

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN SEMICONDUCTOR DEVICES	)	337-TA-1366
AND METHODS OF MANUFACTURING	)	
SAME AND PRODUCTIONS	)	
CONTAINING THE SAME	)	
	)	

OPEN SESSIONS

Pages: 239 through 506 (with excerpts)
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1 UNITED STATES INTERNATIONAL TRADE COMMISSION

2 Washington, D.C.

3 BEFORE THE HONORABLE CLARK S. CHENEY

4 Chief Administrative Law Judge

5 _____
6 In the Matter of:) Investigation No.
7 CERTAIN SEMICONDUCTOR DEVICES) 337-TA-1366
8 AND METHODS OF MANUFACTURING)
9 SAME AND PRODUCTIONS)
10 CONTAINING THE SAME)
11 _____)

12 International Trade Commission

13 500 E Street, S.W.

14 Washington, D.C.

15 Tuesday, February 27, 2024

16 EVIDENTIARY HEARING - VOLUME II

17 The Hearing commenced, pursuant to notice of
18 the Judge in Courtroom A, at 9:00 a.m. Eastern.

19 Reported by: Richard Germosen, FAPR, RDR, CRR
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1 (In session at 9:01 a.m.)

2 CHIEF JUDGE CHENEY: Please take your seats.

3 Good morning, everyone. We're back on the
4 record in the 1366 investigation.

5 When we left off in this evidentiary hearing
6 last evening, we had completed the cross-examination by
7 Respondents of Dr. Lidow. I'd like to finish that
8 examination before we do evidentiary admissions and
9 disputes, and I think we are at the point where the Staff
10 is going to examine, so, Dr. Lidow, would you please come
11 resume your seat here in the witness box. As you're coming
12 up, I'll remind you that you remain under the same oath
13 that you took yesterday.

14 THE WITNESS: Yes.

15 CHIEF JUDGE CHENEY: Please take a seat, and,
16 Mr. Winston, please proceed when you're ready.

17 MR. WINSTON: Thank you, Your Honor.

18

19 A L E X A N D E R L I D O W,

20 Having been previously duly sworn or affirmed
21 on his oath, returned and was thereafter examined and
22 testified as follows:

23

24 EXAMINATION BY COUNSEL FOR ITC STAFF

25

1 BY MR. WINSTON:

2 Q. Good morning, Dr. Lidow.

3 A. Good morning.

4 Q. So I'd like to begin with some basics. Where
5 is EPC's corporate headquarters located?

6 A. El Segundo, California.

7 Q. All right. And in what state is EPC
8 incorporated?

9 A. Delaware.

10 Q. Can you please describe EPC's business in
11 general terms?

12 A. We make, market, and sell gallium nitride-based
13 semiconductor products.

14 Q. In making those products, what sorts of broad
15 areas are involved?

16 A. Well, in making, you have to, you know,
17 certainly procure materials. You have several different
18 manufacturing stages, for example, growing the epitaxial
19 wafers, making the wafers out of those epitaxial, you know,
20 dishes, and then processing them afterwards to attach
21 connections, saw them up into individual pieces, put them
22 into little pockets in a reel, and then ship them off to
23 customers.

24 Q. And before you start making commercial product,
25 what do you have to do?

1 A. Well, you have to procure all the raw materials
2 to do it. You have to give the signals to the factories to
3 expect that they have to manufacture this. You know,
4 before that, you have to design the product, you have to
5 invent the processes behind the designs of the product.

6 Q. Okay. And is EPC involved with the design of
7 its commercial products?

8 A. Yes, we do all the design of our commercial
9 products.

10 Q. Yesterday, you testified about your prior
11 experience working with power MOSFET technology and events
12 that led to the founding of EPC.

13 Do you recall that testimony?

14 A. Yes.

15 Q. You also testified regarding EPC's development
16 of enhancement-mode gallium nitride technology; correct?

17 A. Yes.

18 Q. At the time EPC was founded, silicon-based
19 enhancement-mode devices were commercially available;
20 correct?

21 A. Yes.

22 Q. And depletion-mode gallium nitride transistors
23 were also commercially available; correct?

24 A. Yes.

25 Q. So why then could EPC not simply use the same

1 technology and same techniques used in those gallium
2 nitride depletion-mode devices and silicon enhancement-mode
3 devices to design and fabricate gallium nitride
4 enhancement-mode devices?

5 A. The physics of conduction in gallium nitride is
6 completely different than the physics of conduction in
7 silicon. In silicon, you have these majority carriers that
8 you have to generate by developing an electric field
9 artificially to have those carriers present, and then you
10 can conduct between your drain and source terminals. In
11 gallium nitride, you create a native two-dimensional
12 electron gas. It's there all the time, so the challenge is
13 to create some sort of, I'll say, an innovative material
14 that can pull those electrons away from the two-dimensional
15 electron gas and deplete the area as a normally off state.
16 Silicon prefers to be off. Gallium nitride prefers to be
17 on.

18 Q. And what challenges did you encounter in
19 developing this technology?

20 A. I think that the main challenge was that there
21 was, you know, only, I'd say, one known material that could
22 suck the electrons away and that was magnesium-doped
23 gallium nitride. The problem with it was it was a
24 conductor, so it was like, you know, trying to pull the
25 electrons with a copper wire. It would create -- it took a

1 lot of current. So those actually weren't field-effect
2 devices. They were injection transistors, and so they were
3 called that.

4 Q. And did you have the same problem with
5 conductive magnesium-doped gallium nitride in
6 depletion-mode devices?

7 A. No, because depletion-mode devices didn't use
8 magnesium-doped gallium nitride at all.

9 Q. Thank you.

10 MR. WINSTON: I have no further questions.

11 CHIEF JUDGE CHENEY: I have a couple of
12 questions for the doctor, and I'll remind counsel that you
13 are welcome to object to my questions the way you would
14 object to questions from any other attorney in the room.

15 I want to make sure I understand the very last
16 colloquy you had with Mr. Winston.

17 Mr. Winston's question had as the premise
18 conductive magnesium-doped gallium nitride, and in your
19 answer you said -- I'm sorry. Conductive magnesium-doped
20 gallium nitride depletion-mode devices, and then your
21 answer, you said that depletion-mode devices don't use
22 magnesium-doped gallium nitride at all.

23 Does that mean that the premise of
24 Mr. Winston's question is based on something that didn't
25 exist? I didn't understand that.

1 THE WITNESS: Yeah, that's correct.

2 Depletion-mode devices do not use any magnesium-doped
3 gallium nitride at all.

4 CHIEF JUDGE CHENEY: Okay. So there is no such
5 thing as a conductive magnesium-doped gallium nitride
6 depletion device?

7 THE WITNESS: Not that I know of, no.

8 CHIEF JUDGE CHENEY: Okay. And you've been
9 asked earlier yesterday a little bit from Mr. Winston about
10 the design of EPC's products.

11 Are you familiar with the products that have
12 been alleged to practice the two patents remaining at issue
13 in this investigation?

14 THE WITNESS: Yes.

15 CHIEF JUDGE CHENEY: And where were those
16 products designed?

17 THE WITNESS: By that I assume you mean the EPC
18 products, 2016C and the EPC 2215?

19 CHIEF JUDGE CHENEY: Yes.

20 THE WITNESS: So those were designed in
21 El Segundo, California.

22 CHIEF JUDGE CHENEY: Okay. Was there any
23 design related to those products that happened not in
24 El Segundo?

25 THE WITNESS: No.

1 CHIEF JUDGE CHENEY: Okay. And what kinds of
2 people were involved in that design? What were their
3 duties?

4 THE WITNESS: So, I mean, first of all, Dr. Cao
5 was in charge of that entire process, and the platform or,
6 if you will, the basic processes that were involved in
7 those devices were designed by Dr. Cao and his team, and
8 then we have a couple of, what we call, layout engineers
9 that take these -- the process and they actually create the
10 mass sets that are then used to do all the photo steps
11 during the wafer process, and for those two products, I
12 think Joe Cao actually did the design himself for the
13 2016C, and I believe one of our engineers, Muskan Sharma,
14 that's S-H-A-R-M-A, did the design for the 2215.

15 CHIEF JUDGE CHENEY: So are the masks designed
16 in El Segundo?

17 THE WITNESS: Yes. For those products, yes.

18 CHIEF JUDGE CHENEY: And those masks were used
19 to do the etching on the products as they are manufactured
20 in what country?

21 THE WITNESS: They're manufactured in Taiwan.

22 CHIEF JUDGE CHENEY: Okay. So masks designed
23 in California are used in Taiwan to do the etching that
24 makes the final product?

25 THE WITNESS: That's correct. We

1 electronically transmit the information for the masks to a
2 mask manufacturer, who is also in Taiwan, and they imprint
3 that software, if you will, defined features onto a masked
4 set, which is then sent to our foundry in Taiwan.

5 CHIEF JUDGE CHENEY: And does the Taiwanese
6 foundry also package the chips?

7 THE WITNESS: No, once they are finished with
8 the dish or the wafer, they're sent to, you know, one of
9 several different places to do what we call bumping, which
10 is to put solder into openings that are then reflowed and
11 they create these bumps of solder that can be used by the
12 consumer to solder them onto their circuit board, and then
13 they are also retested to make sure everything works well,
14 and then we use a saw to cut the -- to cingulate, we call
15 it, the individual transistors, and then there is always
16 some bad ones on a wafer, and those are electronically
17 identified in what we call a die map, and that die map is
18 sent to a machine that picks out all the good devices and
19 puts them into -- it looks like the old celluloid film that
20 movies were made on, except it has pockets in it, and they
21 put a device into each pocket and put a tape over it so
22 it's contained in that pocket and spool it onto a reel,
23 like one of those films, and then that becomes the product
24 that we actually ship to customers.

25 CHIEF JUDGE CHENEY: Okay. So the process of

1 cingulating -- bumping, cingulating the chips -- sorry,
2 bumping, testing, cingulating the chips, and packaging them
3 in reels all happens in Taiwan; is that right?

4 THE WITNESS: For those products, yes.

5 CHIEF JUDGE CHENEY: Okay. Do you do any
6 quality control testing of those reels in the United
7 States?

8 THE WITNESS: We sample product out of those
9 reels frequently and do reliability testing on it, which is
10 a form of quality testing on a continuous rotating basis.

11 CHIEF JUDGE CHENEY: And where does that
12 testing happen?

13 THE WITNESS: It happens in El Segundo,
14 California.

15 CHIEF JUDGE CHENEY: Okay.

16 That's all of my questions.

17 Is there redirect for this witness?

18 MR. ZEINEDDIN: Yes, Your Honor.

19

20 REDIRECT

21 BY MR. ZEINEDDIN:

22 Q. Good morning, Dr. Lidow.

23 A. Good morning.

24 Q. I hope you slept well?

25 A. Yes.

1 Q. Dr. Lidow, just following up on Judge Cheney's
2 questions and also on the Staff's question, in the
3 depletion-mode devices that make gallium nitride, what is
4 the gate made of?

5 A. There are two ways that I'm aware of people
6 make those gates routinely. One is, they use an oxide
7 insulator layer between the barrier, aluminum gallium
8 nitride barrier, and a gate metal. That would be one way,
9 and the second way is that they actually put a Schottky
10 barrier gate right onto the barrier metal.

11 Q. And what is that Schottky barrier gate? What
12 is it made of?

13 A. It can be made of a variety of things. For
14 high frequency transistors, they usually make it out of
15 gold.

16 Q. The material in general, what category does it
17 fit in for that Schottky barrier?

18 A. Precious metal.

19 Q. Forgive me. So we don't talk over each other.
20 In general, what would you characterize the material of
21 that gate when it's in the Schottky form?

22 A. Well, it would be, you know, like a precious
23 metal, but there are many varieties. You can use nickel.
24 You can use gold. You can use a variety of things.

25 Q. Not semiconductor material at all?

1 A. That's correct, it's not a semiconductor.

2 Q. Thank you, Dr. Lidow.

3 Dr. Lidow, I'd like to ask you about the
4 testimony you gave yesterday with Mr. Lavenue.

5 If you recall, he asked you the question about
6 your deposition and you wanted to explain. Would you like
7 to explain today?

8 A. Yes, I would.

9 Q. Okay.

10 MR. ZEINEDDIN: Can you please go to JX00024C,
11 page 88, lines seven through 10, please.

12 Q. Do you see this in front of you, Dr. Lidow?

13 A. Can you repeat the number?

14 Q. It's on your screen as well, but it is page 88
15 of your deposition.

16 A. Yes.

17 Q. Which is JX24C.

18 A. Yes.

19 Q. And it's on page 88.

20 A. Okay.

21 Q. And I believe Mr. Lavenue asked you about lines
22 seven through 10; is that correct?

23 A. Yes.

24 Q. Let me stop, please. Is it correct?

25 A. Yes.

1 Q. Okay. What did you want to explain about this?

2 A. Well, on the prior page, I was asked questions
3 about a device. I think it was just on exactly the page
4 before, and it was that device to which I was referring
5 when I said in order of a milliamp. Now, that device, it's
6 an Innoscience device, I think an Innoscience 100 it was
7 referenced, has about 1 meter of gate width. So and a
8 meter is a thousand millimeters, so if you divide 1
9 milliamp by 1,000 millimeters, that's 1 microamp per
10 millimeter.

