depiction on the left-hand
24 side. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED]

1 A. Yes, I do.

2 Q. [REDACTED]
[REDACTED]
[REDACTED]

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

11 BY MR. SHEASBY:

12 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I believe nominally
18 that is the case.

19 BY MR. SHEASBY:

20 Q. Okay. Let me ask the next
21 question, which is -- why don't we go to
22 SDC3467, which is Exhibit 20. Let me know
23 when you're there.

24 And I'm taking you to SDC00024382.

25 A. Okay.

1 Q. And this -- do you know what this
2 is describing?

3 A. Yes. It's a cross-section of one
4 of the OLED panels.

5 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

10 A. I'm sorry, can you repeat that.

11 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

15 A. Yeah. So two points here. Yes,
16 this is one example. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

21 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

25 [REDACTED]

1

[REDACTED]

5

Q. So objection. Form.

6

The question I'm asking you is: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

10

MR. STAFFORD: Objection. Form.

11

THE WITNESS: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

15

BY MR. SHEASBY:

16

Q. Totally understand that. But if

17

there's an extra area -- let me ask it this

18

way: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

22

MR. STAFFORD: Objection. Form.

23

THE WITNESS: Yes. Nominally, it

24

is the case. [REDACTED]

[REDACTED]

[REDACTED]

1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
2 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 BY MR. SHEASBY:

4 Q. Okay. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
5 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
6 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
7 [REDACTED] [REDACTED] [REDACTED] [REDACTED]

8 A. I'm not certain of that.

9 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
10 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
11 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
12 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

13 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
14 [REDACTED] [REDACTED] [REDACTED] [REDACTED]

15 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
16 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
17 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
18 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: [REDACTED] [REDACTED]
21 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
22 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
23 [REDACTED] [REDACTED] [REDACTED] [REDACTED]

24 BY MR. SHEASBY:

25 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
2 [REDACTED] [REDACTED]
3 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
4 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
5 [REDACTED] [REDACTED]

6 Q. Now, is that selective -- strike
7 that.

8 Is the selection of -- let me ask
9 it this way. You know what selected
10 deposition is, correct?

11 A. I do know what selective deposition
12 is.

13 Q. Is selective deposition 100 percent
14 successful?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: No process is
17 100 percent successful. There's -- I mean,
18 there's yield issues, so I -- I'm not sure
19 what the question is.

20 BY MR. SHEASBY:

21 Q. In selected deposition, there is
22 often instances in which there will be
23 bleeding beyond the area selected?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: That depends on what

1 process you're using.

2 BY MR. SHEASBY:

3 Q. There are processes that are -- are
4 you aware of any selective deposition process
5 that is 100 percent successful in only
6 targeting the area that's intended?

7 A. There are certainly processes
8 that -- for selective deposition that have
9 deposition that yield the result that you're
10 trying to yield without requiring additional
11 processing, yes.

12 Q. And there's also selective
13 deposition that does require additional
14 processing, correct?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: That completely
17 depends on what you're trying to achieve with
18 the downstream device.

19 BY MR. SHEASBY:

20 Q. I understand that.

21 You have experience -- well, maybe
22 you don't. You don't actually have
23 experience with selective deposition in
24 commercial products, OLEDs, correct?

25 A. I have plenty of experience with

1 selective deposition and film deposition.

2 Q. And you understand that there are
3 oftentimes instances in which additional
4 steps must be taken to further process after
5 selective deposition because the material is
6 deposited beyond the target area?

7 A. I don't know that I characterize it
8 as oftentimes. It depends on the geometries
9 that you're working with, what subsequent
10 processing is required. So it completely
11 depends on the case that you're speaking
12 about.

13 Q. If subsequent processing is
14 required to remove materials, you cannot
15 describe the step as selective deposition,
16 correct?

17 A. In the context of the patents we're
18 looking at here, I don't believe that you
19 can.

20 Q. So your understanding of selective
21 deposition is it must be 100 percent
22 successful and there cannot be any subsequent
23 processing, correct?

24 A. My understanding of selective
25 deposition in regards to the patents I was

1 asked to look at is that there cannot be
2 subsequent processing.

3 Q. Okay. Now, if we go back to -- are
4 you aware of any OLED process in which
5 selective deposition doesn't require
6 subsequent processing that's used in
7 commercial products?

8 A. I can't speak to every OLED process
9 that happens in the world.

10 Q. Can you speak to any commercial
11 OLED process?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I can only speak to
14 the fact that I have done selective
15 deposition that did not require subsequent
16 processing.

17 BY MR. SHEASBY:

18 Q. I understand that.

19 But was that using OLED in a
20 commercial context?

21 A. It was using semiconductor light
22 emitters in a commercial context.

23 Q. So now to answer my question. Are
24 you aware of any commercial OLED
25 manufacturing process in which selective

1 deposition does not require a subsequent
2 processing step to remove some of the
3 material?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: You know, as a matter
6 of practice, the commercial OLED
7 manufacturers don't share their recipes with
8 me, so I'm not aware of any.

9 BY MR. SHEASBY:

10 Q. Did you ask Samsung if they have
11 any selective deposition process that doesn't
12 require subsequent removal of material?

13 A. I didn't ask them if they do. I
14 know they have a lot of layers that are
15 deposited in these stacks. I didn't ask if
16 there are ones specifically that don't
17 require any cleanup after the deposition.

18 Q. Did you ask any Samsung engineers
19 whether they use any TFE process that does
20 not involve selective deposition?

21 A. I'm sorry, did I ask them if they
22 use any processes that do not require
23 selective deposition?

24 Q. Did you ask any Samsung engineers
25 if they use any TFE process that does not

1 involve selective deposition?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: I didn't specifically
4 ask that question.

5 BY MR. SHEASBY:

6 Q. Okay. Let's go back to -- let's go
7 back to Exhibit 10.

8 A. Okay.

9 Q. And why don't you turn to page 202
10 and 203.

11 A. Of what?

12 Q. Exhibit 10.

13 A. I'm sorry. My Exhibit 10 says EX18
14 and only has six pages.

15 Q. That's correct. But I think the
16 Bates range is 202 to 203.

17 A. Oh, I'm sorry.

18 Okay. Yes. I'm on there.

19 Q. 203, it says:

20 "In contrast with the Phen" --

21 Do you see -- I'm just going to --
22 here's an easier way of doing it -- for the
23 court reporter. It's going to drive her
24 crazy.

25 Do you see the reference to the Liq

1 blend?

2 Do you see that?

3 A. Yes, I see it.

4 Q. And a Liq blend is necessarily
5 n-doped, correct?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I think we have
8 covered this multiple times that Liq can be
9 an n-dopant and also cannot be.

10 BY MR. SHEASBY:

11 Q. Sir, in this design, it's -- a Liq
12 blend would necessarily be n-doped, correct?

13 A. I'm going to look at my opening
14 report for this reference.

15 So I don't see it in my opening
16 report. I'm going to look in my rebuttal
17 report.

18 Q. While you're doing that, let me ask
19 you a question. [REDACTED]

[REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
2 [REDACTED] [REDACTED]

3 BY MR. SHEASBY:

4 Q. Okay. And you don't understand
5 what the word "indiscriminately" means?

6 A. I don't know what you're meaning it
7 to mean.

8 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
9 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
10 [REDACTED] [REDACTED] [REDACTED] [REDACTED]
11 [REDACTED]?

12 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
13 [REDACTED] [REDACTED] [REDACTED] [REDACTED]
14 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
15 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

16 Q. All right. That's helpful. Let's
17 go to Claim 34.

18 A. Claim 34 of which of the patents
19 are we talking about now?

20 Q. The '389 patent. I believe that's
21 Exhibit 21.

22 A. Okay.

23 Q. You can have a planarization layer
24 that makes -- let's just pull it up.

25 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

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[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

A. [REDACTED] [REDACTED] [REDACTED] [REDACTED]

Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED]

A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED]

Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED]

A. So I'm looking at my rebuttal report. So, yeah, I believe it follows the topography of what's -- it doesn't prevent the topography from going up and also doesn't prevent the defects from protruding to the next layer. I'm looking for the specific agreement on planarization layer, but it doesn't meet many of the specifics that are in that agreed-upon construction.

Q. I think I'll read it into the record. The agreed-upon construction of planarization is:

"A layer of material that planarizes

1 such that the propagation of defects
2 from one layer to another layer can be
3 interrupted and the topography of the
4 underlying layer or structure is not
5 reproduced."

6 Do you see that? Is that your
7 understanding?

8 A. That's my understanding.

9 Q. Now, let's go to Exhibit 22.

10 (Exhibit Number 22 was marked.)

11 THE WITNESS: I'm sorry, did you
12 just add that to the file share?

13 BY MR. SHEASBY:

14 Q. Yes, sir.

15 A. Okay. I have Exhibit 22 open.

16 Q. And let's go to Figure 1.

17 A. Okay.

18 Q. Do you see layers 191 and 192?

19 A. Yes, I do.

20 Q. Those are passivization layers,
21 correct?

22 A. 191 is. 192, yes, is also referred
23 to as a passivization layer.

24 Q. Not only -- I'm actually asking
25 about the definition in the patent that we've

1 agreed to for the patent. So the layers 191
2 and 192, you agree that those make -- did you
3 do any analysis as to whether they block
4 defects from propagating?

5 A. So in this particular patent, it
6 does say the passivization layer is applied
7 over the OLED to provide low-pinhole density
8 moisture barrier.

9 Q. I understand that.

10 And did you do any simulation
11 analysis to determine if it's blocking any
12 defects?

13 A. It says that it is, so I didn't --
14 I'm just quoting the invention.

15 Q. So decreasing pinholes and creating
16 a moisture barrier would be blocking defects?
17 They're interrupting the propagation of
18 defects?

19 A. It could.

20 Q. Where does it disclose that 191 or
21 192 block the propagation of defects
22 necessarily?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: So I'm turning to my
25 opening report for the discussion of Jones.

1 BY MR. SHEASBY:

2 Q. Sure. Thank you for telling me.

3 A. So, yeah, it describes the -- Jones
4 describes the layers as having -- being a
5 sealing structure. And so it doesn't disrupt
6 the propagation of defects, so it wouldn't be
7 doing a very good job as a sealing structure.

8 Q. The capping layer, is that -- well,
9 just because you sealed, do you necessarily
10 disrupt the propagation of defects?

11 A. Specifically in Jones it says:
12 "It is another object of the present
13 invention to provide a sealing structure
14 to isolate the OLED layer from moisture
15 and other contaminates."

16 So it would have to be -- actually
17 seal it if the defects were propagating
18 through it. I think most people would
19 understand it's not sealing it anymore.

20 Q. Do you know if the barrier layer
21 that's deposited -- did you ask the engineers
22 if the barrier layer that's deposited in
23 Samsung's devices seals the device?

24 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] or the -- which layer are you

1 talking about?

2 Q. [REDACTED]

3 A. Couple things. [REDACTED]

4 [REDACTED]

5 [REDACTED]

6 [REDACTED]

7 [REDACTED]

8 Q. [REDACTED]

9 [REDACTED]

10 [REDACTED]

11 A. No, I don't believe I needed to ask
12 them. I can see it for myself that it does
13 not.

14 Q. Objection. Form.

15 [REDACTED]

16 [REDACTED]

17 [REDACTED]

18 [REDACTED]

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I said that I did not
21 ask any engineers about it. I can see that
22 the defects propagate through it.

23 BY MR. SHEASBY:

24 Q. So to be a planarization layer, do
25 you have to stop the propagation of all

1 defects?

2 A. You have to have the functionality
3 to stop the propagation of defects.

4 Q. Right. Does that mean stopping the
5 propagation of all defects?

6 A. I think the defects that are
7 relevant for the -- for what you're trying to
8 block, yes. I mean, I guess there's no
9 manufacturing process in the world that is
10 100 percent yield.

11 So I think in a hypothetical that
12 asks to go beyond what anybody in the world
13 could accomplish, but I think one skilled in
14 the art would know and understand whether the
15 layer is actually accomplishing what its
16 function is or not.

17 Q. What percentage decrease in
18 propagation of defects do you have to achieve
19 to meet the definition of "planarization
20 layer"?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: I think the answer to
23 that would depend on what the status of the
24 technology was at any given point in time for
25 what you're trying to accomplish.