11 Q. Okay. So is there anything else you'd like to
12 discuss about this?

13 A. No.

14 Q. Does this in any way, shape, or form mean
15 anything as to the nature of the gate of that device?

16 A. Well, it's a very low leakage gate in the order
17 of a microamp per millimeter.

18 Q. Thank you, Dr. Lidow.

19 Dr. Lidow, yesterday, also during Mr. Lavenue's
20 cross-examination, he showed you RDX001.20C. And I have it
21 here on the screen.

22 Do you see that?

23 A. Yes.

24 Q. Do you recall being asked questions about this
25 yesterday?

1 A. Yes.

2 Q. And on the left-hand side where it says:
3 Embodiment one, was Mr. Lavenue asking you questions about
4 embodiment one?

5 A. He asked me about the words on the left, yes.

6 Q. And you see there are like one, two, three,
7 four rectangles on the left.

8 Do you recall the questions from yesterday?

9 A. Yes.

10 Q. And do you see that bottom part that says:
11 Characteristics?

12 A. Yes.

13 Q. If you go to your witness binder and take the
14 cross-witness binder and look at 48C0006, which is that
15 left -- the bottommost left-hand side rectangle?

16 CHIEF JUDGE CHENEY: Mr. Zeineddin. I'm sorry
17 to interrupt you. A couple of things. I think the exhibit
18 number is CX0486C, slide six, but can we remain on the
19 public record?

20 MR. ZEINEDDIN: Yes, Your Honor.

21 CHIEF JUDGE CHENEY: Okay.

22 MR. ZEINEDDIN: We can do that.

23 Forgive me, Your Honor. You are correct. If
24 we may actually go on EPC's confidential record for this as
25 well.

1 CHIEF JUDGE CHENEY: Okay. Does the transcript
2 need any protection or are we fine continuing? In terms of
3 what has already been said?

4 MR. ZEINEDDIN: I'm sorry, Your Honor?

5 CHIEF JUDGE CHENEY: Do we need to correct
6 where we begin the confidential --

7 MR. ZEINEDDIN: Yes, as soon as I showed this
8 page, which is right after the conclusion of his answer
9 regarding the deposition.

10 CHIEF JUDGE CHENEY: Okay.

11 MR. ZEINEDDIN: Thank you, Your Honor.

12 CHIEF JUDGE CHENEY: So we're now on the
13 confidential record.

14 (Whereupon, the hearing proceeded in
15 confidential session.)

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O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're back on the public record after having completed the examination of Complainant's first witness, Dr. Lidow.

I had some questions about the status of CX0486. Is that a confidential exhibit and has it been admitted into the record?

MR. KOPSIDAS: Good morning, Your Honor. We're checking on the confidentiality status of that right now. It has not yet been admitted, but it is -- it was used yesterday and it is on our list to be put into evidence today.

CHIEF JUDGE CHENEY: Okay. And then --

MS. NIEMEYER: Your Honor, you asked about CX486?

CHIEF JUDGE CHENEY: Who is speaking, please?

MS. NIEMEYER: Sorry, Elizabeth Niemeyer.

CHIEF JUDGE CHENEY: Please come up to the lectern, Ms. Niemeyer. Or you can remain somewhere by a microphone. I just need you by a microphone.

MS. NIEMEYER: Yes, sorry, Your Honor. You asked about CX486?

CHIEF JUDGE CHENEY: Correct.

MS. NIEMEYER: That has been admitted.

1 CHIEF JUDGE CHENEY: Okay. It was on the list
2 of unopposed exhibits?

3 MS. NIEMEYER: Yes.

4 CHIEF JUDGE CHENEY: Okay.

5 MS. NIEMEYER: And it's a C. It's a
6 confidential.

7 CHIEF JUDGE CHENEY: Okay.

8 And what was the other exhibit number that I
9 mentioned yesterday? Does anyone recall? Maybe I didn't
10 even mention it yesterday.

11 MR. JONES: Was it CX103?

12 CHIEF JUDGE CHENEY: Yes. What's the status of
13 that?

14 MR. KOPSIDAS: Your Honor, if I may. That is
15 not admitted yet. It is on our list to admit now and it is
16 confidential.

17 CHIEF JUDGE CHENEY: Okay. Is there any
18 objection to its admission?

19 MS. NIEMEYER: No, Your Honor, and I think the
20 parties do have -- if Your Honor likes, we do have an
21 agreed list of what can be moved into evidence with
22 Mr. Lidow. I don't know if you asked to email -- we can
23 email it to the court reporter. It's a relatively short
24 list.

25 CHIEF JUDGE CHENEY: I just had a question

1 about those two specifically.

2 MS. NIEMEYER: Okay.

3 CHIEF JUDGE CHENEY: And then we'll go ahead
4 and do all of the other admissions now. So is there a
5 motion?

6 MR. KOPSIDAS: Yes, Your Honor. Complainants,
7 I believe jointly, would like to move for the admission of
8 a number of exhibits from Dr. Lidow's direct and
9 cross-examination, and we have that list that we can
10 provide to the Court.

11 CHIEF JUDGE CHENEY: Is there any objection?

12 MS. NIEMEYER: I don't think so. I think we're
13 on the same page.

14 CHIEF JUDGE CHENEY: If you need to have a
15 colloquy off the record --

16 MS. NIEMEYER: I apologize, Your Honor. I
17 apologize.

18 CHIEF JUDGE CHENEY: -- then let's go off the
19 record.

20 MS. NIEMEYER: Yeah.

21 (Whereupon, a discussion is held off the
22 record.)

23 CHIEF JUDGE CHENEY: We're back on the record.

24 It appears the parties are not quite ready to
25 move for the admission of exhibits, so we will try again

1 after the morning break.

2 Are there any other housekeeping matters before
3 we move on?

4 Ms. Niemeyer?

5 MS. NIEMEYER: Your Honor, if I may just ask
6 one follow-up question. I wasn't clear if CX103 had just
7 gotten moved in or if we should include it in the list? I
8 just want to make sure we don't move it in twice.

9 CHIEF JUDGE CHENEY: It has not been moved
10 into --

11 MS. NIEMEYER: Okay. I think the only other
12 item is that the parties had agreed on the time estimates
13 that had been used yesterday, so we're in agreement. I
14 don't know if Your Honor wants -- okay. We've got that
15 done.

16 CHIEF JUDGE CHENEY: I would prefer never to
17 talk about time.

18 MS. NIEMEYER: Okay.

19 CHIEF JUDGE CHENEY: I only want to talk about
20 it if there is a dispute that you cannot resolve, and I
21 have every confidence that you'll be able to resolve it.
22 Okay?

23 Any other housekeeping matters from
24 Respondents?

25 From the Complainants?

1 MR. KOPSIDAS: No, Your Honor.

2 CHIEF JUDGE CHENEY: Staff?

3 MR. WINSTON: Nothing from the Staff, Your
4 Honor.

5 CHIEF JUDGE CHENEY: Okay. Let's call the next
6 witness for Complainant.

7 MS. CHOMENTOWSKI: Your Honor, we call Thomas
8 Vander Veen.

9 CHIEF JUDGE CHENEY: Dr. Vander Veen, once
10 you're settled, please remain standing and raise your right
11 hand. You can have some assistance to clear the witness
12 well.

13 Let's go off the record for a minute.

14 (Whereupon, a discussion is held off the
15 record.)

16 CHIEF JUDGE CHENEY: We're back on the record
17 now.

18 Please raise your right hand while I administer
19 the oath.

20 Do you solemnly swear or affirm the testimony
21 your about give in this matter will be the truth, the whole
22 truth, and nothing but the truth under penalty of perjury?

23 THE WITNESS: I do.

24 CHIEF JUDGE CHENEY: Thank you.

25 Please be seated.

1 Ms. Chomentowski, please proceed when you're
2 ready.

3
4 T H O M A S D. V A N D E R V E E N,
5 Having been first duly sworn or affirmed on his
6 oath, was thereafter examined and testified as follows:

7
8 DIRECT EXAMINATION

9 BY MS. CHOMENTOWSKI:

10 Q. Good morning.

11 Can you state your name for the record?

12 A. Yes. Thomas D. Vander Veen.

13 Q. Can you give us an overview of your educational
14 background.

15 A. Yes. I had a bachelor's degree in economics
16 and mathematics from Calvin College. I have a master's and
17 a Ph.D. My graduate degrees are both in economics and from
18 Brown University.

19 Q. And could you tell the Court a little bit about
20 your work history?

21 A. Yes. I have been working as an economic
22 consultant for approximately 20 years, primarily engaged in
23 matters of intellectual property and international trade.

24 Prior to working as a consultant, I was
25 employed here at the International Trade Commission on the

1 staff of one of the commissioners, and I taught economics
2 prior to that, and I have also taught over time.

3 Q. Have you testified before in evidentiary
4 hearings like this one today?

5 A. Yes, I have.

6 Q. And about how many times have you done that?

7 A. More than 50, I think.

8 Q. And those times you've testified before, did
9 you testify on behalf of both Complainants and Respondents?

10 A. I have, yes, not in the same case, but --

11 Q. Right. Is your compensation here contingent
12 upon the outcome of the results of this investigation?

13 A. No, it is not.

14 Q. I'd like to pull up what's been previously
15 marked as CX976.

16 Dr. Vander Veen, can you identify what's been
17 marked CX976?

18 A. Yes, that's a copy of my CV, and that one is
19 dated November 10, 2023. It was submitted with my expert
20 report in this case.

21 Q. And generally, what does it contain?

22 A. It contains a summary of my education, work
23 experience, as well as testimony experience.

24 MS. CHOMENTOWSKI: Your Honor, I tender
25 Dr. Vander Veen as an expert in economic analysis.

1 CHIEF JUDGE CHENEY: Any objection?

2 MS. YU: No objection.

3 MR. WINSTON: No objection, Your Honor.

4 CHIEF JUDGE CHENEY: Hearing no objection,
5 Dr. Vander Veen will be accepted as an expert in economic
6 analysis.

7 BY MS. CHOMENTOWSKI:

8 Q. Dr. Vander Veen, can you state the subject area
9 upon which you will be offering an opinion in this case?

10 A. This morning, I'll be testifying regarding the
11 economic prong of the domestic industry.

12 Q. And can you identify a summary of that opinion?

13 A. Yes, it's my opinion that Complainants have
14 significant investments in the employment of labor and
15 capital.

16 Q. And upon what time period did you look at
17 that -- did you come to that opinion?

18 A. So I looked at data from 2018 through the
19 filing of the complaint, certainly we're looking at the
20 existence of a domestic industry at the time of the
21 complaint.

22 Q. And what kind of data did you look at?

23 A. So as I would do in a typical case, I looked at
24 data that was provided by or produced by EPC, the
25 Complainant, but I also considered public information. I

1 considered pleadings that were part of the case, deposition
2 testimony. I had conversations as well with the CFO of
3 EPC.

4 Q. And were there certain documents that you would
5 say you primarily relied upon for your opinion in this
6 case?

7 A. Well, yeah, certainly there are certain
8 documents that were the -- primarily the reliance that --
9 in this case, sure.

10 Q. Did you prepare a slide that listed those
11 documents?

12 A. Yes, I did.

13 MS. CHOMENTOWSKI: Mr. Ortega, could we put up
14 the slides for Dr. Vander Veen. And this has been marked
15 CDXC.2.

16 Q. Dr. Vander Veen, do you recognize this slide?

17 A. I do.

18 Q. And what is it?

19 A. So this provides a summary of documents that
20 are the sources of information that I'll testify about
21 today, and throughout the course of my testimony on the
22 demonstratives, the slides are -- the sources are listed.

23 Q. So could you begin by describing how you began
24 your analysis of EPC's investments in domestic industry.

25 A. Sure. So I began by reviewing what was

1 asserted as the domestic industry in the complaint and in a
2 declaration by Mr. Marabotti, and then I began reviewing
3 information that would identify those investments. I
4 sought to understand what the nature of the activities were
5 in the United States, what was being performed, where it
6 was being performed, and then looked at financial records
7 to determine what the amount of investment or expenditures
8 were, and in that process, I talked with the CFO at EPC to
9 understand the documents and the nature of the activities.

10 Q. And what, in general, were those financial
11 documents that you relied upon to come to your opinion
12 today?

13 A. Well, they include documents that are listed
14 here. So the financial reports and other documents
15 maintained in the ordinary course of business. For looking
16 at the investments and expenditures, I relied on data which
17 was extracted from EPC's financial database systems. Over
18 time, they used different software systems, and data was
19 extracted from those systems for the relevant time periods.

20 Q. And did you prepare a slide that highlighted
21 those documents that had the extractions from the financial
22 systems?

23 A. Yes, it's on the next slide.

24 Q. Turning to what's been marked CDX63C.3. Are
25 these those documents?

1 A. Yes, they are. So these are the Excel files
2 that are the data extracts from the various EPC financial
3 systems.

4 Q. And next to each item, it has a year, and can
5 you just explain what that indicates?

6 A. Sure. It just indicates the time range for
7 that file, so these extracts were done for different time
8 periods, and then obviously, they also came from different
9 software systems. So at one point in time, it was
10 QuickBooks, and then there was something called Great
11 Plains, and then there was a Microsoft product that's been
12 used.

13 Q. And in your experience, is this the type of
14 data that you'd tend to rely on to conduct the analysis
15 that you've done in this case?

16 A. Yes. So we're using information that's
17 maintained in the ordinary course of business. Here it's
18 been extracted, of course, for the ease of production for
19 this case.

20 Q. So how did you first begin to analyze the
21 transactional data that's contained in each of these four
22 spreadsheets?

23 A. Well, part of the analysis was to understand
24 how they maintain the data and to be able to identify
25 expenditures that related to the research and development

1 activities that occurred in the United States, and the data
2 is organized by department. They maintain those
3 expenditures by department, and so I sought to identify the
4 departments that were the relevant research and development
5 activity departments.

6 Q. And how did you learn which were the relevant
7 department codes to use in your analysis?

8 A. Sure. So part of that was reviewing the
9 documents, but then it was also from discussions with
10 Mr. Marabotti, who is the CFO of EPC, to confirm and
11 identify those departments.

12 Q. And did you prepare a chart that lists the
13 relevant department codes that you used for each particular
14 year?

15 A. Yes, I did. So in my expert report, I laid out
16 of course all the investments, and here we have
17 demonstratives that show those as well.

18 MS. CHOMENTOWSKI: So before we turn to the
19 next slide, Your Honor, it's going to contain EPC's
20 confidential information, and I request we go on the
21 confidential record for the next few slides.

22 CHIEF JUDGE CHENEY: What's the nature of the
23 information?

24 MS. CHOMENTOWSKI: The next slide contains both
25 the department codes and also the total investments in

1 those codes that Dr. Vander Veen tabulated for his opinion
2 in domestic industry.

3 CHIEF JUDGE CHENEY: We're now on the EPC
4 confidential -- we're now on the EPC confidential record.

5 (Whereupon, the hearing proceeded in
6 confidential session.)

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O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're back on the public record now having after concluded the public examination or the -- not public, the direct examination of Dr. Vander Veen, Complainant's economic expert.

Do the Respondents wish to cross-examine?

MS. YU: Okay.

CROSS-EXAMINATION

BY MS. YU:

Q. Good morning, Dr. Vander Veen.

My name is Yi Yu. I'll be asking you some questions following up on the questions posed by EPC's counsel.

The focus of your bachelor's, master's, and the Ph.D. degrees were economics and math; correct?

A. That's correct.

Q. You don't have a degree of engineering; correct?

A. In engineering? That's correct. I do not.

Q. You're not providing technical opinions in this investigation; correct?

A. I am not. Assuming you mean opinions related to the technical prong or related to infringement, I'm not,

1 no.

2 Q. Your calculations for alleged investments were
3 based on all the alleged DI products combined; correct?

4 A. Generally, that's true. I presented the
5 totals. Now, I do provide the -- I do provide the sales
6 level on a product-by-product basis.

7 Q. Yeah, but your conclusion is based on all the
8 domestic industry products combined; correct?

9 A. Yes, I think that's correct.

10 Q. And in forming your opinions, you did not
11 review any of Respondent's interrogatory responses;
12 correct?

13 A. I don't recall specifically. It would have
14 been listed in my documents considered list.

15 Q. Okay.

16 MS. YU: Your Honor, we'll -- at this time we
17 should switch to the confidential record.

18 CHIEF JUDGE CHENEY: We're now on the EPC
19 confidential record.

20 (Whereupon, the hearing proceeded in
21 confidential session.)

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O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're back on the public record after completing the Staff's cross-examination of Dr. Vander Veen.

Dr. Vander Veen, I have some questions for you, and I think I can stay on the public record, but I'll ask counsel to interrupt before Dr. Vander Veen answers if you think we need to go on the confidential record.

Dr. Vander Veen, you've testified about examining certain R and D expenses that were incurred by EPC in the United States, is that right?

THE WITNESS: Correct.

CHIEF JUDGE CHENEY: In your review of the materials that informed your opinions today, do you have knowledge about where the cash for those R and D activities came from?

THE WITNESS: I didn't -- I didn't analyze sort of the cash flows. Certainly there are revenues, so that would cover some of it for sure. I don't know if there is additional cash infusions that are coming in.

CHIEF JUDGE CHENEY: Were you in the courtroom throughout the testimony of Dr. Lidow?

THE WITNESS: Yes, I was.

CHIEF JUDGE CHENEY: Do you recall him making a

1 statement about where the revenues for the R and D
2 activities came from?

3 THE WITNESS: I can recall some testimony that
4 he provided at different points in time where he mentioned
5 investors putting in money, some of it was his, some of it
6 was family investments. So I do recall some discussion of
7 that, at least relative to early -- early times of EPC.

8 CHIEF JUDGE CHENEY: And, remember, counsel,
9 you can object to any of my questions.

10 Do you recall him testifying that about 80
11 percent of EPC's revenue is directed back into research and
12 development?

13 THE WITNESS: I do, yes.

14 CHIEF JUDGE CHENEY: Okay. Did you understand
15 that when you were formulating your opinions on the
16 significance of EPC's research and development industry?

17 THE WITNESS: So I had a similar calculation
18 that was tied to the investments that I was looking at. So
19 I also looked at a comparison to their sales revenue. I
20 think his calculation would be consistent with what I had
21 looked at, and so I had looked at a similar metric, if you
22 will.

23 CHIEF JUDGE CHENEY: Okay. And did that inform
24 your opinion about the significance of this industry?

25 THE WITNESS: Yes, I think it's consistent with

1 the other metrics that I looked at, which is, you know, a
2 significant -- you know, to date, they have devoted a
3 significant portion of their expenditures in revenue to
4 R and D, and then given that most of that R and D is
5 occurring in the United States and certainly all the
6 R and D that's kind of at the core technology level is in
7 the United States, that would all support the significance
8 of the R and D investments.

9 CHIEF JUDGE CHENEY: If you have an opinion on
10 this as an economist, why is it significant that a company
11 is using such a big percentage of its revenues to reinvest
12 in R and D?

13 THE WITNESS: Well, I think there is two levels
14 to that answer, I think: One, why does it show
15 significance in this case? I think it shows significance
16 for these investments because the R and D investments are
17 a -- you know, a big portion of what the company is doing.
18 So I think it supports the significance of these
19 investments.

20 I think your question is a slightly different
21 question, which is: Is it significant or what's the import
22 of a significant investment in R and D sort of at a more
23 global level, and I think there it -- I would think of it
24 from the perspective of, you know, the investor, say if
25 you're evaluating the company and if you are believing in

1 that technology and in the future of the technology and
2 what's going to happen, you're making big investments now
3 because you really believe that -- that that's going to be
4 even bigger in the future, and so when you have large
5 investments in R and D, that would reflect a belief in the
6 value of the technology going forward. In other words,
7 there is a point in time where R and D investments would
8 probably be not such a significant portion of revenue. So
9 it's really -- it's still sort of a bet on the future.

10 CHIEF JUDGE CHENEY: And how would a company
11 that is reinvesting 80 percent of its revenues into R and D
12 compare with, say, a mere importer? Are those two kinds of
13 business models similar? Different? How do they differ?

14 THE WITNESS: So the added bit of info that the
15 R and D is happening in the United States?

16 CHIEF JUDGE CHENEY: Yes.

17 THE WITNESS: That would not be a mere
18 importer, right, because, again -- again -- well, let me
19 pause. You know, I always am careful to say I'm not a --
20 providing a legal opinion, and we're starting to probably
21 cross into that line, but --

22 CHIEF JUDGE CHENEY: I'm just talking about
23 factually, one company that takes 80 percent of its
24 revenue, reinvest it to R and D in the United States.
25 We've got another company that imports products at --

1 THE WITNESS: Yes.

2 CHIEF JUDGE CHENEY: What's the difference
3 between those industries?

4 THE WITNESS: So the next thing I was going to
5 say is that would -- this scenario you've laid out is not
6 that of a mere importer, because what you have is activity
7 that's happening in the United States that goes beyond what
8 we typically think of a mere importer, and when I think of
9 mere importer, I'm thinking of activities that are --
10 you're essentially doing everything outside the United
11 States, importing the product, and what you're doing in the
12 United States is sales and distribution. That's what kind
13 of I think about the classic mere importer. The fact
14 pattern that you gave is the vast majority of the revenues
15 being dedicated to R and D in the United States, that's not
16 a mere importer. That's -- I think that's easily
17 distinguishable from what we typically think of as a mere
18 importer.

19 CHIEF JUDGE CHENEY: Thank you very much. I
20 have no other questions.

21 Is there any redirect for this witness?

22 MS. CHOMENTOWSKI: No, Your Honor.

23 CHIEF JUDGE CHENEY: Okay. Anyone else have
24 any recross over any question I asked?

25 Ms. Lu -- or Ms. Yu?

1 MS. YU: No.

2 CHIEF JUDGE CHENEY: Staff?

3 MR. WINSTON: No, Your Honor.

4 CHIEF JUDGE CHENEY: Thank you,
5 Dr. Vander Veen. Your testimony has helped me understand
6 the case. You are excused.

7 THE WITNESS: Thank you.

8 (Witness excused.)

9 CHIEF JUDGE CHENEY: Will the Complainant
10 please call -- oh, we actually have some evidence to take
11 care of.

12 Ms. Niemeyer?

13 MS. NIEMEYER: Yes, Your Honor. The parties
14 have agreed on the list of exhibits and are not moving in
15 anything that has already been admitted. It is CX103C,
16 CDX1000, CDX7, RDX1, RX16C, RX133, CX32, CX103C, and just
17 to note on the record as a point of clarification, RDX1 at
18 slide six had a callout that referred to CX9C, which should
19 have been RX -- RX9C, which I think is clear from the
20 context, but just so the record is clear.

21 CHIEF JUDGE CHENEY: Okay. Can we get -- when
22 you submit the final exhibit for RDX1 to my Box account,
23 can you make that correction or is that going to cause a
24 problem?

25 MS. NIEMEYER: I don't think it will cause any

1 problems.

2 MR. KOPSIDAS: No objection from us.

3 CHIEF JUDGE CHENEY: Thanks.

4 So there's been a motion for those exhibits to
5 be admitted. I understand there is no objection, and so
6 those exhibits will be admitted.

7 MS. NIEMEYER: Thank you, Your Honor.

8 MR. KOPSIDAS: Thank you, Your Honor.

9 CHIEF JUDGE CHENEY: Any other housekeeping
10 exhibit matters before we call the next witness?

11 So the goal tomorrow is that at the beginning
12 of the day, we will go over the exhibits that were used
13 today that have not already been admitted, and we'll get
14 those admitted.

15 Counsel for Complainant? Floor is yours to
16 call the next witness.

17 MR. DAVIS: Your Honor, Walter Davis on behalf
18 of Complainant EPC.

19 The next witness is Dr. Robert Beach.

20 CHIEF JUDGE CHENEY: Thank you.

21 Dr. Beach, please come to the witness well.
22 Remain standing, and I will administer the oath.

23 Please raise your right hand.

24 Do you solemnly swear or affirm the testimony
25 your about give in this matter will be the truth, the whole

1 truth, and nothing but the truth under penalty of perjury?

2 THE WITNESS: I do.

3 CHIEF JUDGE CHENEY: Thank you.

4 Please take a seat.

5

6 R O B E R T B E A C H,

7 Having been first duly sworn or affirmed on his
8 oath, was thereafter examined and testified as follows:

9

10 DIRECT EXAMINATION

11 BY MR. DAVIS:

12 Q. Good morning, Dr. Beach.

13 A. Good morning.

14 Q. I'm just going to ask you some questions. I
15 understand you're a bit nervous, but it will be okay.

16 Dr. Beach, where are you currently employed?

17 A. I work for EPC in El Segundo, California.

18 Q. And what's your role at EPC?

19 A. I was a co-founder of EPC, and currently I work
20 as the executive vice-president of materials and IC
21 development.

22 Q. And what else does your role involve?

23 A. So for the materials section, we -- primarily
24 in the R and D and development phase, we are the --
25 generating new technologies, new epitaxial structures, new

1 doping profiles, and things like to that improve our parts
2 over time.

3 Q. Do you review technical documents as part of
4 your role?

5 A. Yeah. We look for -- like I said, we do the
6 doping profiles to improve the performance, the breakdown
7 voltage, things like that. So regularly look at, say, SIMS
8 or the epi recipe that we use for the MOCVD growth. We
9 look at some X-ray diffraction and optical microscopes, so
10 other characterization techniques.

11 Q. Dr. Beach, what do you mean by "epi recipe"?

12 A. So the MOCVD machine is what you use to grow a
13 crystal. We're growing a crystal of gallium nitride on a
14 silicon substrate, and the MOCVD machine flows the gasses
15 into the chamber to grow that crystal, and the recipe is
16 the step-by-step instructions for the machine to execute
17 that crystal growth, all of the gas flows, etc., describes
18 it in detail.

19 Q. And did I hear you mention SIMS?

20 A. Yeah. SIMS is secondary ion mass spectroscopy.
21 That is a technique where you sort of dig a hole very
22 slowly through the crystal and you measure what atoms are
23 coming out so you can tell what dope and atoms are inside
24 the crystal.

25 Q. Dr. Beach, how often do you review epi recipes

1 and SIMS in your normal course of business?

2 A. It depends on the project, but generally every
3 couple of weeks we'll be looking at some SIMS data to try
4 to see whether we're hitting our targets or not.

5 Q. And do you feel comfortable reading these
6 documents?

7 A. I'm very comfortable with them. I've been
8 looking at them for 15, 16 years.

9 Q. Thank you.

10 Dr. Beach, what have you done in preparation
11 for your testimony today?

12 A. So I reviewed some SIMS data. I reviewed some
13 recipes for the growth. I looked at data sheets, some spec
14 sheets for some of the epitaxy, some TEM. That's about it.