1 BY MR. SHEASBY:

2 Q. I'm talking about at the time of
3 the patent.

4 A. So I would think that it would have
5 to, you know, have a large enough change in
6 the -- in the yield to make it worth
7 implementing the process in a manufacturing
8 line.

9 Q. And do you know how much additional
10 defects would propagate upwards [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED]?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: I can see from the
15 thickness of the defects and my own
16 experience working on devices that it would
17 be, I believe, a large number. Sorry, if --
18 BY MR. SHEASBY:

19 Q. Okay. Let me ask you this -- let
20 me ask it this way. Let me ask it this way.
21 This is the better way of asking it.

22 Did you ask any Samsung engineers
23 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: Sorry. Just to be
2 clear and for the record, I think I answered
3 the last question incorrectly because I think
4 I got a double negative in there.

5 BY MR. SHEASBY:

6 Q. You did. What I understand is you
7 don't think -- let me ask it this way.
8 That's why I was asking it this way.

9 Do you -- did you ask Samsung
10 engineers if they performed any experiments

11 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]?

13 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED]

20 Q. Well, you said it performs some
21 sealing function, correct?

22 A. In their manufacturing process.

23 Q. Okay. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] Is that what
25 you said?

1 A. I think the report indicates that
2 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
3 [REDACTED] .

4 Q. Now, did you ask Samsung -- and you
5 referred to that as a sealing function; is
6 that correct?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: I will refer back to
9 the language in my report, which is that [REDACTED]
10 [REDACTED] [REDACTED] [REDACTED] .

11 BY MR. SHEASBY:

12 Q. In your testimony under oath you
13 just referred to that as a sealing function,
14 correct, sir?

15 A. I understand. But now we're
16 looking at another patent that uses --
17 specifically talking about their patent and
18 sealing structure, and I didn't mean to -- I
19 didn't mean to apply what I just said to
20 Jones.

21 Q. Sir, I'm not asking about Jones at
22 all. We are not talking about Jones in the
23 least. I'm just trying to get your testimony
24 under oath.

25 You referred to the [REDACTED] [REDACTED]

1 in Samsung's process as performing a sealing
2 function, correct?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: And I was just being
5 clear that not more than a minute and a half
6 ago we were talking about Jones, and I didn't
7 want there to be confusion between the two.

8 BY MR. SHEASBY:

9 Q. I'm not talking about Jones at all.

10 So objection. Form.

11 Please answer my question. You
12 referred to the [REDACTED] [REDACTED] in Samsung's
13 process as performing a sealing function,
14 correct?

15 A. And I revert back to the language
16 in my report which is that [REDACTED] [REDACTED] [REDACTED]

17 [REDACTED].
18 Q. Right. And you described that as a
19 sealing function in your testimony, correct?

20 A. That may not have been the best
21 choice of words.

22 Q. Do you want to take those words
23 back?

24 A. I just said that may not have been
25 the best choice of words.

1 Q. What is a sealing function?

2 A. In the abstract or in relation to
3 Jones or in relation to defects coming out
4 that need to be encapsulated or in which
5 form?

6 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: So I'm going to look
12 at my rebuttal report. But I understand that
13 it is -- without looking at exact words --

14 [REDACTED]
[REDACTED]

16 BY MR. SHEASBY:

17 Q. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

21 A. I think the -- I think the way that
22 it's worded in the report is [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

1

[REDACTED]

2

Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

4

[REDACTED] [REDACTED]

5

A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

7

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

8

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

9

[REDACTED]

10

Q. Nothing is 100 percent in this

11

world?

12

A. I haven't even seen that it's

13

50 percent. What I have looked at says it

14

has the potential to do that, but the main

15

function of the [REDACTED] [REDACTED] is for operable

16

purposes.

17

Q. Have you seen any experiments or

18

asked Samsung [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

19

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

20

[REDACTED]?

21

A. I have no idea how much, if any --

22

I don't even know that it helps at all. I

23

said potentially.

24

Q. Did you perform any simulation to

25

determine [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

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[REDACTED]

MR. STAFFORD: Objection. Form.

THE WITNESS: No. I'm not even
sure how you would do that. [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] So yeah,
I'm not sure how that would be done.

BY MR. SHEASBY:

Q. Did you ask any Samsung engineer

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED]

A. I'm not using the word "sealing
function," you are, but the -- so no, I
didn't ask them that.

Q. So going back to Jones, what's the
topography of the underlying device? The
underlying device is 14; is that correct?

A. I'm sorry, can you remind me which
exhibit Jones is?

Q. 22.

A. Yes. 14.

Q. And then is 17 also part of the
underlying device as well?

1 A. 17. I'm sorry, 17 is referred to
2 as a recess channel.

3 Q. Okay. So 14 is the underlying --
4 is the topography of the underlying device.
5 Let me -- that's the sort of topography,
6 roughly speaking, of -- that's not a very
7 good -- I'm going to do a line. Give me one
8 second. A line will do a better job than
9 this.

10 It's not working.

11 How would you describe the
12 topography of the underlying device?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: So the OLED layer is
15 18 and then there's an electrode layer 182 on
16 top of 18, and 14 is the -- what are they
17 called in this one? The pixel area. So I
18 would say 14 and 18 and 182 are the
19 underlying device.

20 BY MR. SHEASBY:

21 Q. And then I marked those blue dots.
22 Do you see that?

23 A. Yes, I see that.

24 Q. Those would the peaks or valley in
25 the topography of the underlying device?

1 A. They're -- what's schematically
2 drawn is the surface of the underlying
3 device.

4 Q. And then 191 and 192 are what you
5 were describing as the planarization layers;
6 is that correct?

7 A. Yeah. I think they call them
8 passivation layers in the patent, but, yes,
9 I'm referring to them for their function.

10 Q. So passivization layers also have
11 peaks and valleys, correct, the blue dots?

12 A. The schematic doesn't draw them as
13 perfectly flat.

14 Q. The passivization layers in
15 Figure 1 have four peaks or valleys too,
16 correct?

17 A. I'm sorry, your audio cut out,
18 Mr. Sheasby.

19 Q. Sure. What you describe as the
20 passivization layer have those four dots
21 representing where there's peaks and valleys,
22 correct?

23 A. Yeah. In this schematic, which
24 it's my understanding these drawings are not
25 literal drawings, but the schematic does

1 still show peaks and valleys that happens to
2 not align with the peaks and valleys of the
3 underlying device.

4 Q. Oh, they don't align?

5 A. They don't, no.

6 Q. So you believe that this design
7 doesn't track the underlying topography of
8 the device?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: So what I said
11 specifically is it's my understanding that
12 these schematics are not -- this isn't a CAD
13 drawing, it's a sketch. But even in the
14 sketch they've gone -- they've drawn the
15 device such that if you were to look at the
16 layer that -- if we were to look at, say, the
17 right-hand sloping side, it doesn't follow
18 the right-hand slope of the underlying
19 device, which is why if you were to draw a
20 line directly up from your right-hand peak,
21 it would not intersect with the dot that is
22 now the right-hand peak on layers 192 and 191
23 because it's not following that underlying
24 topography, it's following a new topography.
25 / / /

1 BY MR. SHEASBY:

2 Q. So what does it mean to not produce
3 the underlying topography -- "not reproduce
4 the underlying topography"?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: Well, in this case,
7 it's a different topography.

8 BY MR. SHEASBY:

9 Q. Right. Now I'm asking you the
10 question: What does it mean to "not
11 reproduce the underlying topography" as
12 planarization layer was agreed to by the
13 parties?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: Well, I'm looking at,
16 for example, 182 appears to exactly reproduce
17 the topography of 182, and 191 does not
18 exactly reproduce the topography of 182. To
19 be clear, these are just schematics, but the
20 schematic could have easily been drawn to
21 exactly reproduce it, and it did not.

22 BY MR. SHEASBY:

23 Q. That's why I'm asking you, what
24 does it mean -- so in the definition of
25 planarization, what does it mean to say that

1 the underlying layer or structure is not
2 reproduced?

3 A. That it's a different topography.

4 Q. What does it mean to be a different
5 topography?

6 A. I'm not sure how -- I'm not sure
7 how much confusion there is over the word
8 "different."

9 Q. Please answer my question. What
10 does it mean to be a "different topography"?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: Not the same.

13 BY MR. SHEASBY:

14 Q. What does it mean to be "not the
15 same"?

16 A. It means to be different. I'm not
17 sure -- we can go back and forth. I'm a
18 little bit confused.

19 Q. How much difference?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: I don't know that I
22 can give you a percentage difference.

23 BY MR. SHEASBY:

24 Q. What is the percentage difference
25 between the -- did you ask Samsung [REDACTED] [REDACTED]

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A. [REDACTED]

Q. Not the question I asked.

A. As I said, I reviewed the data, and I didn't ask Samsung engineers about it. I reviewed the data myself, and in the data that I have been able to see, [REDACTED]

Q. Objection. Form.

MR. STAFFORD: Objection. Form.

THE WITNESS: I did not ask the Samsung engineers that specific question. I looked at the data that I was provided to do technical analysis on, and my opinion is that

1 from the data I've been presented with, [REDACTED]
2 [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 BY MR. SHEASBY:

4 Q. Objection. Form.

5 Did you actually do a measurement
6 to assess what the change in topography was?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

9 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
10 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
11 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
12 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
13 [REDACTED]

14 BY MR. SHEASBY:

15 Q. Not the question that I asked.

16 Did you actually do a measurement?

17 A. Well, it depends on what your
18 definition of "measurement" is. I looked at
19 the data and --

20 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
21 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
22 [REDACTED] [REDACTED] [REDACTED] [REDACTED] Let's start there.

23 A. I was not provided with devices

24 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] that I could
25 physically measure.

1 Q. Did you put the image into a
2 software program to measure [REDACTED] [REDACTED] [REDACTED] [REDACTED]
3 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
4 [REDACTED] [REDACTED]

5 A. No. I believe that looking at the
6 data presented that anyone would understand
7 that it is following the -- the [REDACTED] [REDACTED]
8 follows exactly the topography of the layer
9 below.

10 Q. Why does it follow exactly the
11 topography layer of the [REDACTED] [REDACTED] below?
12 What does that mean to follow exactly the
13 topography of the [REDACTED] [REDACTED] below?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: It replicates the
16 topography beneath it.

17 BY MR. SHEASBY:

18 Q. What does it mean to replicate the
19 topography beneath it?

20 A. I think looking at the
21 cross-sectional images that are in my report,
22 anyone of skill in the art looking at it
23 would agree that that replicates, repeats,
24 whatever words you want to use, the
25 topography of the layers beneath the [REDACTED]

1 [REDACTED].

2 Q. And I'm asking you what that means.
3 And you said you looked at images in your
4 report. What image are you referring to?

5 A. I'm going to refer -- I'm going to
6 look at my, I think, rebuttal report first.
7 So as an example, the image on the top of
8 page 62 of my rebuttal report, which is a
9 cross section of the device, and it shows
10 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].

16 Q. Are you talking about the top of
17 page 64? You said 62 but there's no image?

18 A. I'm sorry. Yes. Top of page 64.

19 Q. Okay. Well, let's dig in --
20 let's -- all right. Why don't we take a
21 break and we'll find that document and we'll
22 dig into it.

23 THE VIDEOGRAPHER: This marks the
24 end of Media Unit 2 of the deposition of
25 Thomas Katona, Ph.D. The time is 2:25 p.m.

1 We are off the record.

2 (Recess.)

3 THE VIDEOGRAPHER: We are back on
4 the record at 2:39 p.m. This marks the
5 beginning of Media Unit 3 of the deposition
6 of Thomas Katona Ph.D. Please continue.

7 BY MR. SHEASBY:

8 Q. Is something that's planar flat?

9 A. I mean, in general, a planar
10 structure is relatively flat.

11 Q. If you planarize something, is that
12 making it more or less flat?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: A planarization
15 process tends to make something more flat.

16 BY MR. SHEASBY:

17 Q. Going back to Figure 1 looking at
18 the 191 and 192 layers, are the peaks and
19 valleys, is the angles of those more or less
20 acute than for 18, 14, and 182?