15 Q. Did you look at anything else?

16 A. So I looked at some of our correlation
17 spreadsheets and some of the data sheets for the parts that
18 these epitaxy -- you know, these epi wafers go into and the
19 recipes that we use to grow them.

20 Q. Did you look at the products identified in the
21 complaint of this investigation?

22 A. Yes, when I started, I was looking -- the first
23 thing I did was look at the SIMS for the two identified
24 products.

25 Q. And what are those products?

1 A. The 2016C and the 2215.

2 Q. Okay. And were you able to confirm the
3 information in the complaint for EPC 2016C and EPC 2215?

4 A. I was able to confirm the 2016C data. Looking
5 at the SIMS and the recipes, those looked fine. However,
6 the 2215, when I started to look at the SIMS, was, you
7 know, clearly not the 2215. Those right away just looking
8 at it I could see that that was not a 2215 SIMS.

9 Q. Okay. And what do you mean by that?

10 A. The thickness was wrong. You can see in SIMS
11 how thick the layer is that you have deposited and this one
12 was like 1.3 microns, when it should have been two.

13 MR. DAVIS: Your Honor, at this point I'm going
14 to need to show an EPC confidential document, if it's okay
15 to go into confidential record?

16 CHIEF JUDGE CHENEY: Is it tech information?

17 MR. DAVIS: It's a technical document, yes,
18 Your Honor.

19 CHIEF JUDGE CHENEY: Okay. We're now on the
20 EPC confidential record.

21 (Whereupon, the hearing proceeded in
22 confidential session.)
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O P E N S E S S I O N

CHIEF JUDGE CHENEY: Is there
cross-examination?

MR. LAVENUE: Yes, Your Honor.

CHIEF JUDGE CHENEY: Please proceed when you're
ready.

MR. LAVENUE: Your Honor, to confirm, this is
adverse direct.

CHIEF JUDGE CHENEY: Okay.
Does that mean you have an agreement about
topics that were not raised?

MR. LAVENUE: I believe we do.

CHIEF JUDGE CHENEY: Okay. Thanks.

ADVERSE DIRECT

BY MR. LAVENUE:

Q. Dr. Beach, I'm putting up on the screen an
excerpt of exhibit JX14 in your binder, which is the '294
patent. And as I understand, you're one of the named
inventors of the '294 patent; correct?

A. Correct.

Q. You've been managing EPC's epitaxial growth
processes for the entirety of EPC's existence; is that
correct?

1 A. Correct.

2 Q. And prior to co-founding EPC, you worked at
3 International Rectifier; correct?

4 A. Correct.

5 Q. The provisional application, which became the
6 '294 patent, was filed on April 8, 2009; correct?

7 A. Correct.

8 Q. And I'm going to refer you to column three,
9 line 43, of the '294 patent now, which is on the screen and
10 it's also slide four.

11 Do you see that on the screen?

12 A. I do.

13 Q. And you'll agree with me it says here that:
14 The critical step that differentiates the invention from
15 the prior art is passivating p-type impurity atoms using
16 hydrogen; correct?

17 A. Yes, it says --

18 Q. Thank you.

19 And an example of such a p-type impurity is
20 magnesium; correct?

21 A. I'm sorry, could you repeat the question?

22 Q. An example of a p-type impurity is magnesium;
23 correct?

24 A. Correct.

25 Q. Now, let's go a little bit down on the slide,

1 lines 47 through 49, I'm on slide six, and do you see that
2 here it says: Passivating p-type impurities using hydrogen
3 creates a highly compensated layer that is semi-insulating;
4 correct?

5 A. I'm sorry, where were you reading?

6 Q. If you'll look at the beginning of the
7 highlight, it says: The compensated semiconductor layer 38
8 is a highly compensated semi-insulating material.

9 Do you see that?

10 A. I do.

11 Q. And then the prior art had a conductive p-GaN
12 layer, not a semi-insulating layer; correct?

13 A. Correct.

14 (Whereupon, the hearing proceeded in
15 confidential session.)
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O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're back on the public record.

Please proceed, counsel.

MR. LAVENUE: Thank you, Your Honor.

BY MR. LAVENUE:

Q. So directing your attention to the '508 patent, you are listed as an inventor on the '508 patent; correct?

A. Correct.

Q. And slide 52, the '508 patent's provisional application was filed on April 8, 2009; correct? Check the screen.

A. Correct.

Q. Okay.

MR. LAVENUE: So, Your Honor, the next question we'll be dealing with a confidential exhibit.

(Whereupon, the hearing proceeded in confidential session.)

O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're now on the public record.

BY MR. LAVENUE:

Q. So slide 56, Dr. Beach, I have two other patent applications by you, and these are exhibits RX11 and RX286. Do you see those on the screen?

A. I do.

MR. LAVENUE: Let's go to slide 57.

Q. So the first is RX11 and it's U.S. Patent Application 2006 0145189.

Do you see that?

A. I do.

Q. And the inventor, as highlighted on the screen, is listed as Robert Beach; correct?

A. That's me, yes, correct.

Q. And I'm going to refer to this because the patent publication number ends in 189. I'm going to just refer to this by ease of reference as Beach189; is that okay?

A. That is okay.

Q. And so Beach189 says it was filed on December 30, 2005; correct?

A. Correct.

1 Q. And you worked at International Rectifier in
2 December 30, 2005; correct?

3 A. Correct.

4 Q. And so you assigned Beach189 to International
5 Rectifier; correct?

6 A. Correct.

7 MR. LAVENUE: Let's go to slide 58.

8 Q. So here I have the approval application for the
9 '294 patent that was filed on April 8, 2009.

10 Do you see that?

11 A. Oh, on the right-hand side. Yes.

12 Q. Yes, on the right-hand side?

13 A. April 8, 2009. Okay.

14 Q. And Beach189 was filed before the '294 patent's
15 provisional application, if you compare the left side of
16 the screen to the right side of the screen; correct?

17 A. Correct.

18 Q. And, in fact, Beach189 was filed almost four
19 years prior to the approval application date for the '294
20 patent; correct?

21 A. Correct.

22 Q. Okay.

23 MR. LAVENUE: Let's go to slide 59.

24 Q. So next, let's look at CX853, and EPC's
25 complaint is what we're looking at here, and EPC has in its

1 complaint, it's highlighted at slide 59. The description
2 of the '294 patent having a German counterpart application;
3 correct?

4 A. This document shows that, yes.

5 Q. And the German counterpart application was
6 rejected based upon the Beach189 reference; right?

7 A. I'm not sure.

8 Q. You don't know?

9 A. (Indicating.)

10 Q. Okay. Let's go to slide 60.

11 So slide 60 shows RX286, and it's an excerpt
12 showing on slide 60 the international application
13 W02005/057624; correct?

14 A. Correct.

15 Q. And the inventor again is Robert Beach?

16 A. Correct.

17 Q. And that's you.

18 Okay. I'll refer to this application for ease
19 of reference as the Beach624, if that's okay?

20 A. That's fine.

21 Q. And the Beach624 says it was filed on
22 December 6, 2004; correct?

23 A. Correct.

24 Q. And the Beach624 says it was assigned to
25 International Rectifier; correct?

1 A. Correct.

2 MR. LAVENUE: Let's go to slide 60, please.

3 Q. So in slide 60, we just saw that the
4 provisional application for the '508 patent was filed on
5 April 8, 2009, and that is on the right side of the screen;
6 correct?

7 A. Correct.

8 Q. And the Beach624 was filed before the '508
9 patent provisional application filing date of April 8,
10 2009; correct?

11 A. I'm sorry, could you repeat that?

12 Q. So the Beach624 was filed before the '508
13 provisional patent application date; correct?

14 A. Right.

15 Q. And, in fact, the Beach624 was filed almost
16 five years prior to the '508 provisional patent filing;
17 right?

18 A. Correct.

19 MR. LAVENUE: Let's go to slide 62.

20 Q. So if we look at JX14, again, it is the '294
21 patent, and the cover page of the '294 patent has a section
22 called: References cited, and you see that on the screen;
23 correct?

24 A. I do.

25 Q. And none of the references cited in the '294

1 patent included either the Beach189 or the Beach624 patent
2 applications; correct?

3 A. Correct.

4 Q. Let's go to slide 63.

5 So looking at JX15, and this is the '508
6 patent, this is the cover page and second page of the '508
7 patent for the references cited section.

8 Do you see that on the screen?

9 A. I see that.

10 Q. And here, again, none of the references cited
11 in the '508 patent include either the Beach189 reference or
12 the Beach624 reference; correct?

13 A. Correct.

14 Q. So you agree with me that both Beach189 and
15 Beach624 are prior art to the '294 and '508 patents;
16 correct?

17 A. What do you mean by "prior art"?

18 Q. Okay. You don't understand prior art?

19 A. No. I'm just meaning are -- are you suggesting
20 that they are related to it or just that they happened to
21 have been patents before, pre-existing patents?

22 Q. Well, my question is: Are they prior art in
23 the context were they before?

24 A. Okay. Were they -- they were before the other
25 patents. They were -- they were published before our

1 patents.

2 Q. Okay. Thank you.

3 MR. LAVENUE: I'll pass the witness, Your
4 Honor.

5 CHIEF JUDGE CHENEY: Okay. Is there
6 cross-examination from the Commission Investigative Staff?

7 MR. WINSTON: Yes, Your Honor.

8 May I proceed?

9 CHIEF JUDGE CHENEY: You may.

10

11 EXAMINATION BY COUNSEL FOR ITC STAFF

12 BY MR. WINSTON:

13 Q. Hi, Dr. Beach.

14 You were asked a few minutes ago some questions
15 about the reference that we're referring to as the Beach189
16 reference.

17 Do you recall that?

18 A. I do.

19 Q. And I've put up RDX0002, page 57. Tell me
20 about this document.

21 A. I mean, this is the patent that I -- that I'm
22 the author of or, you know, the inventor of this idea. How
23 deep of an explanation would you like me to go?

24 Q. That's fine. Let me -- I'll ask you some more
25 questions.

1 A. Okay.

2 Q. Let me put up -- so this document has been
3 marked exhibit RX11.

4 A. I'm sorry. Yeah, I see it.

5 Q. So you should see it on your screen.

6 A. I do.

7 Q. So what's the subject matter of this patent in
8 general?

9 A. So this patent was about how to relax the
10 field, obviously it's called: Field Relaxation Feature,
11 but in semi-conductors you typically have a metal field
12 plate. There is a metal here that's at one potential, and
13 on the other side on the drain, you have a much higher
14 potential, and normally when you have metal, the electric
15 fields tend to focus down onto that metal, so they become
16 very high point for the electric field, and those devices
17 break, and the idea here was that -- is to transform the
18 way that you relax those electric fields at the corner of
19 field plates by putting a highly resistive layer between
20 either a source field plate or a gate metal such that the
21 fields are spread out evenly across the layer between those
22 source- or gate-related side to the drain side. That's to
23 improve breakdown of your devices.

24 Q. And does this patent refer to or relate to
25 enhancement-mode gallium nitride transistors?

1 A. No, no, not at all. I wrote this while I was
2 at EPC working on depletion-mode transistors, and that's --
3 that was not discussed in this at all.

4 Q. Does this patent relate to gallium nitride
5 transistors?

6 CHIEF JUDGE CHENEY: Before you answer that,
7 sir, we have an objection.

8 MR. LAVENUE: Objection. So I had --

9 CHIEF JUDGE CHENEY: Can you turn on your
10 microphone, please?

11 MR. LAVENUE: Yes, Your Honor.

12 So I was making adverse direct, Your Honor, and
13 I did not ask any questions about the contents or scope of
14 the patent. I only asked questions about the dates, and so
15 the content, scope, description of the patents is not a
16 single thing that I asked about, so I believe that the
17 Staff would not be able to ask questions that go beyond the
18 scope of my direct.

19 CHIEF JUDGE CHENEY: Overruled. You introduced
20 the document. He can ask about the document.

21 Please proceed, counsel.

22 BY MR. WINSTON:

23 Q. So, Dr. Beach, you just testified that this
24 patent did not have -- was not related to enhancement-mode
25 gallium nitride transistors. What does this document

1 relate to?

2 A. Well, these are depletion-mode transistors with
3 a layer that is meant to improve the breakdown capability
4 of the device.

5 Q. Do you believe that the work that is described
6 here is relevant to the patent that you're named on as the
7 '294 patent?

8 A. No, not at all. Not at all. I feel like this
9 device would not -- you know, would not work if we tried to
10 do things the way we do them. Here you see a layer that
11 extends all the way across the device. If you had made
12 that into a gate like we make, the device wouldn't
13 function.

14 Q. And why is that?

15 A. Because our p-GaN, it absorbs 2DEG. Basically,
16 the magnesium and the p-GaN will eat 2DEG electrons before
17 getting passivated. It's sort of an electron sponge.

18 At the time when I made this patent, I didn't
19 know that. I didn't realize that. It was actually part of
20 the discovery for the '294 that -- as that led to the '294
21 patent. My apologies.

22 Q. Okay. Thank you, Dr. Beach.

23 MR. WINSTON: I don't have any further
24 questions.

25 CHIEF JUDGE CHENEY: Okay. I have some

1 questions for Dr. Beach, but I don't know how that works
2 into all of your agreement about what we're doing here.
3 Can I ask some questions now?

4 MR. LAVENUE: No objections to your questions,
5 Your Honor, so far.

6 MR. DAVIS: No objections, Your Honor. I will
7 have some redirect afterwards.

8 CHIEF JUDGE CHENEY: Okay. Let's go on the
9 confidential record.

10 (Whereupon, the hearing proceeded in
11 confidential session.)

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3 CHIEF JUDGE CHENEY: And so if you were talking
4 to an average person in your industry at this time about
5 compensated gallium nitride, and you said to them, Go test
6 this sample and see if it has compensated gallium nitride,
7 what would that person do?

8 THE WITNESS: You know, when you're talking
9 about like a sample by itself and you've compensated it so
10 that it's really resistive, it starts becoming a little bit
11 challenging test-wise, but if you're just talking about a
12 layer in space, God, how do you -- how do you test a layer
13 in space and it's not conductive?

14 CHIEF JUDGE CHENEY: I'll make it a little
15 easier.

16 THE WITNESS: Yeah.

17 CHIEF JUDGE CHENEY: Let's say it's in our
18 device.

19 THE WITNESS: So like for our device, for --
20 let's say it's a gate. I think it would be best if I could
21 say it's for a gate because I kind of know what we would
22 look for.

23 CHIEF JUDGE CHENEY: Okay.

24 THE WITNESS: So whenever you're looking in a
25 gate of the Fed, you know, first, of course, you do SIMS,

1 because you want to know what's in there. Is it likely
2 compensated or not, give you a rough idea, and then you can
3 do simple electrical testing to see what the leakage is
4 that gives you some -- a good indication that it's
5 conductive or not.

6 For our particular device, you look at the
7 shape of the curve. It's not always a number. Sometimes
8 you have to look at, you know, what does it look like or
9 whatever, and one of the issues with making contacts to a
10 semiconductor, particularly if your expectation is that
11 it's -- it may be conductive or compensated, you want to do
12 what's called capacitance voltage. Is that a term you
13 would know what that is? Not really. I'll describe it for
14 you because it's not too hard.

15 So in a CV curve, you basically wiggle -- you
16 put a voltage in that's wiggling. It's an AC voltage, high
17 frequency, and what's nice about that is that when there's
18 oxides or interfaces, it can look through because it's
19 wiggling, it's capacitively coupled to the layers beneath,
20 and that gives you a good idea, even though you're not able
21 to make an ohmic or a nice conductive interface between the
22 metal and the material, you just wiggle it, and you can see
23 whether the layer behind is conductive.

24 So like for our device, you can -- you can do
25 CV and get a curve and say, Well, okay, is it flat? Okay,

1 flat. Okay, that means it's an insulator. Okay, if it's
2 going down, you say, Okay, that's conductive. You know,
3 they act differently. You know, you can tell the
4 difference between a conductive layer, even if it's behind
5 something that's blocking the DC current, you can tell if
6 it's conductive.

7 Another one that is easy to do is kind of on
8 the same idea is where you measure the total charge that
9 you put in to the gate to source, and that should -- you
10 know, it has certain character shapes if it's insulating
11 versus if it's a conductive layer.

12 CHIEF JUDGE CHENEY: Thanks. One other
13 question.

14 What is the difference between a compensated
15 gallium nitride layer and a semi-insulating gallium nitride
16 layer, if any?

17 THE WITNESS: Sure. Okay. So compensated,
18 like we kind of talked a lot about this, where you're
19 trying to get back to no doping, effectively no current,
20 because there are no holes, or for us, holes, but it could
21 be the other.

22 For semi-insulating, what you're doing is
23 you're putting in traps. So it's not -- it's not so much
24 that it's not doped, but that the electrons as they move,
25 they fall into an acceptor state. So you put a state in,

1 imagine a road with a bunch of holes in it. You're trying
2 to go down the road, you keep falling in, it takes a lot of
3 time for you to get out, and you go and fall in again. Go
4 up. So all you've done is you've put all of these -- a lot
5 of trap states in there so the charge that's trying to move
6 through, keeps getting stuck. Right? It's like -- it's
7 sort of a way to make it very high res or highly resistant.

8 CHIEF JUDGE CHENEY: So can a compensated
9 gallium nitride layer have those traps in it or are those
10 two ideas mutually exclusive?

11 THE WITNESS: They're not mutually -- let me be
12 careful with this one. Okay. So we -- the way we did it,
13 because we had those ideas, those are -- the way we used
14 the terms, we're trying to specify the idea of compensation
15 with just one and the --

16 CHIEF JUDGE CHENEY: Just one what?

17 THE WITNESS: Just one of the approaches where
18 we had magnesium and hydrogen.

19 CHIEF JUDGE CHENEY: Okay.

20 THE WITNESS: And then we had the other ones
21 for the other approach, and if you look --

22 CHIEF JUDGE CHENEY: The other approach, you
23 mean the trap approach?

24 THE WITNESS: The trap approach.

25 CHIEF JUDGE CHENEY: Okay.

1 (Whereupon, the hearing proceeded in
2 confidential session.)
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2 CHIEF JUDGE CHENEY: Thank you. I'd like to
3 suspend my examination now so we can take our lunch break.
4 I may not have questions, but I might have more questions
5 when we resume.

6 We're going to take a one-hour lunch, and I
7 would appreciate it, sir, if you would not discuss your
8 testimony with anyone during lunch.

9 Do you understand?

10 THE WITNESS: I do, sir.

11 CHIEF JUDGE CHENEY: Okay.

12 THE WITNESS: Thank you.

13 CHIEF JUDGE CHENEY: We'll see you in one hour.
14 We're off the record.

15 (Whereupon, a recess is taken.)

16 CHIEF JUDGE CHENEY: Go back on the record.

17 Counsel, can you please consult the transcript
18 with our court reporter. I believe that all of my
19 questioning after we took down the slides for 97C should be
20 on the public record with Dr. Beach. Can you confer about
21 that and make sure that we can change the public
22 designation as soon as we take down those slides? We can
23 talk about that after lunch if you need, but I hope you can
24 work it out with the court reporter. We are now off the
25 record for an hour.

1 (A luncheon recess was taken at 12:36 p.m.,
2 after which the proceedings resumes at 1:36 a.m.)

3 CHIEF JUDGE CHENEY: Please take your seats.

4 We are back on the public record in the 1366
5 investigation after having taken our lunch break.

6 Before we broke for lunch, I had asked
7 Dr. Beach some questions, asked counsel to consult with the
8 court reporter about the designation of the transcript as
9 being public. Did that happen, Mr. Davis?

10 MR. DAVIS: Your Honor, I attempted to consult,
11 and then I went up to talk to the court reporter to try to
12 figure things out, and as I kept looking, I kept on seeing
13 how Dr. Beach was interjecting what EPC was doing, and it
14 was quite difficult for me to try to do it on the fly, and
15 I really think I'm going to need to look at it when I have
16 more time --

17 CHIEF JUDGE CHENEY: Okay.

18 MR. DAVIS: -- to figure it out.

19 CHIEF JUDGE CHENEY: That's fine, but do make
20 that a priority, because once that transcript hits EDIS,
21 then it becomes a lot much more difficult --

22 (Stenographer clarification.)

23 CHIEF JUDGE CHENEY: EDIS, E-D-I-S, it's our
24 document system.

25 It becomes a lot more difficult to change it.

1 I would like it to be corrected before it goes to EDIS.

2 MR. DAVIS: Understood.

3 And do you know the timing on that, Your Honor?
4 That it will go to EDIS.

5 CHIEF JUDGE CHENEY: Talk to the court
6 reporter.

7 MR. DAVIS: I'll do that. Thank you, Your
8 Honor.

9 CHIEF JUDGE CHENEY: Okay. I don't have any
10 further questions for Dr. Beach.

11 Is there redirect?

12 MR. DAVIS: I do have some brief redirect, Your
13 Honor.

14

15 REDIRECT

16 BY MR. DAVIS:

17 Q. Dr. Beach?

18 A. Hello.

19 Q. How are you? Did you enjoy your lunch?

20 A. I had a piece of pizza from a truck down there.
21 It was fantastic. I'm really surprised. I couldn't
22 believe it.

23 Q. Very good.

24 Judge Cheney was just talking to you about the
25 '294 patent.

1 Do you remember that?

2 A. I do.

3 Q. Specifically discussing compensated and
4 semi-insulating.

5 Do you recall that?

6 A. Yes.

7 Q. Okay.

8 MR. DAVIS: If I could pull up JX14, please.
9 And let's go to column three. Lines 46 through 48.

10 A. Yes.

11 Q. Do you see the language there that reads:
12 First in GaN transistor?

13 A. Yes, first in GaN transistor one. The
14 compensation --

15 Q. The compensation semiconductor layer 38, it's a
16 highly compensated semi-insulating material.

17 A. Yep.

18 Q. Do you see that?

19 A. Yes.

20 Q. Now, I'd like to direct your attention to
21 column three, lines 53 through 57.

22 And here do you see where it says: Figure 10
23 shows a GaN transistor two according to a second embodiment
24 of the present invention?

25 A. Uh-huh.

1 Q. The GaN transistor two is similar to the GaN
2 transistor one, except that GaN transistor two has a
3 semi-insulating layer 39 in place of the compensated
4 semiconductor layer 38.

5 Do you see that?

6 A. I do.

7 Q. Sorry. Dr. Beach, what's the difference
8 between compensated semiconductor layer 38, which is a
9 highly compensated semi-insulating material, and
10 semi-insulating layer 39?

11 A. I think I was trying to explain that earlier to
12 the Judge, where, you know, semi-insulating focuses more on
13 the resistance. You have something in it that is a trap
14 that prevents the charge from moving in the insulator. Not
15 as much of removing the charge from the insulator, just
16 making it so that it can't move. We tried to use this
17 language consistently in the patent just because they're a
18 little different, and it's not always that clear. Is that
19 okay?

20 MR. DAVIS: Thank you. Thank you.

21 We can take that down.

22 Q. I'm going to show you some of the slides that
23 counsel for Innoscience showed you. See if I can do it
24 this way.

25 All right. This is RDX0002.64.

1 Do you recall being asked about this slide?

2 A. 624? Yes, I recall it.

3 Q. Specifically your patent application, Beach189?

4 A. I do.

5 Q. Okay. When you were testifying about this, you
6 testified that you were working at EPC when you did this
7 patent application. Was that accurate?

8 A. No, no. That's a mistake. I was working at
9 International Rectifier when I did the '189 patent.

10 Q. Thank you.

11 I'm going to show you a different slide. And
12 this slide is -- it shows a CX97C-0768, snapshot there,
13 RDX0002.26C.

14 Do you see this?

15 MR. DAVIS: I'm sorry, Your Honor, I should be
16 on the confidential record at this point.

17 CHIEF JUDGE CHENEY: Whose information is it?

18 MR. DAVIS: This is EPC's information.

19 CHIEF JUDGE CHENEY: We're now on the EPC
20 confidential record.

21 (Whereupon, the hearing proceeded in
22 confidential session.)

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O P E N S E S S I O N

CHIEF JUDGE CHENEY: We're back on the public record now after having completed the examination of Dr. Beach.

Dr. Beach, thank you for coming in and sharing your testimony with us and help me understand the case better. You may step down.

THE WITNESS: Thank you, sir.

CHIEF JUDGE CHENEY: And I understand from previous representations from the Complainant that Dr. Beach will not be recalled, so you're welcome to stay in the hearing room and watch the hearing or leave.

THE WITNESS: Thank you much, sir.

CHIEF JUDGE CHENEY: Okay.

(Witness excused.)

CHIEF JUDGE CHENEY: Will the Complainant please call the next witness.

MR. PARADKAR: Plaintiff calls Dr. Fred Schubert.

CHIEF JUDGE CHENEY: Thank you.

Let's go off the record while we prepare the hearing room for Dr. Schubert.

(Whereupon, a recess is taken.)

CHIEF JUDGE CHENEY: We're back on the record

1 now after taking a brief break to reset the hearing room.

2 As we're preparing for Dr. Schubert to testify,
3 the Respondent apparently has some items to address.

4 Mr. Lavenue, the floor is yours.

5 MR. LAVENUE: Yes, Your Honor. We have six
6 exhibits that we have objections for and I can take them in
7 groups of three.

8 The first group is exhibit CPX-0119C, and to
9 confirm, this was not on the list of unopposed exhibits, so
10 it's not like those that we had yesterday, and this is an
11 exhibit that Dr. Schubert has not provided any opinion on.
12 We understand that the Complainant does plan to ask
13 Dr. Schubert about this, but under ground Rule 9, the
14 expert witness is to disclose his opinions with respect to
15 any basis for those opinions, and because Dr. Schubert has
16 never provided an opinion on CPX-0119C, then we would
17 object to its use during his examination.

18 CHIEF JUDGE CHENEY: And, Mr. Lavenue, did
19 Dr. Schubert provide a list of materials considered in
20 offering his opinions?

21 MR. LAVENUE: It was not cited in
22 Dr. Schubert's infringement report, and it's not listed on
23 his list of materials considered.

24 CHIEF JUDGE CHENEY: Okay. Let me hear from
25 the Complainant on this issue, CPX-0119C.

1 Let me just start with an easy question. Was
2 this discussed last night?

3 MR. PARADKAR: This was not discussed last
4 night, Your Honor.

5 CHIEF JUDGE CHENEY: Okay. Why is that?

6 MR. PARADKAR: We did not receive this
7 particular exhibit with an objection.

8 CHIEF JUDGE CHENEY: Mr. Lavenue?

9 MR. LAVENUE: I just confirmed with my team it
10 was discussed last night, Your Honor. We objected to it.

11 MR. PARADKAR: That is incorrect, Your Honor.

12 CHIEF JUDGE CHENEY: Okay. Well, I was not
13 there so --

14 MR. KOPSIDAS: A number of exhibits were
15 discussed at last night's meet and confer, but that was not
16 one of them.