21 A. I'm sorry, are the peaks and
22 valleys...

23 Q. The angles of the peaks and valleys
24 in 191 or 192 more or less acute than 18,
25 182, and 14?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: So first off, I'll
3 remind you that I indicated that these are
4 schematics, not CAD drawings, but the peaks
5 from top left to top right have been
6 stretched out over a larger length, which
7 would indicate if you were to take a line and
8 stretch it out or take a string and stretch
9 it out over a longer distance, a string that
10 had sagged, it would have less sag in it.

11 BY MR. SHEASBY:

12 Q. Not the question I asked.

13 I said are the angles more or less
14 acute?

15 A. I haven't measured the angles on
16 the schematic drawing that's not to scale.

17 Q. Where does the Jones describe
18 making of the -- that 191 and 192 make the
19 surface more planar or flatter?

20 A. Well, as I said earlier, at a
21 minimum, the drawing shows that the
22 topography has not been replicated from the
23 bottom layer up to the top layer. And as I
24 said, the fact that the left peak and right
25 peak are further out or more -- there is a

1 larger length from left peak to right peak, I
2 think, indicates that it has been planarized
3 to some degree.

4 Q. Not the question I asked.

5 In language, where does it describe
6 that 191 and 192 make the -- makes the
7 surface flatter or more flat?

8 A. I don't know if the language -- I
9 don't know if there's an area in the spec
10 where the language describes it flattening
11 outside of the image that we just discussed.

12 Q. And you said this image is not to
13 scale. It's not a CAD drawing, correct?

14 A. It's not to scale. It's not a CAD
15 drawing, but it --

16 Q. Let me ask you this question. Why
17 don't we go to Column 6, lines 39 through 53.

18 A. You said lines 39 to 53, Column 6?

19 Q. Yes. Are any of the materials
20 identified in this passage organic?

21 A. None of them are explicitly called
22 out as organic. Although in line 48, it
23 lists et cetera as additional materials. And
24 in line 55, it says not limited to specific
25 materials disclosed.

1 Q. Sure. Answer my question.

2 Is there any specific
3 identification of the use of an organic
4 material for passivization in the Jones
5 patent?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: The materials that
8 are specifically called out, not including
9 the additional materials that it leaves open,
10 are not organic materials.

11 BY MR. SHEASBY:

12 Q. Is there any reference to any
13 organic material, specific organic material
14 being used for passivization in the patent?

15 A. Again, outside of them describing
16 that it's not limited to what's called out in
17 the patent, there are not specific organic
18 materials that are referenced here.

19 Q. Objection. Form.

20 Are there any specific organic
21 materials referenced in the Jones patent?

22 A. Well, the Jones patent references
23 materials by way of saying that it's not
24 limited to this that are not specifically
25 called out. So yes, but the letters that are

1 put in here don't describe organic layer.

2 Q. Objection. Form.

3 For the specific materials that are
4 specified by letter in the Jones patent, are
5 any of them organic?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: Well, et cetera would
8 include organic materials as I testified by
9 letter, but the list reading up to it does
10 not include any organic materials.

11 BY MR. SHEASBY:

12 Q. The list of specific materials,
13 which are defined by a chemical name, are any
14 of those organic?

15 A. They are not --

16 Q. Sorry. Go ahead. I thought you
17 were done?

18 A. Not limited to the specific
19 materials disclosed.

20 Q. All right. Objection. Form.

21 Are any of the specific materials
22 listed in the Jones patent organic materials?
23 Yes or no?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: Not including the

1 specific materials that are not disclosed,
2 no.

3 BY MR. SHEASBY:

4 Q. So as to the specific materials
5 that are disclosed, all of them are organic,
6 correct?

7 A. No.

8 Q. What is the specific material
9 that's disclosed that's not -- that is
10 organic?

11 A. I believe, if I heard you
12 correctly, you said with regards to the
13 specific materials disclosed, they're all
14 organic.

15 Q. No. I said inorganic. But let me
16 ask it again.

17 The specific materials disclosed in
18 Jones, disclosed by chemical name are all
19 inorganic, correct?

20 A. The specific materials disclosed
21 are inorganic.

22 Q. Okay. Now let's go down and look
23 at another issue, which is do you know what's
24 required for inkjet deposition of inorganic
25 materials?

1 A. I mean, you need inkjet deposition
2 equipment and you would need materials that
3 are configured such that they can inject
4 document productions at a minimum.

5 Q. So to be configured to be inkjet
6 deposited, they have to have a low viscosity,
7 correct, below 100CP?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I don't know that I
10 offered an opinion on that or know off the
11 top of my head what the viscosity is for
12 inkjet printing.

13 BY MR. SHEASBY:

14 Q. It would have to be some type of
15 low viscosity, though; is that correct?

16 A. If you had a very viscous material,
17 it would likely jam the inkjet printer or the
18 inkjet deposition system.

19 Q. Are you aware of any inkjet
20 deposition system that was functional with
21 inorganic materials at the time of the
22 patent?

23 A. Off the top of my head, I'm not
24 aware of any.

25 Q. Okay. You make another -- you

1 propose a number of combinations of prior art
2 references in your analysis of the '389
3 patent, correct?

4 A. Yeah. And in my opening report,
5 there are a number of combinations of
6 references that are included.

7 Q. Do you know of any instance in the
8 real world in which those references were
9 actually combined?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: As discussed earlier,
12 I can't speak to everything that's in the
13 real world.

14 BY MR. SHEASBY:

15 Q. Can you speak of any instance in
16 which those references were actually ever
17 combined?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: I think similar to my
20 answer earlier today, the references that I
21 combined I felt were all in the relevant
22 field of art by which someone working in that
23 space would be motivated to at least be aware
24 of them and know how to combine them.

25 / / /

1 BY MR. SHEASBY:

2 Q. Are you aware of any instance in
3 which they were actually combined by anyone
4 with skill in the art?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: I don't -- I don't
7 think I specify anywhere where they were
8 combined. I think I specified a motivation
9 to combine.

10 BY MR. SHEASBY:

11 Q. Objection. Form.

12 Are you aware of any instance in
13 which they were actually combined in the real
14 world?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: Again, I don't think
17 I referenced any specific place that they
18 were -- that I saw them combined firsthand.

19 BY MR. SHEASBY:

20 Q. Okay. Did you speak to any Samsung
21 engineers to ask if they would think it would
22 be rational to combine these references
23 together?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: I didn't speak to any

1 Samsung engineers about the opinions in my
2 report. I think I said that before.

3 BY MR. SHEASBY:

4 Q. I've marked a new exhibit. It's
5 going to be Exhibit 23. Let me know when you
6 get it.

7 (Exhibit Number 23 was marked.)

8 THE WITNESS: Okay. This is the
9 Burrows reference.

10 BY MR. SHEASBY:

11 Q. Mm-hmm.

12 A. Yeah, I have it open.

13 Q. Let's go to Figure 5.

14 A. Okay.

15 Q. What's the underlying device in
16 Figure 5? What's the shape of the underlying
17 layer in Figure 5?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: I'm just looking
20 through the patent. I don't believe Figure 5
21 shows the underlying device, but I'm
22 double-checking.

23 BY MR. SHEASBY:

24 Q. I think the underlying device or
25 layer is 205.

1 A. So I think 205 is the substrate
2 they describe it as.

3 Q. Right. And you describe the
4 layers -- the passivization -- the
5 planarization layers as 220; is that correct?

6 A. In my opening report?

7 Q. Yes, sir.

8 A. I'm sorry. I'm not seeing it right
9 now in my report specifically where I called
10 out the planarization layer in Burrows or
11 which layer was the planarization. I see 210
12 is the decoupling layer.

13 Q. I believe it's in 332. You discuss
14 it in paragraph 332 -- or page 332.

15 A. So, again, I'm sorry. I'm looking
16 here. I don't see the use of the word
17 "planarization layer."

18 Q. Right. Is there a planarization
19 layer in Humphreys?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: I'm sorry, do you
22 mean in Burrows?

23 BY MR. SHEASBY:

24 Q. Sorry, in Burrows, excuse me, yes.

25 A. So I think -- I mean, I think

1 Burrows shows with the deposition of these
2 layers, the planarization is occurring in
3 Figure 5 from the bottom towards the top.

4 Q. So you believe that layer -- the
5 first of the 210 layers is a planarization
6 layer?

7 A. 210?

8 Q. Yes, sir.

9 A. So I think it shows a planarization
10 process that could be applied to Jones. So
11 if you look at Burrows with the slanted side
12 walls, which it did seem that you had an
13 objection to for Jones, with the combination
14 of layers together, it's showing a process
15 for flattening out that slope.

16 Q. And the combination of layers makes
17 the planarization layer?

18 A. It's showing a process by which you
19 could planarize.

20 MR. STAFFORD: Objection. Form.

21 BY MR. SHEASBY:

22 Q. By combining together multiple
23 layers?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: I think what Burrows

1 is teaching is similar to the PML structure,
2 many layers that will eventually planarize
3 the surface.

4 BY MR. SHEASBY:

5 Q. Not the question I asked.

6 Objection. Form.

7 Can multiple layers combine
8 together to make the planarization layer?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I don't think I
11 specified a planarization layer in Burrows.

12 BY MR. SHEASBY:

13 Q. Is there a planarization layer in
14 Burrows?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: No. I think Burrows
17 describes a process with a barrier stack and
18 a specific mask relative to the dimensions
19 that taken together would result in a more
20 planar surface.

21 BY MR. SHEASBY:

22 Q. And is that a planarization layer?

23 A. It's a process by which you can
24 deposit layers to help planarize. As I said,
25 I don't think I defined a planarization layer

1 in Burrows.

2 Q. The first layer in Humphreys 210 is
3 actually -- makes a slope shape, makes a less
4 flatter shape than the substrate below it,
5 correct?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I'm sorry, do you
8 mean Burrows or Humphreys?

9 BY MR. SHEASBY:

10 Q. Burrows. Excuse me.

11 A. So you said the first layer, 210?

12 Q. Yes.

13 A. Makes it what? I got thrown off by
14 the Humphreys part. I was looking somewhere
15 else.

16 Q. Burrows, the first 210 layer, the
17 angles are more acute, it's less flat than
18 what's below it?

19 MR. STAFFORD: Objection.

20 THE WITNESS: Than 205?

21 BY MR. SHEASBY:

22 Q. Yes, sir.

23 A. Yes, that's true.

24 Q. All right. Let's go to Exhibit 17.

25 A. Okay.

1 Q. So on the right-hand side --

2 A. I'm sorry, what part? There's 62
3 pages.

4 Q. I'm getting there. It's on page --
5 PDF page 4, and I'm showing it.

6 A. Okay.

7 Q. Does the right-hand side describe
8 the thin-film encapsulation process that's
9 used by Samsung?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: I mean, I think that
12 that is a cartoon. So -- on some level, yes,
13 but it's not an engineering drawing or
14 anything.

15 BY MR. SHEASBY:

16 Q. [REDACTED]
[REDACTED]
[REDACTED]

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I mean, this is a
21 PowerPoint or -- I don't -- I wouldn't take
22 this as the exact result of Samsung's device,
23 but [REDACTED]
[REDACTED]

25 / / /

1 BY MR. SHEASBY:

2 Q. Let me -- why don't we go down to
3 something more precise, then. We can go down
4 to page 1204. Why don't we go there. Here
5 we go. [REDACTED]

6 [REDACTED]

7 A. Yes, that's correct.

8 Q. [REDACTED]

9 [REDACTED]

10 [REDACTED]

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: [REDACTED]

13 [REDACTED]

14 [REDACTED]

15 [REDACTED]

16 [REDACTED]

17 [REDACTED]

18 BY MR. SHEASBY:

19 Q. [REDACTED]

20 [REDACTED]

21 [REDACTED]

22 [REDACTED]

23 [REDACTED]

24 [REDACTED]

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED]

2 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 BY MR. SHEASBY:

4 Q. Right. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

5 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6 [REDACTED] [REDACTED] [REDACTED]

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

9 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

10 BY MR. SHEASBY:

11 Q. Okay. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

12 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

13 [REDACTED] [REDACTED] [REDACTED]

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: Well, these images
16 don't show any defects.

17 BY MR. SHEASBY:

18 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

19 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

20 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

21 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

22 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

23 [REDACTED]

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: I haven't observed

1 any. And you had originally pointed to
2 page 71204, [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
3 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
4 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
5 [REDACTED] [REDACTED] [REDACTED]

6 BY MR. SHEASBY:

7 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED]
8 [REDACTED]

9 A. Yes.

10 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
11 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
12 [REDACTED]

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: I don't believe so.