17 CHIEF JUDGE CHENEY: Okay. Was there some
18 evidence that --

19 MR. JONES: May I clarify, Your Honor?

20 CHIEF JUDGE CHENEY: Yes.

21 MR. JONES: The exhibit list was not sent to us
22 until 8 o'clock, not 7, and we had said that we would have
23 additional exhibits that we would raise before this morning
24 that we would have objections to, and we sent that list
25 last night, after the initial meet and confer.

1 CHIEF JUDGE CHENEY: Okay. So did the other
2 side receive a supplementary list of objections?

3 MR. KOPSIDAS: So we did provide our exhibits
4 at 7 per the agreement. We provided them in the
5 demonstratives. They asked for a separate list of
6 exhibits, which we then provided at 8. So they had all of
7 our exhibits at 7, and then we met and conferred at 9:30 --
8 or sorry, at 9 o'clock, and this was not one of the
9 objections that was raised. Later in the evening, we got
10 an email with a few additional objections, and I believe
11 that may have been one of them.

12 CHIEF JUDGE CHENEY: Okay.

13 MR. JONES: I'm sorry, Your Honor, one point of
14 clarification.

15 CHIEF JUDGE CHENEY: Sure.

16 MR. JONES: We had alerted EPC that we would be
17 sending additional exhibit objections before the meet and
18 confer. And we did not hear anything to say that that was
19 going to be improper.

20 CHIEF JUDGE CHENEY: Okay. Would you believe
21 me if I told you that I have trials where this never
22 happens? I mean, I really do. So something is not working
23 and it doesn't reflect well on the parties. I hope you'll
24 do a better job tonight.

25 Regardless of what happened, we have a dispute

1 about it. Who is going to address the substance of the
2 dispute for Complainant?

3 MR. PARADKAR: Your Honor, I understand
4 CPX-119C to be the ICX3 for which Dr. Schubert is a
5 sponsoring witness on the exhibit list.

6 CHIEF JUDGE CHENEY: Okay. That seems to
7 differ from what Mr. Lavenue just told me.

8 Do you maintain, Mr. Lavenue, that this is not
9 on the exhibit list with Dr. Schubert as the sponsoring
10 witness?

11 MR. LAVENUE: That's what we found, Your Honor,
12 but --

13 MR. JONES: Your Honor, it's on the exhibit
14 list with Schubert as a sponsoring witness, but he had
15 never previously testified about it, and it was not listed
16 in his materials considered.

17 CHIEF JUDGE CHENEY: Okay. I just specifically
18 asked that question and got an incorrect answer and that
19 was the time to correct it.

20 Do you understand?

21 I asked Mr. Lavenue that very question. He
22 gave me the answer that it was not on that list.

23 MR. LAVENUE: It was not listed --

24 MR. JONES: I believe the question was whether
25 it was on the materials considered. It was not.

1 CHIEF JUDGE CHENEY: I am so sorry. So it was
2 exchanged on the exhibit list. You were told that
3 Dr. Schubert was going to be the sponsoring witness, and so
4 what is the prejudice?

5 MR. LAVENUE: Because Dr. Schubert had never
6 used in his opinion or cited to the document at any time.
7 So the Complainants did put it on their exhibit list for
8 trial, but in his opinions, he did not rely on it and that
9 is the objection.

10 CHIEF JUDGE CHENEY: I see. So it's a
11 violation of the report rule?

12 MR. LAVENUE: That's correct, Your Honor.

13 CHIEF JUDGE CHENEY: Okay. Please address
14 that.

15 MR. PARADKAR: So Dr. Schubert --

16 CHIEF JUDGE CHENEY: I'm sorry, let's cut to
17 the chase. Did he include it in his report as material
18 considered? Because if he did not, we're just going to
19 leave it out and move on.

20 MR. PARADKAR: Let me confer. He didn't have
21 it.

22 CHIEF JUDGE CHENEY: It is out and we're going
23 to move on. That would have been so much faster if you
24 just would have said that. That's a clear violation of the
25 rule. I'm not going to make an exception to that.

1 Okay. Let's go ahead and have Dr. Schubert
2 come to the stand, unless there is anything else,
3 Mr. Lavenue? More objections?

4 Sorry. Sorry, Dr. Schubert.

5 MR. LAVENUE: The second group of -- we have
6 three groups, two of three. The second group of objections
7 are to RX193C, RX033C, CX0507, and RX0073. And again, to
8 confirm, to not make the same mistake I made yesterday,
9 none of these were on the parties' joint list of unopposed
10 exhibits. Whether I make the same mistake I made today,
11 I'll try not to do that, Your Honor.

12 CHIEF JUDGE CHENEY: I made a mistake too.

13 MR. LAVENUE: Thank you, Your Honor.

14 The objection is, is that Dr. Schubert again
15 had not provided any information on these four documents,
16 and they have them listed on his slides 50 and 51, and so
17 in the meet and confer last night we objected, and we
18 specifically objected to CX0507, and then our follow-up
19 email, as I understand from Mr. Jones, immediately an hour
20 after we objected to the others, and none of these were
21 opined on by Dr. Schubert, and that is our objection,
22 because we believe that in order for him -- this is, again,
23 a violation of Rule 9, so it's the same issue as before.
24 It's Rule 9.

25 CHIEF JUDGE CHENEY: Okay. So on this set of

1 exhibits, were they listed in the materials considered by
2 Dr. Schubert?

3 MR. LAVENUE: I'm checking. I have it here.
4 These were not listed in the materials considered, Your
5 Honor.

6 CHIEF JUDGE CHENEY: Okay. So now I want to
7 hear from the Complainant, if you agree that these were not
8 listed on materials considered. If they're not listed,
9 we're going to just leave them behind and move on.

10 MR. PARADKAR: Your Honor, these documents, I
11 understand, are not on the report. However, they were
12 raised during Dr. Doolittle's deposition, which was
13 followed -- which was subsequent to his report, which was
14 filed in rebuttal. So this is just an opportunity for
15 Dr. Schubert to respond to Dr. Doolittle.

16 CHIEF JUDGE CHENEY: Was there a supplemental
17 expert report process?

18 MR. PARADKAR: No, it was not.

19 CHIEF JUDGE CHENEY: That just wasn't provided
20 for in the procedural schedule to respond to the other
21 side?

22 MR. PARADKAR: That's correct.

23 CHIEF JUDGE CHENEY: These exhibits were put
24 before Dr. Doolittle at Dr. Doolittle's deposition, is that
25 right?

1 MR. PARADKAR: One of these exhibits, I believe
2 CX507, was an appendix to Dr. Doolittle's report.

3 CHIEF JUDGE CHENEY: Okay. What about the
4 other ones in Mr. Lavenue's list?

5 MR. PARADKAR: I will confirm that, Your Honor.

6 So, Your Honor, I can confirm that RX333 is
7 Doolittle report, appendix 15. RX073 was in our prehearing
8 brief. It's a patent publication, and 507. 507 was also
9 in our prehearing brief.

10 CHIEF JUDGE CHENEY: Give me a prefix to 507,
11 please.

12 MR. PARADKAR: CX507. I'm sorry, Your Honor.

13 CHIEF JUDGE CHENEY: Okay. So all of those
14 exhibits were not in the materials considered by
15 Dr. Schubert when he provided his expert report, is that
16 right?

17 MR. PARADKAR: That's correct, but they're
18 there in response to Dr. Doolittle's report that followed.

19 CHIEF JUDGE CHENEY: Okay. Did anyone question
20 Dr. Schubert about those exhibits at his deposition?

21 MR. ZEINEDDIN: May I?

22 CHIEF JUDGE CHENEY: Sure.

23 MR. ZEINEDDIN: Thank you, Your Honor, for your
24 indulgence. As Your Honor noted --

25 CHIEF JUDGE CHENEY: Let's try to keep this --

1 MR. ZEINEDDIN: As Your Honor noted, the
2 procedure was we have one expert report on infringement and
3 one rebuttal report and the same thing on validity. They
4 do one and we do one on rebuttal.

5 CHIEF JUDGE CHENEY: Okay. I misunderstood. I
6 thought for some reason there were no rebuttal reports, but
7 you're saying --

8 MR. ZEINEDDIN: The rebuttal was by
9 Dr. Doolittle. So Dr. Schubert never got to respond in an
10 expert report to Dr. Doolittle, which is -- which explains
11 why Dr. Schubert's report would not have -- how could he
12 anticipate at the time that he did his report what
13 Dr. Doolittle is going to say a month later and address it
14 here?

15 CHIEF JUDGE CHENEY: Okay.

16 MR. ZEINEDDIN: So the question is this: They
17 took the deposition of our expert. They didn't ask our
18 expert, What do you think of what Dr. Doolittle said? They
19 were in control of that. What they can't do right now is
20 prevent our expert from ever explaining what he thought
21 about how Dr. Doolittle was responding to him. By the same
22 token, we expect that on their side, they're going to do
23 the same thing. They got the first word on validity. We
24 responded with validity, and their expert should be able
25 also to explain what they think.

1 What we don't have here is -- otherwise, we are
2 deprived of ever having our expert addressing their
3 expert's opinions that ensued after.

4 CHIEF JUDGE CHENEY: There are at least two
5 ways that you could have had that, if you wanted it. You
6 could have proposed in the procedural schedule. You could
7 have asked for some relief during discovery. You didn't do
8 either of those things.

9 MR. ZEINEDDIN: That is correct, Your Honor.
10 We thought this is the way Your Honor wanted to proceed,
11 and we kind of just followed those rules without thinking
12 that we should be able to respond to them and they us. By
13 the same token them responding to us.

14 CHIEF JUDGE CHENEY: The Administrative
15 Procedure Act gives you a right to cross-examine witnesses.
16 It does not give you a right to put up a rebuttal expert
17 opinion. If you wanted that, you should have asked for it.

18 MR. ZEINEDDIN: Understood, Your Honor.

19 CHIEF JUDGE CHENEY: There is no way that I'm
20 going to have an expert give testimony on opinions that
21 were not provided in an expert report.

22 MR. ZEINEDDIN: I understand, Your Honor, and
23 then we'll withdraw these and we'll address them on cross.

24 CHIEF JUDGE CHENEY: You can certainly address
25 them on cross of Dr. Doolittle.

1 MR. ZEINEDDIN: Exactly, we will do that.

2 CHIEF JUDGE CHENEY: Okay. So that's my
3 ruling. You don't get to talk about these exhibits with
4 Dr. Schubert because Dr. Schubert has not given anyone
5 notice that he has opinions about these things.

6 Okay. To the next set of exhibits.

7 MR. LAVENUE: Your Honor, the third of the
8 three groups is just one exhibit, CX0502, and the
9 difference here is that this document, this exhibit, it is
10 on the parties' joint list of unopposed exhibits, so --

11 CHIEF JUDGE CHENEY: So it's already in
12 evidence.

13 MR. LAVENUE: I'm sorry, Your Honor?

14 CHIEF JUDGE CHENEY: So it's already in
15 evidence.

16 MR. LAVENUE: Correct, so I am not objecting to
17 the exhibit. I'm objecting to the testimony, to be clear,
18 and the reason we're objecting to the testimony is because
19 Dr. Schubert did not list it as materials considered in his
20 opinion. He has not opined on it, and so the reason we
21 agreed for it to be in the list of unopposed exhibits is
22 there are other witnesses, such as Dr. Doolittle, who would
23 be able to comment on it because he did include it, but not
24 Dr. Schubert because he did not, and just similar issues
25 before, just with that one distinction.

1 CHIEF JUDGE CHENEY: Okay. Complainants, do
2 you disagree with any of the characterization made by
3 Mr. Lavenue?

4 MR. PARADKAR: Well, we say that this exhibit,
5 while on the unopposed exhibit list, is being presented in
6 response to Dr. Doolittle's arguments.

7 CHIEF JUDGE CHENEY: So it's in the record. I
8 can look at it. I can draw whatever conclusions I want,
9 but Dr. Schubert cannot testify about it. That's my
10 ruling.

11 What else do we have from Mr. Lavenue?

12 MR. LAVENUE: That is all, Your Honor.

13 CHIEF JUDGE CHENEY: Okay. Staff, I didn't
14 involve you as much as I should have in all of these
15 rulings. Is there anything else you wish to add?

16 MR. WINSTON: Your Honor, one of the reasons
17 that this came up is that these arguments were not
18 identified in Respondent's noninfringement contentions and
19 didn't come up until the rebuttal report after
20 Dr. Schubert's report was already in, and so that's why
21 Dr. Schubert didn't address it and didn't raise it in his
22 report. At least one of these exhibits was addressed at
23 his deposition, but I'm not sure exactly which one, but
24 beyond that, I just want to give you some background as to
25 how we got here.

1 CHIEF JUDGE CHENEY: My advice remains the
2 same. If people thought that they wanted an expert to
3 address this, should have sought for some relief before the
4 second day of trial. And I'll reconsider a ruling about
5 whatever was talked about during the deposition if someone
6 can show me that it was talked about during the deposition,
7 but I don't think anyone knows which exhibit or where, so
8 I'll reconsider a ruling if someone shows me that, but for
9 now, let's get on with some testimony from Dr. Schubert.

10 Dr. Schubert, at long last, please come to the
11 witness well.

12 Please raise your right hand.

13 Do you solemnly swear or affirm the testimony
14 your about give in this matter will be the truth, the whole
15 truth, and nothing but the truth under penalty of perjury?

16 THE WITNESS: I do.

17 CHIEF JUDGE CHENEY: Thank you.

18 Please be seated.

19 THE WITNESS: I do.

20 CHIEF JUDGE CHENEY: Thank you.

21 Please take a seat.

22 Counsel, please proceed when you're ready.

23 MR. PARADKAR: Thank you, Your Honor.

24 My colleague, Sydney Salters, will be assisting
25 Dr. Schubert with binders.

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E. F R E D S C H U B E R T,
Having been first duly sworn or affirmed on his
oath, was thereafter examined and testified as follows:

DIRECT EXAMINATION

BY MR. PARADKAR:

Q. Good afternoon.

For the record, I'm Ameya Paradkar for EPC.

Can you please introduce yourself to
Judge Cheney, Dr. Schubert.

A. Yes.

THE WITNESS: Good afternoon, Your Honor. My
name is Eric Fred Schubert, and I'm a tenured active full
professor at Rensselaer Polytech Institute in Troy, New
York, Upstate New York.

Q. Have you been retained in this investigation?

A. Say it again, please?

Q. Have you been retained in this investigation?

A. Yes.

Q. For what purpose?

A. I have been retained to provide expert opinions
on behalf of EPC.

Q. And on what topics are you providing expert
opinions?

1 A. The opinions concern infringement and DI
2 industry prong and validity.

3 Q. I'd like to turn your attention to your
4 background. Start with your education. Can you describe
5 that for me?

6 A. Yes. I received all my academic degrees in
7 Germany from the University of Stuttgart, and all my
8 degrees are in electrical engineering. I have an
9 equivalent of a bachelor's degree, a master's degree, and a
10 Ph.D. degree.

11 Q. And what is your bachelor's degree and Ph.D.
12 in?

13 A. All degrees are in electrical engineering.

14 Q. What did you do after your Ph.D.?

15 A. I joined industry, AT&T Bell Laboratories in
16 New Jersey, and worked in industry for 10 years.

17 Q. Can you describe the nature of your work with
18 Bell Labs?

19 A. Yes. I was in research and development, and my
20 work was in the field of semiconductors, semiconductor
21 devices, semiconductor epitaxial growth, and device design.

22 Q. Do you have prior experience in gallium
23 nitride?

24 A. Yes, I have been working in the field of
25 gallium nitride now for more than 25 years, and this

1 includes epitaxial growth. It includes doping. It
2 includes various electrical contacts. It includes
3 polarization effects and 2DEG effects, and it also includes
4 device design.

5 Q. Before we get ahead of ourselves, can you
6 explain what is gallium nitride?

7 A. Gallium nitride is a semiconductor. It is a
8 compound semiconductor, and one element comes from group
9 three gallium and the other element comes from the group
10 five of the periodic system of elements, and that is
11 nitrogen.

12 Q. Have you designed any gallium nitride devices?

13 A. Yes, I have, including transistors and LEDs and
14 laser diodes.

15 Q. Do you have any prior experience with patents?

16 A. Yes, I have 39 patents of my own, and also have
17 worked on various matters that related to patent
18 litigation.

19 Q. Can you describe the nature of the patents on
20 which you're listed as an inventor?

21 A. I'm not sure if I heard the question.

22 Q. Certainly, I'll repeat it.

23 Can you describe generally the types of patents
24 on which you're listed as an inventor?

25 A. The types of patents that --

1 Q. On which you are listed as an inventor?

2 A. Yes. The patents on which I'm listed as an
3 inventor are patents that relate to semiconductor
4 materials, semiconductor processing, and semiconductor
5 devices.

6 Q. Have you ever been an expert in a patent case?

7 A. Yes, I have been a technical expert in patent
8 cases quite a number of times.

9 Q. About how many times?

10 A. Approximately 50 times.

11 Q. Have you ever served as an expert for EPC in
12 the past?

13 A. No, I have not.

14 Q. What is your hourly rate in this case?

15 A. \$525.

16 Q. Do you stand to gain financially if the
17 Commission finds in favor of EPC?

18 A. I do not.

19 Q. Dr. Schubert, could you generally describe the
20 field of art, the patents at issue in this case?

21 A. Yes. The field is field-effect transistors and
22 a particular type of field-effect transistor that is
23 referred to as high-electron-mobility transistor, and
24 within that field, it is enhancement-mode transistors. One
25 of the patents has a compensated-gate semiconductor, and

1 the other patent is a method of fabrication for a
2 field-effect transistor.

3 Q. Do you consider yourself a person of skill in
4 the art at the time of the filing of the asserted patents?

5 A. Yes, I have been working in the field for more
6 than 25 years.

7 MR. PARADKAR: Would you please display CX0975,
8 please.

9 Q. Dr. Schubert, do you recognize this document?

10 A. Yes, it is my CV.

11 Q. Is it generally an accurate representation of
12 your CV?

13 A. Sorry, I did not hear the question.

14 Q. Is it an accurate representation of your CV?

15 A. Yes.

16 Q. Thank you, Dr. Schubert.

17 MR. PARADKAR: Your Honor, we offer
18 Dr. Schubert as a technical expert in the semiconductor
19 field and specifically in gallium nitride devices, their
20 methods of manufacture.

21 CHIEF JUDGE CHENEY: Is there any objection?

22 MR. LAVENUE: No objection.

23 MR. WINSTON: No objection, Your Honor.

24 CHIEF JUDGE CHENEY: Dr. Schubert will be
25 accepted as an expert in the semiconductor field and

1 specifically in gallium nitride devices and their methods
2 of manufacture.

3 Please continue, counsel.

4 MR. PARADKAR: Thank you.

5 BY MR. PARADKAR:

6 Q. Dr. Schubert, in anticipation of this
7 investigation, did you obtain any Innoscience product?

8 A. Yes. In approximately January 2023, I
9 purchased 200 Innoscience devices.

10 Q. And how did you go about doing that?

11 A. I contacted Innoscience through their website
12 and communicated with Innoscience, and this ultimately
13 resulted in a purchase order in which I -- through which I
14 ordered eight type -- types of devices, 25 devices each.

15 MR. PARADKAR: Can you put up CX15 and go to
16 page three.

17 Q. Do you recognize this document, Dr. Schubert?

18 A. Yes. It is an email communication between
19 myself and Innoscience.

20 Q. And what were you doing in this email
21 communication?

22 A. Sorry, I did not hear the question.

23 Q. What were you doing in this email
24 communication?

25 A. What was I doing with this communication?

1 Q. What were you trying to achieve with this email
2 communication?

3 A. The intent of my email was to purchase
4 Innoscience devices.

5 Q. And if I can direct you to page four and five
6 of this exhibit. Do you recognize those pages?

7 A. Yes.

8 Q. What are they?

9 A. At the moment, the print is too small for me to
10 recognize, so it is a quotation.

11 MR. PARADKAR: Can you scroll up, please?

12 A. If you look at the top, there is a quotation
13 number, and then in the middle it says: Sales order. So
14 this appears to be my sales order.

15 Q. Thank you, Dr. Schubert.

16 And who's identified as the seller of the
17 product?

18 A. Innoscience.

19 Q. And did you obtain the Innoscience products
20 that are listed in the sales order?

21 A. Yes, I have obtained these devices.

22 Q. If I can turn your attention to CX38 at
23 page one. Do you recognize this document, Dr. Schubert?

24 A. Yes, it is a packing list.

25 Q. And from the information in CX15 and CX38, what

1 country were these products shipped from?

2 A. China.

3 Q. And where were they shipped to?

4 A. To my university address in Troy, New York.

5 Q. Did you analyze any of the products you
6 purchased from Innoscience?

7 A. I took them out of the box and photographed
8 them, but other than that, I did not perform an analysis.
9 I forwarded the devices to a characterization laboratory
10 and that laboratory is the MSS laboratory.

11 Q. Do you recall which of these products you
12 specifically sent to the laboratory for testing?

13 A. Yes, I believe I sent the high voltage device,
14 INN650DA140A, and I also sent a low voltage device,
15 INN100W032A. That is my recollection.

16 Q. Thank you, Dr. Schubert.

17 And why did you send these devices for testing?

18 A. I was interested in the property of these
19 devices, and I had communication with counsel and I wanted
20 to see an analysis of the properties of these devices.

21 Q. Did you rely on these devices for your
22 infringement analysis?

23 A. Yes, I did. I do.

24 Q. Let's change topics.

25 Dr. Schubert, have you had a chance to review

1 the '294 and '508 patents, the asserted patents in this
2 case?

3 A. Yes, I reviewed both patents.

4 Q. What is your conclusion on the technical prong
5 of domestic industry with regard to those two patents?

6 A. My conclusion is that the representative
7 Innoscience devices practice the claims, the asserted
8 claims of the '294 and '508 patent.

9 Q. I just want to clarify for the record that your
10 answer there was with regard to the Innoscience devices. I
11 asked what was your conclusion on the technical prong of
12 domestic industry.

13 A. Technical prong of domestic industry, my
14 conclusion is that the EPC devices practice the asserted
15 claims of the patent.

16 Q. And what is your conclusion on infringement?

17 A. My conclusion is that the Innoscience devices,
18 the accused Innoscience devices and the representative
19 devices practice the asserted claims of the patent or
20 infringe the asserted claims of the patent.

21 Q. Thank you, Dr. Schubert.

22 Did you prepare any slides to assist in your
23 testimony today?

24 A. Yes.

25 MR. PARADKAR: Could we put up CDX2, please.

1 Q. Dr. Schubert, are these the slides you
2 prepared?

3 A. Yes.

4 Q. Let's talk about the technology associated with
5 the '294 patent.

6 Can you tell us about the different types of
7 transistors?

8 A. Yes. If we go to the next slide, I talk about
9 the technical background, and just as an introduction, I
10 want to point out that there are two types of field-effect
11 transistors, one of them is a depletion-mode transistor.
12 The other one is an enhancement-mode transistor. The
13 depletion-mode transistor is also referred to as a
14 normally-on transistor.

15 Now, these devices are essentially switches.
16 So they can be switched on or off. And usually we expect a
17 switch to be starting out in the off position, and then we
18 apply some signal and then the switch turns on. However, a
19 depletion-mode device or normally-on device is without any
20 input in its on position, and that is a less desirable
21 configuration or a less desirable state because the
22 transistor is on or the switch is on without having any
23 input.

24 In contrast or conversely, there are
25 enhancement-mode devices, also switches, on/off switches,

1 but they are in the off state without having any -- when we
2 have no input signal, then they are in the off state, and
3 then when we give an input signal to the gate, they turn
4 on. So that is a more desirable configuration.

5 Q. And the bottom half of this slide, what do you
6 show there?

7 A. On the bottom half of the slide, I show two
8 figures that relate to the '294 patent. On the left-hand
9 side, there is a prior art transistor structure, and on the
10 right-hand side, there is the inventive, the '294 patent
11 device, the inventive device.

12 Now, both devices have a p-type gate
13 semiconductor. On the left-hand side, the p-type gate
14 semiconductor, which is gallium nitride, is activated and
15 electrically conductive.

16 On the right-hand side, the corresponding
17 semiconductor is compensated or passivated in nonconductive
18 or semi-insulating. So there is quite a clear contrast
19 between the prior art device and the inventive device. In
20 one of them, the gate semiconductor is activated and
21 conductive. In the other case, it is passivated and
22 nonconductive.

23 MR. PARADKAR: Let's go to slide four, please.

24 Q. Could you explain what you're showing on this
25 slide, Dr. Schubert?

1 A. Yes. As I pointed out, we have
2 enhancement-mode transistors that are of greater interest
3 that are more desirable, and we have -- for this particular
4 type of transistor, we have a buffer layer and a barrier
5 layer, and so this bi-layer configuration creates a
6 two-dimension electron gas and sheet of electrons at the
7 interface at the boundary between these two layers, and I
8 showed two devices. The top device is an enhancement-mode
9 transistor with a conductive p-type gallium nitride layer.
10 The lower device, the bottom device, is also an
11 enhancement-mode transistor, but with a passivated p-type
12 gallium nitride gate semiconductor, and we can see that the
13 two-dimension electron gas is missing or depleted under the
14 gate, which means that the channel between source and drain
15 is interrupted. The transistor, if you look at it as a
16 switch, is turned off.

17 Q. Are there are any advantages to a normally off
18 transistor with a passivated p-GaN layer?

19 A. Yes, if we compare a dope semiconductor or a
20 conducting semiconductor to a nonconducting semiconductor,
21 it is -- our intuition tells us right away that the
22 nonconducting, the semi-insulating material will carry less
23 current, and similarly, a metal contact on a conducting
24 semiconductor, like a gate metal on a conducting
25 semiconductor, will have a higher leakage current than a

1 gate semiconductor on a nonconducting semiconductor.

2 And so the advantage of having the gate
3 semiconductor being insulating or semi-insulating is that
4 the gate leakage current is reduced compared to a
5 conductive gate semiconductor configuration.

6 Q. And which type of device is claimed by the '294
7 patent?

8 A. The '294 patent relates to a compensated
9 gallium nitride gate layer. This compensated gallium
10 nitride gate layer is nonconductive or semi-insulating, and
11 so putting a gate contact on such a semi-insulating
12 semiconductor, based on our intuition, will result in a
13 lower leakage current.

14 MR. PARADKAR: Before we go to the next slide,
15 Your Honor, I'd like to go on the confidential record as it
16 will have Innoscience confidential information.