15 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
16 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
17 [REDACTED]

18 BY MR. SHEASBY:

19 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED]
20 [REDACTED] [REDACTED] [REDACTED] [REDACTED]
21 [REDACTED]

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I mean, looking at
24 these and the images, [REDACTED] [REDACTED] [REDACTED]
25 [REDACTED]

1 BY MR. SHEASBY:

2 Q. Now, the underlying device -- the
3 device is -- the function of the device is to
4 emit a wave length -- some type of wave
5 length of light, correct?

6 A. Yeah, I guess. It's an organic
7 light-emitting diode, so presumably it's
8 supposed to emit light.

9 Q. What you describe as the [REDACTED]
10 [REDACTED], its primary function is to facilitate
11 that emission; is that correct?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I guess I would say
14 it's been described as enhancing the
15 emission, yeah.

16 BY MR. SHEASBY:

17 Q. And how does it function -- so
18 explain what are the pieces below that [REDACTED]
19 [REDACTED] and how they function together to
20 emit light.

21 A. I'm sorry. The entire device or
22 are we talking about [REDACTED] [REDACTED] now?

23 Q. So, like, there's structures below
24 the [REDACTED] [REDACTED] and what are those structures
25 that are involved in the emission of light?

1

[REDACTED]

2

[REDACTED]

3

A. [REDACTED]

4

[REDACTED]

5

[REDACTED]

6

[REDACTED]

7

[REDACTED]

8

[REDACTED]

9

[REDACTED]

10

[REDACTED]

11

[REDACTED]

12

Q. And then all those layers, the

13

anode, cathode, and control circuit work

14

together to emit light?

15

A. A bias is required on the device to

16

emit light, so yes.

17

Q. Okay. Let's go to Jones 220. I

18

believe that's paragraph -- actually, let's

19

go to Katona. Pagano. Yeah. Let's go to

20

Pagano, which is page 362.

21

A. Sorry, is that an exhibit that

22

you've introduced?

23

Q. I have not.

24

A. So where am I looking now, then?

25

Q. Page 362 of your report.

1 A. Okay.

2 Q. Do you know what the invention date
3 is of the disclosure relied on in Pagano?

4 A. If there's not an invention
5 disclosure date listed right here in my
6 report, I don't know off the top of my head.

7 Q. Okay.

8 MR. SHEASBY: Why don't we take a
9 break.

10 THE VIDEOGRAPHER: We're going off
11 the record. The time is 3:20 p.m.

12 (Recess.)

13 (Exhibit Numbers 24 through 31
14 were marked.)

15 THE VIDEOGRAPHER: Back on the
16 record. The time is 3:40 p.m.

17 BY MR. SHEASBY:

18 Q. Why don't you open up Exhibit 6.
19 Oh, sorry. Why don't you go ahead and open
20 up Exhibit 24.

21 A. Okay.

22 Q. Do you recognize analyzing this
23 document?

24 A. I mean, I don't remember the
25 document specifically, but it looks like a

1 lot of documents that I looked at.

2 Q. Does this describe an
3 optoelectronic device?

4 MR. STAFFORD: Objection.

5 THE WITNESS: So I'm looking in my
6 opening report to see if I make any
7 statements on this here. And now I'm looking
8 at my rebuttal report.

9 I'm sorry, Mr. Sheasby, the first
10 order I don't see anywhere where I reference
11 this document.

12 BY MR. SHEASBY:

13 Q. Right. I'm asking you as an
14 expert, is this an optoelectronic device?

15 A. Yeah. So the image that's shown on
16 SDC_00071903 appears to be an optoelectronic
17 device.

18 Q. Now, within that optoelectronic
19 device --

20 A. Or at least it's part of one.

21 Q. It's the layers within the
22 optoelectronic device that allow for the
23 emission of light, correct?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: It's the layers when

1 they get carriers, yes.

2 BY MR. SHEASBY:

3 Q. Okay. Now, [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]

5 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]

8 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] You know what? I think
10 it would be easier -- I'm going to paste this
11 image into a PowerPoint so that we can
12 annotate it as we discuss it.

13 So I'll mark this as Exhibit A for
14 right now. There we go. I have pasted the
15 page. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: I'm now looking at my
19 rebuttal report. I don't remember the
20 specifics of why they call things 1T, 2T.

21 BY MR. SHEASBY:

22 Q. I think it's a tandem. That's the
23 nomenclature for tandem.

24 A. Which is what I said when you asked
25 me the first time, but I don't remember if I

1 talked specifically about which layer is a 1T
2 or sublayers is a 1T. ■ ■ ■ ■ ■
3 ■ ■ ■ ■ ■.

4 Q. I think that's right, which is now
5 why I'm asking your question because you're
6 an expert and I'm eliciting expert
7 information.

8 A. I'm -- I wouldn't call myself an
9 expert on Samsung's internal code names they
10 use. I'm not an employee of Samsung.

11 Q. I'm not saying -- I'm saying you're
12 an expert on -- you purport to be an expert
13 on the design of optoelectronic devices and
14 their manufacture, correct?

15 MR. STAFFORD: Objection. Form.
16 BY MR. SHEASBY:

17 Q. Let's start with some easy stuff.
18 Where would the first electrode be in this
19 design?

20 A. The first electrode would be below
21 the figure that's shown here.

22 BY MR. SHEASBY:

23 Q. Does that work for you?

24 A. Sure.

25 Q. And what are the -- what's 1T, 2T,

1 and the 3T?

2 A. I didn't provide any opinion on
3 what the 1T, 2T is. I've looked in my
4 report.

5 Q. Do you have any opinion on what the
6 1T is?

7 A. I didn't provide an opinion on what
8 1T is.

9 Q. Are there functional layers in the
10 1T through 3T region?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

14 BY MR. SHEASBY:

15 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: Well, presumably they
19 all have some function, otherwise, I don't
20 know why Samsung would include them.

21 BY MR. SHEASBY:

22 Q. What are the functional layers?

23 A. There's --

24 Q. Or you can just say "I don't know."
25 That's fine.

1

A. [REDACTED]

2

[REDACTED]

3

[REDACTED]

4

[REDACTED]

5

Q. And what is "BIL"?

6

A. [REDACTED]

7

[REDACTED]

8

[REDACTED]

9

[REDACTED]

10

[REDACTED]

11

[REDACTED]

12

[REDACTED]

13

[REDACTED]

14

[REDACTED]

15

[REDACTED]

16

[REDACTED]

17

Q. Right. And so speaking about these

18

layers, which I've put in the red box, what

19

color do they emit? What color light do they

20

emit?

21

MR. STAFFORD: Objection. Form.

22

THE WITNESS: [REDACTED]

23

[REDACTED]

24

BY MR. SHEASBY:

25

Q. And then what color do the

1 functional layers in the -- what color do the
2 functional layers in the green box emit?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] MR. SHEASBY:

8 Q. Now, the blue sequence 1T
9 through 3T, what is the wavelength that's
10 emitted by that sequence?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I don't see anything
13 on this page that tells me what the
14 wavelength is specifically. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] but I don't have any

20 information to tell you exactly what the
21 spectrum is right here.

22 BY MR. SHEASBY:

23 Q. There is the spectrum for the 1T
24 through 3T sequence, though, correct?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I believe that I
2 looked at a couple of different designs that
3 Samsung either uses or looked at that had
4 similar but different spectrum. But yes, it
5 would have -- the 1T to 3T would have a
6 spectrum.

7 BY MR. SHEASBY:

8 Q. And the 4T sequence would also have
9 a spectrum?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: I guess what I would
12 say is 1T to 4T would have a spectrum, of
13 which the 4T portion would represent the
14 green portion, and the 1T to 3T would
15 represent the blue portion.

16 BY MR. SHEASBY:

17 Q. Right. But there would be a
18 sequence -- the 4T sequence that would have a
19 spectrum that you don't know the exact number
20 but it's determinant, it would exist?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: When you've got
23 electrons and holes to the green emission
24 layer, it would have a spectrum that it would
25 emit.

1 (Exhibit Number A was marked.)

2 BY MR. SHEASBY:

3 Q. Now -- all right. Let me save this
4 as a PDF. What did I mark this as, Madam
5 Courtroom -- Court Reporter?

6 THE COURT REPORTER: Exhibit A.

7 BY MR. SHEASBY:

8 Q. I'm introducing this as Exhibit A
9 just for the record.

10 Now let's go to -- let's go to
11 Exhibit 26.

12 A. Okay.

13 Q. And let's turn to page 388. If you
14 go to page 388, the sequence of 1 to 3T BBB
15 will emit a blue wavelength, correct? A blue
16 light, correct?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: So I'm sorry,
19 which -- you're looking at the far left
20 structure now?

21 BY MR. SHEASBY:

22 Q. Yes. A 1T to 3T BBB will emit a
23 blue wavelength, correct?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: So multiple blue

1 emitters will emit blue light.

2 BY MR. SHEASBY:

3 Q. And that will be a blue wavelength,
4 correct?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: Yes, that would be a
7 blue wavelength.

8 BY MR. SHEASBY:

9 Q. Let me add an exhibit.

10 So this is Defendant's Corrected
11 Fifth Supplemental and Amended Responses to
12 Pictiva's First Set of Interrogatories.

13 Do you see that?

14 A. Yes, I do.

15 Q. And if you turn to page 90 --

16 A. So this is Exhibit 10?

17 Q. Yeah. Do you want me to -- give me
18 a second, I will -- I will place it in the
19 exhibit share. It's very large. It's going
20 to take a second.

21 A. It's not Exhibit 10.

22 Q. No. It's not Exhibit 10 in exhibit
23 share, but I will get it into exhibit share.
24 Okay. It's going to be marked as Exhibit 32.

25 (Exhibit Number 32 was marked.)

1 THE WITNESS: Okay. I have it.

2 BY MR. SHEASBY:

3 Q. If you go down -- this is for the
4 benefit of the court reporter. Go to
5 page 91.

6 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

15 BY MR. SHEASBY:

16 Q. Now, is it your position in the
17 patent -- where in the patent does it specify
18 that the organic layer sequence must be all
19 layers between the cathode and anode?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: We are now talking
22 about the '547 patent?

23 BY MR. SHEASBY:

24 Q. Yes, sir. Do you need a copy of
25 that added as an exhibit?

1 electromagnetic radiation when they get
2 carriers, yes.

3 BY MR. SHEASBY:

4 Q. And in the same thing -- and that
5 electromagnetic radiation would correspond to
6 the blue spectrum; is that correct?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: If you can get
9 electromagnetic radiation -- or sorry, if you
10 can get carriers to that region, it will
11 emit -- it will emit blue electromagnetic
12 radiation. And it's my understanding that
13 you can't do that without turning the green
14 on.

15 BY MR. SHEASBY:

16 Q. So I'm actually asking a different
17 question.

18 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

25 Q. When that current is passed through

1 the entire optoelectronic device, [REDACTED]

2 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 [REDACTED] [REDACTED]

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

6 [REDACTED] [REDACTED] [REDACTED] [REDACTED].

7 BY MR. SHEASBY:

8 Q. Okay. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

9 [REDACTED] [REDACTED] [REDACTED] [REDACTED]

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: No. The composite

12 spectrum would be all the one that the

13 outside world sees.

14 BY MR. SHEASBY:

15 Q. I'm not asking about the composite

16 spectrum. I'm asking about what will be

17 emitted by the 4T.

18 A. Yes. But you're calling it a

19 second spectrum and I didn't call it that.

20 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

21 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

22 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

23 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

24 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

25 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

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[REDACTED]

MR. STAFFORD: Objection. Form.

BY MR. SHEASBY:

Q. Let me ask that again. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

MR. STAFFORD: Objection. Form.

THE WITNESS: So yes. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

BY MR. SHEASBY:

Q. Well, what you mean by they don't emit it independently is because they're both turned on for the same current passing through them all, correct?

MR. STAFFORD: Objection. Form.

THE WITNESS: Meaning the -- say the 4T layers were just removed, you'd have no way to get carriers from the electrode down to the 3T that you're talking about.

BY MR. SHEASBY:

Q. Well, if there was no 4T green put

1 on it, then the cathode and anode would just
2 bracket the 1T to 3T blue, correct?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

5 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6 BY MR. SHEASBY:

7 Q. I understand that.

8 So what's a structured layer?

9 A. So I'm going back to the claim
10 construction because I believe there's -- I
11 recall there was agreed-upon construction for
12 that.

13 I'm sorry, no. The agreed-upon
14 instruction was for volume structure.

15 Q. So what's a structured layer?

16 A. Where specifically are you
17 referencing now, Mr. Sheasby?

18 Q. In the '547 patent.

19 A. So in the '547 patent, it's the
20 area that encompasses what they call the
21 first and second regions.

22 Q. And what are first and second
23 regions?

24 A. So the first regions is the
25 wavelength conversion region, and the second

1 region -- and the second region has the
2 filter layer.

3 Q. Let's go to Exhibit 31. Let's go
4 to page 780.

5 A. Okay.

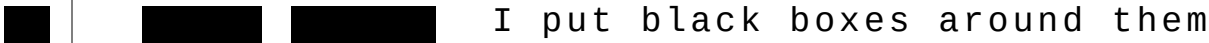
6 Q. Are the -- let me -- what does it
7 mean to be arranged laterally?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: So, again, I'm going
10 back to the claim construction chart in the
11 opening report. Okay. I'm not seeing a --
12 any construction here, so I guess I would --
13 unless I'm missing it, it would be arranged
14 planar to one another.

15 BY MR. SHEASBY:

16 Q. So this is a page from the document
17 we were looking at. 

 I put black boxes around them
20 just so that they can be seen easier.

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: So your boxes are
23 actually larger than the QD regions.

24 BY MR. SHEASBY:

25 Q. That's correct. Just so that

1 people can see them.

2 A. But your boxes, then, are arranged
3 laterally, but I don't know that the QD
4 regions are.

5 Q. Okay. Well, I'll remove the boxes.
6 Are the QD regions arranged
7 laterally?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: [REDACTED]

[REDACTED]

[REDACTED]

12 BY MR. SHEASBY:

13 Q. What do you mean "partially
14 lateral"?

15 A. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

22 Q. [REDACTED]

[REDACTED]

[REDACTED]

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]

4 BY MR. SHEASBY:

5 Q. And why aren't the bottom parts
6 arranged laterally?

7 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED].

11 Q. Okay. So you agree that -- and you
12 think that to be arranged laterally requires
13 that each of the regions have the identical
14 depth. Is that your analysis?

15 MR. STAFFORD: Objection. Form.

16 BY MR. SHEASBY:

17 Q. You can answer the question.

18 A. So with respect to the patent, it
19 says that the first and second regions are
20 arranged laterally, and [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED].

25 Q. Not the question I'm asking at all.

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MR. STAFFORD: Objection. Form.

THE WITNESS: [REDACTED]

BY MR. SHEASBY:

Q. That's what I'm getting to. Where does it say in the patent that the entire depth of each of the regions must be the same to be laterally arranged?

MR. STAFFORD: Objection. Form.

THE WITNESS: So now we're speaking to the patent, and the patent doesn't say that the wavelength conversion regions are arranged laterally. It says the first region and the second region where the second region is the filter layer, and so you're asking two different things.

BY MR. SHEASBY:

Q. Right. So now answer my question. Where in the patent does it say that the first region and the second region have to be the same depth to be arranged

1 laterally?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: It says in the patent
4 that the second region is the filter layer,
5 and we haven't talked about the filter layer
6 at all.

7 BY MR. SHEASBY:

8 Q. Objection. Form.

9 Where in the patent does it say
10 that the first region and the second region
11 to be arranged laterally must have the same
12 depth?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: I didn't say to have
15 the same depth, but I said they had to be
16 lateral. And the second region is a filter
17 layer which is not lateral from the first
18 region.

19 BY MR. SHEASBY:

20 Q. Sir, objection. Form.

21 Where in the patent does it say the
22 first region and the second region must have
23 the same depth to be arranged laterally?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: It says that the

1 first region, which is the wavelength
2 conversion region, has to be lateral from the
3 filter layer, which is shown in here to not
4 be lateral from the wavelength conversion
5 region.

6 BY MR. SHEASBY:

7 Q. I don't know what this is or that.
8 I'm just asking you a question.

9 Where does it say that the first
10 region and the second region must be the same
11 depth?

12 A. And I'm just pointing you back to
13 the patent where it says what the first
14 region and second region are, which you seem
15 to have ignored here by trying to look at two
16 regions that aren't described by the patent.

17 Q. Objection. Form.

18 Where does it say in the patent
19 that the second region must be the same depth
20 to be arranged laterally?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: It says that the
23 first region, the wavelength conversion,
24 region, needs to be lateral from the second
25 region, which is the filter layer.

1 BY MR. SHEASBY:

2 Q. I understand that.

3 Objection. Form.

4 Where does it say they have to have
5 the same depth?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: It says they need to
8 be arranged laterally.

9 BY MR. SHEASBY:

10 Q. Okay. Does it say they have to
11 have the same depth?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: It says they need to
14 be arranged laterally.

15 BY MR. SHEASBY:

16 Q. Objection. Form.

17 Does it say they have to have the
18 same depth?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: It says they need to
21 be arranged laterally.

22 BY MR. SHEASBY:

23 Q. Does that mean they have to have
24 the same depth?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: It means that the
2 wavelength conversion region, the first
3 region, needs to be lateral from the filter
4 layer, the second region, based on the
5 patent.

6 BY MR. SHEASBY:

7 Q. What does it mean to be lateral?
8 Does it mean to have the same depth?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: It means to be
11 located roughly in the same plane, as we
12 talked about before.

13 BY MR. SHEASBY:

14 Q. What does it mean to be "roughly in
15 the same plane"?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: Well, in this
18 drawing, you have drawn a line across. I
19 would say that that line represents a plane.

20 BY MR. SHEASBY:

21 Q. Okay. And by "this drawing," you
22 mean the figure that's on the screen right
23 now?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: Yes.

1 BY MR. SHEASBY:

2 Q. Okay. And that's Exhibit B. So
3 let me go ahead and print it out and mark it
4 as an exhibit.

5 (Exhibit Number B was marked.)

6 BY MR. SHEASBY:

7 Q. Let me ask you another question.
8 Did you clear any of your
9 non-infringement theories with any Samsung
10 engineers?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: What do you mean
13 "clear them"?

14 BY MR. SHEASBY:

15 Q. Well, did you say -- did you speak
16 to any Samsung engineers to make sure your
17 understanding of the operation of the devices
18 is correct or they agree with your
19 characterization of the operation?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: As I said before, I
22 did not -- I didn't get any edits on my
23 opinions from Samsung engineers.

24 BY MR. SHEASBY:

25 Q. For the record, I've marked Exhibit

1 B.

2 Let's go to the '547 patent. And
3 let's go to Column 12.

4 A. Okay.

5 Q. And I put up Figure 4A and 4B. I
6 believe that's discussed at Column 12. Now,
7 what's the second region in 4A and 4B?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: So the -- you said
10 the second region?

11 BY MR. SHEASBY:

12 Q. Yes, sir.

13 A. So it says the second region has
14 scattering layer 5 and filter layer 4.

15 Q. And is the second region arranged
16 laterally with the first region?

17 MR. STAFFORD: Objection. Form.

18 THE WITNESS: The second region as
19 shown in this diagram is lateral to the first
20 region.

21 BY MR. SHEASBY:

22 Q. The second region has two sublayers
23 in it, correct?

24 A. It has --

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: It has a scattering
2 layer and a filter layer.

3 BY MR. SHEASBY:

4 Q. Is the scattering layer arranged
5 laterally to the first region?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: It's partially
8 lateral. I guess, yeah, it overlaps -- I
9 would say it's lateral to the first region
10 and the first region is partially lateral to
11 the scattering layer of the second region.

12 BY MR. SHEASBY:

13 Q. So is the scattering layer in the
14 second region lateral to the scattering layer
15 in the first region?

16 A. I think you misspoke because the
17 first region is a wavelength conversion
18 region not a scattering region.

19 Q. Is conversion region 32 arranged
20 laterally with region 5?

21 A. So I would say 32 is partially
22 lateral to 5 and 5 is lateral to 32.

23 Q. And is region 4 lateral to region
24 32?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: Region 4 is lateral
2 to 32 and 32 -- well, I think 32 is actually
3 the phosphor. 31, I believe, is what you
4 mean.

5 BY MR. SHEASBY:

6 Q. Yes.

7 A. Is lateral to 31 and 31 is
8 partially lateral to 4.

9 Q. Is the design in Figure 4A and 4B
10 encompassed by Claim 1 of the patent?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I don't know if
13 Claim 1 is represented by that particular
14 embodiment.

15 BY MR. SHEASBY:

16 Q. Okay. Let's go back to Exhibit 31.
17 In the red QD region, there is a dark red
18 below a more pink red.

19 Do you see that?

20 A. So the -- the red QD region, I
21 believe, is just the pink region, yes.

22 Q. And what is that made up of? What
23 is that region?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: The region that

1 contains the quantum dots.

2 BY MR. SHEASBY:

3 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

4 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

5 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6 [REDACTED]

7 Q. And then there in the green -- the
8 green region there's the green QD, which is
9 the green quantum dot region; is that
10 correct?

11 A. Yes. The lighter of the green
12 regions is where the quantum dots are, the
13 wavelength conversion part.

14 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

15 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

16 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

17 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

18 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

19 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: Yes. That's my
22 understanding.

23 BY MR. SHEASBY:

24 Q. You can answer.

25 A. I said in this schematic, yeah,

1 that would be my understanding. [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

3 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

10 BY MR. SHEASBY:

11 Q. They don't use the word "region."

12 You just added that.

13 A. Sorry. There's a block that's
14 shown as a pink, lighter green, and white
15 that say white, red, and green QD.

16 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED]

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: Yeah. [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED]

24 BY MR. SHEASBY:

25 Q. All right. We'll just do it

1 cleaner. There is a -- is that -- is the red
2 QD layer, is that a conversion layer?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: My understanding
5 would be the red QD layer would be a
6 conversion layer.

7 BY MR. SHEASBY:

8 Q. And the green QD would be a
9 conversion layer; is that correct?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: Yes, that's correct.

12 BY MR. SHEASBY:

13 Q. And the white QD would be a
14 conversion layer; is that correct?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I'm actually not
17 certain what the white QD layer is, what the
18 functionality is.

19 BY MR. SHEASBY:

20 Q. [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

23 A. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

25 Q. If we go to Figure 4A and the

1 second region, region 5 is a conversion
2 layer; is that correct? The top of region --
3 for the second region in Figure 4A, the top
4 layer is layer 5, and that's a conversion
5 layer; is that correct?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I believe that's a
8 scattering layer. Let me check with the
9 patent.

10 BY MR. SHEASBY:

11 Q. Why don't we do Figure 7, then.
12 That will be easier.

13 A. Yes. Just to be clear, so 5 is a
14 scattering layer.

15 Q. So we'll go to Figure 7.

16 A. Okay.

17 Q. Okay. So if you go to Figure 7,
18 Figure 7 in region 1 contains a conversion
19 layer as well as a filter layer, correct?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: Yeah. So region --
22 in Figure 7, region 3 is a conversion layer
23 and then 7 is a filter layer.

24 BY MR. SHEASBY:

25 Q. Is that design covered by the

1 claims of the patent?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: I don't know that the
4 patent calls out any specific embodiments. I
5 don't know. The patent claims say "as seen
6 in Figure 7."

7 BY MR. SHEASBY:

8 Q. As an expert, do you understand --
9 does your understanding of Claim 1 encompass
10 Figure 7?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I didn't map Claim 1
13 to Figure 7.

14 MR. SHEASBY: Let's take a break.

15 THE VIDEOGRAPHER: This marks the
16 end of Media Unit 3 of the deposition of
17 Thomas Katona, Ph.D. The time is 4:44 p.m.
18 We are off the record.

19 (Recess.)

20 THE VIDEOGRAPHER: We are back on
21 the record at 5:02 p.m. This marks the
22 beginning of --

23 MR. STAFFORD: One minute.

24 THE VIDEOGRAPHER: I'm going to hit
25 stop.

1 (Recess.)

2 THE VIDEOGRAPHER: We are back on
3 the record at 5:03 p.m. This marks the
4 beginning of Media Unit 4 of the deposition
5 of Thomas Katona, Ph.D.

6 Please continue.

7 BY MR. SHEASBY:

8 Q. Sir, let's go back to Claim 1 of
9 the '547 patent.

10 A. Okay.

11 Q. It says:

12 "An organic layer sequence which
13 emits an electromagnetic radiation
14 having a first wavelength spectrum
15 during operation."

16 Do you see that?

17 A. Yes, I see that.

18 Q. So do you understand an organic
19 layer sequence to allow more than one organic
20 layer sequence in the optoelectronic device?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: My understanding is
23 it would have to be an organic layer sequence
24 which emits an electromagnetic radiation.

25 / / /

1 BY MR. SHEASBY:

2 Q. Yes. So there can be more than one
3 organic layer sequence that emits
4 electromagnetic radiation having a given
5 wavelength spectrum during operation?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: If there were some
8 way to turn on different sequences, I suppose
9 that's possible.

10 BY MR. SHEASBY:

11 Q. So you suppose it's possible. Does
12 the claim allow for more than one organic
13 layer sequence in the optoelectronic device?
14 Yes or no?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: So my read is that
17 when the device is on, which would allow it
18 to emit electromagnetic radiation, that the
19 organic layer sequence that's referred to
20 here is what produces the electromagnetic
21 radiation, which if there are multiple
22 emitting layers, would be the combination of
23 those.

24 BY MR. SHEASBY:

25 Q. Objection. Form.

1 Can there be more than one organic
2 layer sequence in the optoelectronic device?
3 Yes or no?

4 MR. STAFFORD: Objection. Form.
5 (Reporter clarification.)

6 BY MR. SHEASBY:

7 Q. In the optoelectronic device?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: So this is describing
10 an organic layer sequence which emits an
11 electromagnetic radiation and the devices and
12 the products that we're looking at have an
13 organic layer sequence that emits the full
14 first wavelength spectrum.

15 BY MR. SHEASBY:

16 Q. Objection. Form.

17 I'm not talking about the devices.
18 I'm talking about the claim. Do you
19 understand that, sir?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: I don't -- I don't
22 recall seeing anywhere where the '547 patent
23 describes multiple independently controlled
24 emitting regions, no.

25 / / /

1 BY MR. SHEASBY:

2 Q. Not the question I asked either.
3 Did you understand the question I
4 asked, sir?

5 MR. STAFFORD: Objection. Form.

6 THE WITNESS: I think I'm answering
7 the question to the best of my ability. It
8 seems you're not happy with the answer,
9 but --

10 BY MR. SHEASBY:

11 Q. You shouldn't take anything from
12 that, sir, and you don't need to be
13 argumentative.

14 A. I don't believe I'm being
15 argumentative.

16 Q. An organic layer sequence, does
17 that mean to you one or more organic layer
18 sequences?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: It's the sequence
21 that emits electromagnetic radiation.

22 BY MR. SHEASBY:

23 Q. Can there be more than one organic
24 layer sequence emitting electromagnetic
25 radiation having a wavelength spectrum during

1 operation?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: If there were a way
4 to have a device with -- that can control the
5 different regions such that they
6 independently can emit light, then that would
7 be independent organic layer sequences. I
8 haven't seen that described in the '547
9 patent.

10 BY MR. SHEASBY:

11 Q. Where in the claim does it use the
12 word "independent operation"? Does it use
13 that phrase?

14 A. It says it emits light, which means
15 it has to be turned on.

16 Q. It says it emits a first wavelength
17 spectrum, correct?

18 A. Electromagnetic radiation with the
19 first wavelength spectrum, correct.

20 Q. And during operation, correct?

21 A. Yes. It has to be an
22 optoelectronic device.

23 Q. Yes. And it doesn't say
24 independent, correct?

25 MR. STAFFORD: Objection. Form.

1 BY MR. SHEASBY:

2 Q. It doesn't say independent
3 operation, correct?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: It says it has to be
6 an organic layer sequence which emits an
7 electromagnetic radiation having a first
8 wavelength spectrum.

9 BY MR. SHEASBY:

10 Q. Does it say independent operation?
11 Yes or no, sir?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: It says "during
14 operation."

15 BY MR. SHEASBY:

16 Q. Does it say "independent
17 operation"? Yes or no, sir?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: It says that it has
20 to be a first wavelength spectrum during
21 operation, which presumably means you have to
22 get electrons and holes to the emitting
23 layer. So you need all the sequences -- my
24 read is the organic layer sequence that is
25 required to do all that functionality.

1 BY MR. SHEASBY:

2 Q. Objection. Form.

3 Does the claim say "independent
4 operation"? Yes or no?

5 A. The word "independent operation" is
6 not in Claim 1A.

7 Q. Now, let's go back and look at
8 another document, which is PX -- PX --
9 PTX4056.

10 Exhibit 26. And let's turn to
11 page 25. 4T BBBG.

12 Do you see that?

13 A. You're looking at the left-hand
14 side and the rightmost structure.

15 Q. Yes, sir.

16 A. Yes, I see it.

17 Q. Does that depict a green wavelength
18 spectrum?

19 A. It depicts a blue and green
20 together.

21 Q. Maybe I can do this in a
22 PowerPoint.

23 I'm putting a box -- is this the
24 electromagnetic radiation that's emitted from
25 the 4T BBBG optoelectronic device?

1 A. Yes. That's my understanding. I
2 don't know whether that specific chart is
3 like a measured spectrum that they put in or
4 a schematic of the spectrum, but it's
5 representative of the spectrum, yes.

6 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED]

9 MR. STAFFORD: Objection. Form.

10 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

11 BY MR. SHEASBY:

12 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] MR. SHEASBY:

19 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED]

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

1

[REDACTED]

2

[REDACTED]

3

BY MR. SHEASBY:

4

Q. [REDACTED]

5

[REDACTED]

6

MR. STAFFORD: Objection. Form.

7

THE WITNESS: [REDACTED]

8

[REDACTED]

9

[REDACTED]

10

BY MR. SHEASBY:

11

Q. [REDACTED]

12

[REDACTED]

13

[REDACTED]

14

A. [REDACTED]

15

[REDACTED]

16

Q. [REDACTED]

17

[REDACTED]

18

[REDACTED]

19

MR. STAFFORD: Objection. Form.

20

THE WITNESS: [REDACTED]

21

[REDACTED]

22

[REDACTED]

23

[REDACTED]

24

Q. The question I'm asking is: [REDACTED]

25

[REDACTED]

1

[REDACTED]

2

A. [REDACTED]

3

[REDACTED]

4

[REDACTED]

5

Q. Objection. Form.

6

[REDACTED]

7

[REDACTED]

8

[REDACTED]

9

MR. STAFFORD: Objection. Form.

10

THE WITNESS: [REDACTED]

11

[REDACTED]

12

[REDACTED]

13

[REDACTED]

14

BY MR. SHEASBY:

15

Q. Is the answer to my question yes?

16

A. I don't believe so.

17

Q. So let me ask you -- you referred

18

to there being blue photons and green

19

photons, correct?

20

A. Yes.

21

Q. What is the -- the spectrum of blue

22

photons, if you took all the blue photons and

23

mapped them onto the spectrum that you're

24

referring to, would that be different from

25

the spectrum of the green photons that you

1 were referring to?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: And I think one who
4 works in this field would look at the output
5 that's shown and say that is the spectrum,
6 and then you can refer to parts of the
7 spectrum, which is what you're doing now.

8 [REDACTED]
9 [REDACTED]

10 BY MR. SHEASBY:

11 Q. Objection. Form.

12 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: So looking at this --
18 you're asking two different things. So yes,
19 blue photons have a different wavelength than
20 green photons. That's just by definition.
21 If you're asking --

22 BY MR. SHEASBY:

23 Q. Go ahead. Keep going.

24 A. [REDACTED]
[REDACTED]

1 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]

5 But the -- if it does, they are
6 green photons not blue photons.

7 Q. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED]

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: It's labeled as blue.
12 As I said, I don't know -- there are no
13 wavelengths listed on that chart.

14 BY MR. SHEASBY:

15 Q. It's labeled as only emitting blue
16 photons, correct?

17 A. The labeling says blue.

18 Q. And those blue photons have a
19 different wavelength from the green photons
20 that are emitted, correct?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: As we've discussed,
23 yes. Every photon that has a different
24 wavelength has a different wavelength.

25 / / /

1 BY MR. SHEASBY:

2 Q. Objection. Form.

3 I said the green photons that are
4 emitting have a different wavelength from the
5 blue photons, correct?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: But -- yeah. I mean,
8 we're -- you're carving these up -- so there
9 are cyan photons in there too. There's all
10 sorts of -- this is a continuous spectrum
11 that is shown in the box that you've shown.

12 BY MR. SHEASBY:

13 Q. Right. Now I'm asking about the
14 blue photons and the green photons. Do you
15 understand that, sir?

16 A. The portions of the first spectrum,
17 yes, I do.

18 Q. Sir, I'm asking about [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] Do you understand
22 that?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: I do, and I'm just
25 clarifying that you're asking about a part of

1 a full spectrum.

2 BY MR. SHEASBY:

3 Q. That's not the question I asked,
4 sir.

5 Objection. Form.

6 [REDACTED]

7 [REDACTED]

8 [REDACTED]

9 A. [REDACTED]

10 [REDACTED]

11 [REDACTED]

12 Q. [REDACTED]

13 [REDACTED]

14 [REDACTED]

15 A. Yes. I'm not disagreeing, as I
16 said. Every photon with a different
17 wavelength has a different wavelength than --
18 yes, green photons are different than blue
19 photons as are the spectrum of green photons
20 all have different wavelengths too.

21 Q. Objection. Form.

22 [REDACTED]

23 [REDACTED]

24 [REDACTED]

25 [REDACTED]

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: And as I have said,
3 yes. All photons have a different wavelength
4 if they have a different wavelength. So the
5 blue ones have a different one than the green
6 and the collection of blue photons have
7 different wavelengths than each other, and
8 the collection of green photons have a
9 different wavelength than each other also.

10 BY MR. SHEASBY:

11 Q. Let's go -- now why don't you
12 download Exhibits 35 through 38.

13 (Exhibit Numbers 35 through 38 were
14 marked.)

15

16

17 BY MR. SHEASBY:

18 Q. And we'll start with 35, Igarashi.

19 A. Okay.

20 Q. What is the emission material
21 that's used in Igarashi?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: So one of the
24 materials that emits is a light phosphor.

25 / / /

1 BY MR. SHEASBY:

2 Q. In paragraph 107, is the -- what is
3 the emission material for emitting blue
4 light?

5 A. You said paragraph 107, correct?

6 Q. Yes.

7 A. It refers to as a bipanel DPVBi.

8 Q. Is there any other blue-emitting
9 material disclosed in Igarashi?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: Well, it says that
12 the BCzVBi is the blue emission species.
13 It's the dopant.

14 BY MR. SHEASBY:

15 Q. And it's disbursed in DPVBi,
16 correct?

17 A. Correct. That's the host.

18 Q. Have any other host blue emission
19 combination disclosed for blue light?

20 A. Right now, I don't see another
21 disclosure.

22 Q. And do you know what emission
23 spectrums would be emitted by that?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: Presumably a blue

1 emission spectrum, but I don't have the
2 spectrum memorized, no.

3 BY MR. SHEASBY:

4 Q. Did you analyze scientifically what
5 spectrums are emitted by BCzVBi disbursed in
6 DPVBi?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: No. I mean, it just
9 says it's a blue spectrum.

10 BY MR. SHEASBY:

11 Q. I asked you scientifically, did you
12 analyze what is emitted?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: Scientifically, it's
15 blue photons.

16 BY MR. SHEASBY:

17 Q. No, it's okay. That's a fine
18 answer.

19 A. It does say that in a particular
20 embodiment, the blue region having a
21 wavelength range 450 to 470 is emitted.

22 Q. Yes. And do you understand that
23 BC -- and what's the green -- what's the blue
24 radiation spectrum?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: It's just saying --
2 in one of the embodiments, at least, it's
3 saying 450 to 470.

4 BY MR. SHEASBY:

5 Q. I understand that. I'm saying do
6 you know what the blue wavelength spectrum
7 is?

8 A. The blue wavelength spectrum is
9 roughly maybe 405 or 410 nanometers to
10 500 nanometers.

11 Q. And do you know if BCzVBi and DPVBi
12 emits a wavelength beyond 450 to 470?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: Off the top of my
15 head, I don't know what the emission spectrum
16 is of that material.

17 BY MR. SHEASBY:

18 Q. Do you know if the design in
19 Igarashi is blocking part of the emission
20 spectrum of BCVBI [sic] and DPVBi?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: All I know is that
23 it's a blue filter with a blue emission.

24 BY MR. SHEASBY:

25 Q. Right. Did you investigate what

1 the -- what the spectrum that's emitted by
2 BCzVBi and DPVBi is?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: I didn't, although it
5 does say this is just an example of a method
6 for producing it. So presumably, it's not
7 limited to this one method.

8 BY MR. SHEASBY:

9 Q. But this is the method you mapped
10 the claims to, correct, sir?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I didn't map
13 paragraph 107 to the claims.

14 (Exhibit Number 39 was marked.)

15 BY MR. SHEASBY:

16 Q. Let's go to Exhibit 39.

17 A. Is that a new exhibit?

18 Q. It is.

19 A. Okay.

20 Q. Let's go to Figure 6. Where does
21 the noise at the tail end of the spectrum
22 start in these figures?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: I'm sorry, I'm trying
25 to look at Exhibit 22, if I've seen this

1 before.

2 So it looks like I didn't rely on
3 this for anything in my report, as far as I
4 can tell, unless I'm missing it right now.

5 BY MR. SHEASBY:

6 Q. That's the whole point, which is
7 that did you investigate whether BCzVBi and
8 DPVBi emits wavelength that goes well beyond
9 500 nanometers?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: I guess my first
12 comment is I'm looking at this paper, I don't
13 know that what you're showing me in Figure 6
14 is representative of all BCzVBi devices in
15 the world. Even these four devices in the
16 same paper have four different spectrum.

17 BY MR. SHEASBY:

18 Q. Right. So let's do it in pieces
19 first. What's the tail end of the spectrum?
20 Where does the tail end start of these
21 spectrums?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: For this spectrum
24 that's not in Igarashi?

25 / / /

1 BY MR. SHEASBY:

2 Q. I don't know what you mean. I'm
3 asking about Figure 6 in Exhibit 39. So
4 let's be very clear. Figure 6, Exhibit 39,
5 where is the tail end of the spectrum?

6 MR. STAFFORD: Objection. Form.

7 BY MR. SHEASBY:

8 Q. Where does it start?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: So for which of the
11 four spectrums?

12 BY MR. SHEASBY:

13 Q. All of them.

14 A. Well, there's four different
15 spectrums.

16 Q. I know. So tell me where the tail
17 end is for each of them.

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: Loosely -- I'm trying
20 now to integrate with my eyeball on the fly
21 which isn't the best way to do this, but the
22 red -- device B, C, and D -- I'm sorry, A, C,
23 and D are roughly at 500 nanometers, and
24 device B would probably be a longer
25 wavelength.

1 BY MR. SHEASBY:

2 Q. Okay. Now, are the -- for the red
3 device B, is -- at 550, is that noise?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: So I think device B,
6 again, without like doing an integrated
7 comparison, would not be noise. It looks
8 like there is some appreciable number of
9 photons in device B. The other ones that are
10 all -- as far as I can tell from this paper
11 all made from the same materials, don't seem
12 to show that peak.

13 BY MR. SHEASBY:

14 Q. Does Igarashi describe any organic
15 layer sequence that emits light substantially
16 only in the wavelength range of 450 to
17 470 nanometers?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: It just refers to it,
20 I believe, as an example of a particular
21 embodiment.

22 BY MR. SHEASBY:

23 Q. So I'm actually asking a different
24 question. For this embodiment, does it point
25 to any instance in which it does not filter

1 out a portion of the wavelength emitted by
2 the organic layer sequence?

3 MR. STAFFORD: Objection. Form.

4 THE WITNESS: I don't know that it
5 specifically says that it is filtering out
6 the -- I mean, it has a blue filter, but I
7 don't know that it's saying it's filtering
8 out the emission.

9 BY MR. SHEASBY:

10 Q. Does it say either way?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I believe Igarashi
13 says that the blue light is going to pass
14 through the blue filter.

15 BY MR. SHEASBY:

16 Q. That's not the question that I
17 asked.

18 Objection. Form.

19 Does Igarashi disclose that -- what
20 you described as the organic layer sequence
21 only has an emission spectrum in 450 to 470
22 or only in the blue light range?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: It doesn't use the
25 words only 450 to 470.

1 BY MR. SHEASBY:

2 Q. Okay. Now let's go on to another
3 one of these. Let's go on to 36, which is
4 Shiotani.

5 (Reporter clarification.)

6 BY MR. SHEASBY:

7 Q. What is the wavelength of the
8 emitted before filtering for what you
9 describe as the organic layer sequence in
10 Shiotani?

11 A. I'm sorry, have you provided
12 Shiotani?

13 Q. I have. It's Exhibit 36.
14 Do you have the question in mind?

15 A. Yes. I'm looking for where it
16 discloses the wavelength.

17 So right now I'm not seeing
18 specifically any disclosures of exact -- the
19 exact spectrum. That doesn't mean it's not
20 in here, but I'm trying to thumb through this
21 patent quickly.

22 Q. Well, I looked at your report, and
23 you have your report as well, and I don't see
24 where you identify the -- okay. Well, does
25 Shiotani use BCzVBi and DPVBi?

1 MR. STAFFORD: Objection. Form.

2 THE WITNESS: I think those are
3 referenced as a particular embodiment.

4 BY MR. SHEASBY:

5 Q. Do they disclose any other emitter
6 specifically?

7 MR. STAFFORD: Objection. Form.

8 THE WITNESS: It's disclosed -- I
9 believe these are the examples.

10 BY MR. SHEASBY:

11 Q. Does it disclose any other
12 examples?

13 A. The majority of the patent just
14 talks about blue light.

15 Q. I understand that.

16 And the question is: Is the blue
17 light -- is the emitter the organic layer,
18 the EL-emitting layer 19, does it disclose
19 what the -- what the wavelength spectrum of
20 that layer is?

21 MR. STAFFORD: Objection. Form.

22 THE WITNESS: It discloses it as
23 blue.

24 BY MR. SHEASBY:

25 Q. And does it disclose that the

1 ultimate wavelength after passing through the
2 conversion layer and the color filter layer
3 will be same as the organic layer wavelength?

4 MR. STAFFORD: Objection. Form.

5 THE WITNESS: It's passing through
6 a filter. Presumably, there is some
7 filtering.

8 BY MR. SHEASBY:

9 Q. Does the optoelectronic device emit
10 the entirety of the blue wavelength spectrum
11 that's generated by the organic layer 19 or
12 the organic layer sequence --

13 MR. STAFFORD: Objection. Form.

14 BY MR. SHEASBY:

15 Q. -- 19, 18 and 22?

16 MR. STAFFORD: Same objection.

17 THE WITNESS: I'm sorry. I don't
18 know where you're looking now. I'm not sure
19 where you're pointing me to.

20 BY MR. SHEASBY:

21 Q. Do you know if the organic layer
22 sequence that you identify in Shiotani, if
23 that has a wavelength spectrum that is
24 greater than what is ultimately -- that is
25 substantially more than the wavelength that's

1 emitted by the optoelectronic device after
2 filtration?

3 A. I can't comment on that. What I do
4 know is that if it is, in fact, the case it
5 would be obvious for one to modify that to be
6 only blue so that more light passes through.

7 Q. Objection. Form.

8 Do you know if in Shiotani the
9 spectrum that's emitted by the -- what you
10 describe as the organic layer sequence is
11 broader than the spectrum that's emitted by
12 the opto -- of the optoelectronic device
13 after filtration?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: There isn't a
16 spectrum shown that I see in the patent for
17 either the emitted -- the organic emission or
18 the filter layer.

19 BY MR. SHEASBY:

20 Q. Okay. Let me ask you the next
21 question. You cite a number of references
22 that you try to combine together, correct?

23 A. There are combinations listed in my
24 report.

25 Q. In the real world, has anyone ever

1 combined those references together?

2 MR. STAFFORD: Objection. Form.

3 THE WITNESS: So, again, I don't
4 know what everybody in the real world has
5 done. I think that in this case specifically
6 it would be clear that if you have a blue
7 filter and if this emitted wavelength that's
8 not shown happens to have photons longer than
9 blue, then it would be obvious to anyone who
10 works in this to increase the percentage of
11 photons that go by that filter by having a
12 narrower wavelength that they could do that
13 with a different material.

14 BY MR. SHEASBY:

15 Q. Objection. Form.

16 The question I asked you: Has
17 anyone in the real world ever combined these
18 references in the way you've combined them?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: I think my report
21 states that there would be motivation to
22 combine those because the references are
23 working in the same field, and I have given
24 you one example of a reason that people might
25 be motivated to combine.

1 BY MR. SHEASBY:

2 Q. Objection. Form.

3 In the real world, has anyone ever
4 combined these references in the way you
5 depict in your report?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: I can't speak to what
8 everybody in the world has done.

9 BY MR. SHEASBY:

10 Q. Has anybody in the world ever done
11 it?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I can't speak to
14 whether anyone has done it.

15 BY MR. SHEASBY:

16 Q. Did you speak to Samsung engineers
17 to see if they felt it was -- would be
18 obvious to make the combinations that you set
19 out?

20 MR. STAFFORD: Objection. Form.

21 THE WITNESS: As I said before, I
22 didn't consult Samsung engineers about my
23 opinions in this case. I merely stated that
24 as one has patents in the OLED space, I know
25 that what people look at for comparable

1 art -- and I think that there's comparable
2 art that I've cited for these combinations.
3 BY MR. SHEASBY:

4 Q. That's not the question I asked.
5 Objection. Form.

6 Did you ask Samsung engineers if
7 anyone would make the combinations that you
8 propose?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I said I didn't
11 consult Samsung engineers about the opinions
12 on my case. They're my opinions as one who
13 has worked in the field of semiconductor
14 light emitters for many years.

15 BY MR. SHEASBY:

16 Q. But never has designed commercially
17 an OLED, correct?

18 MR. STAFFORD: Objection. Form.

19 THE WITNESS: But has designed
20 commercial OLEDs.

21 BY MR. SHEASBY:

22 Q. You have never designed a
23 commercial OLED, correct?

24 MR. STAFFORD: Objection. Form.

25 THE WITNESS: I have designed

1 commercial LEDs and worked with OLEDs.

2 BY MR. SHEASBY:

3 Q. Have you ever designed a commercial
4 OLED?

5 A. I have not designed a commercial
6 OLED.

7 Q. When is the last time you published
8 a peer-reviewed paper on an OLED design?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I haven't published
11 peer-reviewed papers on OLEDs.

12 BY MR. SHEASBY:

13 Q. Okay. When's the last time you
14 received a research grant that funded the --
15 that did design of an OLED?

16 A. So I have not applied for any
17 research grants for OLEDs. I have done
18 consulting for the Department of Energy on
19 the solid-state lighting program.

20 Q. Objection. Form.

21 When is the last time you received
22 a research grant on OLED design?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: OLEDs are not my
25 primary area of research. I don't apply for

1 research grants for OLEDs.

2 BY MR. SHEASBY:

3 Q. Okay. Let's go to Exhibit 37,
4 which is Park.

5 A. Okay.

6 Q. So Park incorporates Tang; is that
7 correct?

8 MR. STAFFORD: Objection. Form.

9 BY MR. SHEASBY:

10 Q. You can look at paragraph 468 in
11 Exhibit 1, which is your report.

12 A. It says -- yeah, the report says
13 that it incorporates Tang by reference.

14 Q. And then Tang incorporates mixed
15 ligand aluminum chelates of the type
16 disclosed by VanSlyke -- Slyke, et al.

17 Do you see that?

18 A. Yes. I see that in paragraph 468.

19 Q. Where does Tang -- where does Park
20 expressly teach that the spectrum that's
21 emitted by what you describe as the organic
22 layer sequence is substantially all of the
23 spectrum that's emitted by the optoelectronic
24 device after filtration?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: So the report refers
2 to Tang which has a spectral region of 400 to
3 500 nanometers.

4 BY MR. SHEASBY:

5 Q. Yes. I understand that's the --
6 that's the emission. Now I'm asking: Is
7 there anything in the reference that
8 discloses that the -- what you describe as
9 the organic layer sequence has
10 substantially -- is not -- no substantial
11 portion of it is filtered out by the
12 structure of Park?

13 MR. STAFFORD: Objection. Form.

14 THE WITNESS: I mean, it just
15 refers to blue color filter, and you asked me
16 what wavelength range blue was earlier, and I
17 said roughly probably 405 to 410 up to 500,
18 and Tang refers to 400 to 500 nanometers.

19 BY MR. SHEASBY:

20 Q. And it discusses using the mixed
21 ligand aluminum chelates of VanSlyke, et al.

22 Do you see that? As the preferred
23 material.

24 A. Again, these are listed as
25 representative embodiments, but I see what

1 you're referring to.

2 Q. It refers to it as the preferred
3 material, correct, not just representative?

4 A. Not the only material, though.
5 Preferred is not the only one.

6 Q. It refers to it as preferred,
7 correct, sir?

8 MR. STAFFORD: Objection. Form.

9 THE WITNESS: I say it is preferred
10 but not only.

11 BY MR. SHEASBY:

12 Q. For the VanSlyke mixed ligand
13 aluminum chelates, what would be the emission
14 range of those -- the wavelength I mean?

15 MR. STAFFORD: Objection. Form.

16 THE WITNESS: I don't have the
17 emission of this memorized.

18 BY MR. SHEASBY:

19 Q. Let me ask you this: For any of
20 these references -- for the -- for the '547
21 patent, have you identified any device
22 anywhere in the world that meets these --
23 that embodies the elements of the claims of
24 the patent before the patent was filed?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I mean, I think I
2 describe everything in my opening report that
3 I was able to find for the '547.

4 BY MR. SHEASBY:

5 Q. Not the question I asked.

6 Objection. Form.

7 Do you describe any actual device
8 anywhere in the world that embodies the
9 elements of the claims of the '547 patent
10 before the '547 patent was filed?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: I pointed to patents
13 related to -- I don't know if the patents
14 were converted into commercial devices or
15 not.

16 BY MR. SHEASBY:

17 Q. Once again, my question --

18 Objection. Form.

19 Can you point to any device
20 anywhere in the world that embodies each of
21 the elements of the claims of the '547
22 patent?

23 MR. STAFFORD: Objection. Form.

24 THE WITNESS: I will repeat what I
25 referenced in my report are patents not

1 devices. And I can't speak to whether those
2 patents, many of which are owned by
3 companies, were turned into devices or not.

4 BY MR. SHEASBY:

5 Q. How about for the '389 patent? Do
6 you identify any device anywhere in the world
7 that embodies each of the claims of the '389
8 patent?

9 MR. STAFFORD: Objection. Form.

10 THE WITNESS: I think for the '389,
11 similarly what I've identified are patents
12 and prior art, but not -- I don't know
13 whether those were converted to commercially
14 available devices.

15 BY MR. SHEASBY:

16 Q. Any commercially available
17 device -- commercial, research, or any other
18 device anywhere in the world that has ever
19 been built that embodies the claims of the
20 '547 or '389 patent before they were --
21 before those patents were filed?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I guess I would be
24 shocked if -- in all those patents have --
25 none of those inventors had ever reduced any

1 of that to practice in a lab in a commercial
2 device, but I can't point to one.

3 BY MR. SHEASBY:

4 Q. Did you do that research of
5 identifying any commercial device -- did you
6 attempt to identify any device, actual device
7 anywhere in the world that meets each of the
8 elements of each of the claims of the
9 asserted patents before those patents were
10 filed?

11 MR. STAFFORD: Objection. Form.

12 THE WITNESS: These are old
13 patents. I don't know how I would have been
14 able to go back and find all these devices to
15 map claim elements to it.

16 BY MR. SHEASBY:

17 Q. Is the answer to my question yes or
18 no?

19 MR. STAFFORD: Objection. Form.

20 THE WITNESS: The answer to your
21 question is I don't know what I would have
22 done to be able to find these things.

23 BY MR. SHEASBY:

24 Q. Well, did you reach out to the
25 companies and ask them if they ever designed

1 devices based on these patents?

2 MR. STAFFORD: Objection to form.

3 THE WITNESS: Well, I mean, as one
4 who has worked in the industry before, I
5 think if someone reached out to me, I
6 probably would have been busy doing other
7 things for my company and not spent a lot of
8 time on that task.

9 BY MR. SHEASBY:

10 Q. So did you ask Samsung's lawyers to
11 serve subpoenas to determine whether there's
12 any device anywhere in the world that
13 practiced these patents?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: I didn't ask anybody
16 to serve subpoenas.

17 BY MR. SHEASBY:

18 Q. Did you do any research on industry
19 websites or a Wayback Machine to determine
20 what types of devices were available at the
21 time of the patent?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: I don't think the
24 specific internal devices that were available
25 15 years ago would have been something that a

1 company would have put online, but --

2 BY MR. SHEASBY:

3 Q. Did you do any research, yes or no,
4 as to what actual devices were being made at
5 the time of the patents in suit?

6 MR. STAFFORD: Objection. Form.

7 THE WITNESS: Well, I think there
8 is a difference between what devices are
9 being made and the internals of how they're
10 being made.

11 BY MR. SHEASBY:

12 Q. Objection. Form.

13 Did you do any research whatsoever
14 on what devices were being made at the time
15 of the patents in suit?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: I did not try to find
18 the internal manufacturing processes of
19 something on the internet.

20 BY MR. SHEASBY:

21 Q. Did you -- did you do -- did you
22 identify any of the prior art references
23 yourself or were they just provided by the
24 firm representing Samsung?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: I don't recall if I
2 found any of them or if they were all
3 provided by counsel. Most were provided by
4 counsel at least.

5 BY MR. SHEASBY:

6 Q. Okay. Let's go to 38, Exhibit 38,
7 which is the Ko reference. So the only
8 blue-emitting materials that Ko describes are
9 DPVBi and DSA specifically; is that correct?

10 MR. STAFFORD: Objection. Form.

11 THE WITNESS: Yes. It does say,
12 for example, DPVBi as the blue in there.

13 BY MR. SHEASBY:

14 Q. Does it give any other specific
15 examples other than DPVBi and DSA?

16 MR. STAFFORD: Objection. Form.

17 THE WITNESS: It just says, for
18 example, that that's the particular blue
19 emitter.

20 BY MR. SHEASBY:

21 Q. Do you know if those emitters had
22 substantial emissions outside of the blue
23 wavelength including the green wavelength
24 range?

25 MR. STAFFORD: Objection. Form.

1 THE WITNESS: There isn't a
2 spectrum listed here to compare against, so I
3 can't comment on that.

4 BY MR. SHEASBY:

5 Q. Let me ask you the next question,
6 which is: Have you did an analysis to
7 determine at the time of the patent if what
8 companies were using for their blue emitters
9 included emitted a substantial portion in the
10 green wavelength as well and it was just
11 filtered out?

12 MR. STAFFORD: Objection. Form.

13 THE WITNESS: I haven't gone
14 through to review every material that was
15 being used as a blue emitter back at the time
16 of the patents to determine whether there
17 were ones that would need to be filtered out.
18 BY MR. SHEASBY:

19 Q. Did you determine if there were any
20 that wouldn't need to be filtered out or that
21 were being used commercially?

22 MR. STAFFORD: Objection. Form.

23 THE WITNESS: Again, I did not do
24 an expansive global search through every
25 material being used, but I do see that this

1 patent and the other ones you described
2 describe blue emitters. And to the extent
3 that photons are being lost, unless there was
4 some other benefit being gained, there would
5 be motivation to look for blue materials that
6 are transparent to the blue filter.

7 BY MR. SHEASBY:

8 Q. Not the question I asked.

9 Objection. Form.

10 Do you know if the blue emitters
11 that were being used commercially at the time
12 of these patents also emitted in the green
13 layer -- green wavelength? Yes or no?

14 MR. STAFFORD: Objection. Form.

15 THE WITNESS: Again, I don't know
16 every device that was being made at the time
17 of the patents whether they all emitted in
18 the green or not.

19 MR. SHEASBY: Pass the witness.

20 THE WITNESS: Or any, to be honest.

21 MR. SHEASBY: I pass the witness.

22 MR. STAFFORD: I have no questions.

23 THE VIDEOGRAPHER: This concludes
24 today's deposition of Thomas Katona, Ph.D.
25 The number of media used was four and will be

1 retained by Veritext Legal Solutions. The
2 time is 6:10 p.m. We are off the record.

3 (Whereupon, the proceedings concluded
4 at 6:10 p.m.)

5 * * * * *

CERTIFICATE OF REPORTER

STATE OF CALIFORNIA)

) SS:

COUNTY OF LOS ANGELES)

I, Monice K. Campbell, a duly
commissioned and licensed court reporter, Los
Angeles County, State of California, do
hereby certify: That I reported the taking
of the deposition of the witness, Thomas
Katona, PhD, commencing on Friday, June 13,
2025, at 9:10 a.m.;

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

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

() Review and signature was requested.

() Review and signature was waived.

(X) Review and signature was not requested.

1 IN WITNESS THEREOF, I have hereunto set
2 my hand in my office in the County of Los
3 Angeles, State of California, this 26th day of
4 June, 2025.

5
6 
7

Monice K. Campbell, CCR No. 14171

1 JASON SHEASBY, ESQ.

2 jsheasby@irell.com

3 JUNE 26, 2025

4 RE: Pictiva Displays International LTD v. Samsung
5 Electronics Co.

6 6/13/2025, Thomas Katona, Ph.D., (#7408143).

7 The above-referenced transcript has been
8 completed by Veritext Legal Solutions and
9 review of the transcript is being handled as follows:

10 — Per CA State Code (CCP 2025.520 (a)-(e)) - Contact Veritext
11 to schedule a time to review the original transcript at
12 a Veritext office.

13 — Per CA State Code (CCP 2025.520 (a)-(e)) - Locked .PDF
14 Transcript - The witness should review the transcript and
15 make any necessary corrections on the errata pages included
16 below, notating the page and line number of the corrections.
17 The witness should then sign and date the errata and penalty
18 of perjury pages and return the completed pages to all
19 appearing counsel within the period of time determined at
20 the deposition or provided by the Code of Civil Procedure.
21 Contact Veritext when the sealed original is required.

22 — Waiving the CA Code of Civil Procedure per Stipulation of
23 Counsel - Original transcript to be released for signature
24 as determined at the deposition.

25 — Signature Waived - Reading & Signature was waived at the
time of the deposition.

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1 ___ Federal R&S Requested (FRCP 30(e)(1)(B)) - Locked .PDF
2 Transcript - The witness should review the transcript and
3 make any necessary corrections on the errata pages included
4 below, notating the page and line number of the corrections.
5 The witness should then sign and date the errata and penalty
6 of perjury pages and return the completed pages to all
7 appearing counsel within the period of time determined at
8 the deposition or provided by the Federal Rules.
9 _X_ Federal R&S Not Requested - Reading & Signature was not
10 requested before the completion of the deposition.

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

DISCLAIMER: THE FOREGOING FEDERAL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

Veritext Legal Solutions is committed to maintaining the confidentiality of client and witness information, in accordance with the regulations promulgated under the Health Insurance Portability and Accountability Act (HIPAA), as amended with respect to protected health information and the Gramm-Leach-Bliley Act, as amended, with respect to Personally Identifiable Information (PII). Physical transcripts and exhibits are managed under strict facility and personnel access controls. Electronic files of documents are stored in encrypted form and are transmitted in an encrypted

fashion to authenticated parties who are permitted to access the material. Our data is hosted in a Tier 4 SSAE 16 certified facility.

Veritext Legal Solutions complies with all federal and State regulations with respect to the provision of court reporting services, and maintains its neutrality and independence regardless of relationship or the financial outcome of any litigation. Veritext requires adherence to the foregoing professional and ethical standards from all of its subcontractors in their independent contractor agreements.

Inquiries about Veritext Legal Solutions' confidentiality and security policies and practices should be directed to Veritext's Client Services Associates indicated on the cover of this document or at www.veritext.com.