17 CHIEF JUDGE CHENEY: Technical information?

18 MR. PARADKAR: Confidential record, it will
19 have Innoscience confidential information.

20 CHIEF JUDGE CHENEY: Okay.

21 (Whereupon, the hearing proceeded in
22 confidential session.)

23 (Whereupon, Chief Judge Cheney requested that
24 the reporter remove this confidential session later in the
25 transcript.)

1 CHIEF JUDGE CHENEY: We're on the Innoscience
2 confidential record.

3 MR. PARADKAR: Go to slide five. Thank you.

4 BY MR. PARADKAR:

5 Q. What does this slide show, Dr. Schubert?

6 A. This slide addresses the question: How are the
7 electrons depleted from the 2DEG, and I first quote from
8 the '294 patent, it states: The critical step of the
9 present invention is the passivation of the p-type impurity
10 using hydrogen. The high doping of semi-insulating layer
11 38 leads to enhancement-mode devices. The 2DEG region is
12 depleted, that is, removed.

13 So the teaching of the '294 patent is that the
14 2DEG is removed or depleted, and I show a number of
15 statements from Innoscience's Mr. Zhao, which he made
16 during deposition. And I would like to go through these
17 four statements.

18 He stated the holes come from p-type gallium
19 nitride because p-GaN is a p-type conducting material.

20 So as indicated by number one, magnesium
21 acceptors, according to his understanding, create holes
22 which are in the valence band. Then he states: Aluminum
23 gallium nitride is in between p-GaN and gallium nitride
24 channel.

25 So for the holes to travel to the interface

1 between aluminum gallium nitride and channel gallium
2 nitride, they have to start from the p-GaN layer and travel
3 through the aluminum gallium nitride layer. I indicated
4 this in the sketch on the right-hand side by the numeral
5 two.

6 Then he stated: And the holes in the p-GaN
7 layer will diffuse to the interface between aluminum
8 gallium nitride and channel. So that interface is right
9 here.

10 So between the aluminum gallium nitride barrier
11 and the gallium nitride buffer.

12 And so then we are at position three, and
13 finally, Mr. Zhao stated: The holes will diffuse to the
14 interface and then compound or combine with 2DEG.

15 The disappearance of the electrons means that
16 they have been depleted, which is indicated as numeral
17 four. So the hole moves to the 2DEG and recombines with
18 the 2DEG, thereby making an electron disappear.

19 Now, if we look at this sequence, and we can
20 say we move a hole from the magnesium acceptor, ultimately
21 to the location of the 2DEG, moving a hole from A to B
22 means that we move an electron from B to A.

23 So moving a hole from the magnesium acceptor to
24 the 2DEG is equivalent or necessitates that at the same
25 time an electron is moved from the two-dimension electron

1 gas to the magnesium acceptor level.

2 And this is indicated by the numeral five.

3 Q. What are the dynamics of that electron moving
4 from the 2DEG to the magnesium acceptor?

5 CHIEF JUDGE CHENEY: Can I just pause here for
6 a minute. Is there anything about what Mr. Zhao has said
7 that is confidential on this slide? This is for
8 Innoscience specifically.

9 MR. LAVENUE: No, Your Honor.

10 CHIEF JUDGE CHENEY: Okay. So CDX002C, slide
11 five, can be on the public record. Counsel, should we
12 continue on the public record or should we continue
13 confidentially?

14 MR. PARADKAR: Yes, we can be on the public
15 record.

16 CHIEF JUDGE CHENEY: Okay. We're back on the
17 public record.

18 And if I could have the last confidential
19 session made public from the court reporter. Thanks.

20 Please continue, counsel.

21 MR. PARADKAR: Thank you, Your Honor.

22 BY MR. PARADKAR:

23 Q. Dr. Schubert, could you please explain the
24 mechanics by which the 2DEG electron moves across the
25 barrier to the magnesium acceptor?

1 A. Sure. Yes, we can go to the next slide, and
2 there are multiple mechanisms by which electrons can move
3 across the barrier, in particular the --

4 MR. LAVENUE: Objection, Your Honor.

5 CHIEF JUDGE CHENEY: Yeah?

6 MR. LAVENUE: So the next slide has CX502,
7 which has been struck from the presentation. So we do not
8 object to the left side of the screen, which is the
9 testimony of Mr. Zhao, but we would object to the
10 testifying by Dr. Schubert as to anything on CX502 pursuant
11 to your previous ruling.

12 CHIEF JUDGE CHENEY: Any problem with that,
13 counsel?

14 MR. PARADKAR: I have no problem with that to
15 the extent Dr. Schubert is still allowed to testify as to
16 how he's opining on how the 2DEG electron crosses the
17 barrier.

18 CHIEF JUDGE CHENEY: Why don't we have the
19 graphics wizard just focus on the left half of the slide
20 and move the image.

21 Does that satisfy you, Mr. Lavenue?

22 MR. LAVENUE: Thank you, Your Honor, and as
23 long as this is removed when the final is submitted, then
24 that will be fine, the improper portion on the right side
25 of the screen, because I believe the final demonstrative

1 will be submitted after the examination.

2 CHIEF JUDGE CHENEY: Okay. Let's get an edit
3 made to that slide. Thanks.

4 Please continue, counsel.

5 MR. PARADKAR: Thank you, Your Honor.

6 BY MR. PARADKAR:

7 Q. Dr. Schubert, would you please continue.

8 A. Yes, as I said earlier, if we move a hole from
9 A to B, then we move at the same time an electron from B to
10 A, and we can say if we move a hole from the magnesium
11 acceptor to the 2DEG, we move an electron from the 2DEG to
12 the acceptor, and Mr. Zhao was asked to confirm this fit,
13 and so he was asked: An equivalent and necessary
14 counterpart of that is electrons are moving up from the
15 2DEG through the aluminum gallium nitride, into the p-GaN;
16 correct?

17 And Mr. Zhao answered affirmatively. He said:
18 Based on what I have learned from the semiconductor books
19 and textbooks, this is the movement of holes.

20 Now, one may ask, How do the electrons get from
21 the 2DEG to the p-type gallium nitride, through the
22 aluminum gallium nitride barrier, and there are various
23 mechanisms by which the electrons go from the 2DEG to the
24 acceptors.

25 We can essentially say if we have a barrier,

1 carriers can get over the barrier or carriers can get
2 through the barrier. Getting over the barrier is described
3 as thermal emission. Emission over the barrier, and we
4 have to keep in mind that the growth temperatures are 1,000
5 degrees, quite high. Our carriers have quite a bit of
6 thermal energy. The other mechanism is going through the
7 barrier, and there are multiple ways to get through the
8 barrier: Straight tunneling, defect-assisted tunneling, or
9 trap-assisted tunneling, as well as thermionic
10 trap-assisted tunneling.

11 Q. You mentioned thermal emission earlier. Can
12 you explain how that works in the context of the
13 enhancement-mode device at issue here?

14 A. Yes. Each electron has a thermal manager, and
15 at room temperature, we have a thermal energy that
16 corresponds to room temperature at a thousand degrees C.
17 They have a thermal energy that is about four times
18 greater, and as a result, the electrons that are subject to
19 thermal motion, that are subject to thermally moving
20 around, can either get over the barrier or can get through
21 the barrier. Ultimately, the driving force is the much
22 lower energy that the acceptor states have than the
23 two-dimensional electron gas. That is, the two-dimensional
24 electron gas, the energy state is in the conduction band,
25 whereas the acceptors are close to the valence band, so

1 there is an energy difference of about three electron
2 volts, and that energy difference, that lower energy is a
3 strong driving force for electrons to occupy low energy
4 states.

5 Q. And you mentioned room temperature versus 1,000
6 degrees Celsius. Which temperature is relevant to the
7 formation of these devices?

8 A. Well, these processes happen at growth
9 temperature. So we can say the absolute temperature at
10 room temperature is 300 kelvin. The absolute temperature
11 at the growth temperature is approximately 1300 kelvin. So
12 there is a factor of four in thermal energy between room
13 temperature and growth temperature.

14 Q. So is that thermal energy sufficient to deplete
15 the 2DEG?

16 A. Yes, absolutely.

17 MR. PARADKAR: Let's go to the next slide.

18 And for the record, the previous slide was
19 CDX2, page six. This is CDX2, page seven.

20 A. Yes. So now we're in the state where the
21 electrons are depleted from the 2DEG. We have no longer a
22 two-dimensional electron gas at the interface. The
23 electrons have been removed. They are gone. They no
24 longer available for conduction. The transistor is off,
25 and the electrons are occupying acceptor states, and I'm

1 showing one of the three magnesium acceptors is occupied by
2 an electron that came from the 2DEG.

3 Now, this semiconductor has fulfilled its
4 purpose and has depleted the two-dimension electron gas,
5 but in the past, in the prior art, the semiconductor was
6 conducting, and we don't like this conductivity, and so for
7 that reason the remaining acceptors are passivated by
8 hydrogen, and hydrogen is an atom that has one electron.
9 The acceptor is ready to accept an electron, and it is
10 found that hydrogen and magnesium form a complex form,
11 somewhat like a bi-atom, where the acceptor accepts the
12 electron from the hydrogen.

13 As a result, we have all acceptors in the p-GaN
14 being occupied by an electron, but none of the acceptors
15 creates free holes. That is, we have a nonconductive p-GaN
16 layer that has depleted the 2DEG that is passivated with
17 hydrogen that creates no holes and no p-type conductive
18 activity.

19 Q. And what does that mean for the relative number
20 of hydrogen and 2DEG electrons occupying magnesium
21 acceptors?

22 A. Well, the number of magnesium acceptors is
23 chosen in such a way that it can accept all the electrons
24 from the 2DEG. So we need a high concentration of
25 acceptors as is being taught by the '294 patent.

1 However, we certainly won't have an excess
2 number of magnesium atoms to make sure that all electrons
3 are depleted, and these excess electrons, these excess
4 acceptors need to be passivated by hydrogen. That is, if
5 we look at the total number of magnesium atom, atoms here
6 in this example, we have three magnesium atoms, two of
7 which are occupied by a hydrogen atom. If we look at
8 experimental results, we can say that the number of
9 magnesium atoms may be twice as high than the number of
10 hydrogen atoms or we can say the number of hydrogen atoms
11 is about 50 percent or 40 percent or on that order of
12 magnitude of the number of magnesium atoms.

13 MR. PARADKAR: Let's go to the next slide,
14 CDX2, page eight.

15 Q. What do you show on this slide, Dr. Schubert?

16 A. On this slide, I show the various claim
17 constructions. So compensated gallium nitride layer is a
18 claim term, and it is a disputed claim term, and I show
19 here the three constructions that have been offered. EPC's
20 construction and ITC Staff's construction are similar,
21 quite similar. The constructions are one type of impurity
22 cancels the electrical effect of another type of impurity.
23 So the two constructions are the same in this regard. So
24 one type of impurity may be magnesium, an acceptor, and the
25 other type of impurity can be hydrogen, and the hydrogen

1 will cancel the electrical effects of magnesium.

2 Now, what are the electrical effects of the
3 magnesium acceptor? Why do we dope a semiconductor? What
4 is the purpose of a dopant? Well, usually, it's to create
5 free carriers, free holes for an acceptor. And the free
6 holes will provide conductivity, but in this case, in the
7 case of the '294 patent, that effect, that electrical
8 effect is canceled. That is, we do not create free
9 carriers. We do not create free holes, and we do not
10 create an electrically conductive semiconductor, but
11 instead have a semi-insulating semiconductor that is
12 electrically nonconductive or semi-insulating.

13 I also show the third construction,
14 Innoscience's proposed construction, and it addresses a
15 specific case of compensation that can be referred to as
16 passivation, and so passivation naturally includes hydrogen
17 or is accomplished with hydrogen, and I also understand
18 that Innoscience requires a specific step that accomplishes
19 the passivation.

20 Q. And what are your finds on infringement on the
21 domestic industry technical prong under these different
22 constructions?

23 A. I find infringement for any of those three
24 proposed constructions.

25 Q. What about domestic industries technical prong?

1 A. Same. Same thing. Under any of these
2 constructions, it is my opinion that the DI devices or the
3 DI products practice the asserted claims under any of those
4 three constructions.

5 MR. PARADKAR: Let's go to CDX2, page nine.

6 Q. What do you show here, Dr. Schubert?

7 A. Here I show another image of a
8 high-electron-mobility transistor, a basic
9 high-electron-mobility transistor structure, and there is
10 no dispute about this structure. Everyone agrees that a
11 HEMT has two layers, two key layers, and these key layers
12 referred to here as the first semiconductor layer, also
13 known as a channel or a buffer layer, and then a second
14 semiconductor layer that is universally referred to as a
15 barrier layer.

16 At the boundary between these two
17 semiconductors, we have the two-dimension electron gas, and
18 the channel -- the conducting channel is between source and
19 drain. So between source and drain, we conduct
20 electricity, and so I would like to just describe the flow
21 of electrons. The flow of electrons starts at the source
22 electrodes -- at the source electrode, the electrons flow
23 through the barrier, through the barrier layer, to the
24 interface, between the two semiconductor where the 2DEG is
25 located, then the electrons flow in the 2DEG towards the

1 drain. At the drain end, they flow again across the
2 barrier to the drain electrode to the metal drain contact
3 and leave the transistor there.

4 MR. PARADKAR: Let's go to CDX2, page 10.

5 Q. What do you show here, Dr. Schubert?

6 A. I am showing here various contexts that are
7 relevant in regards to the '294 patent, and I distinguish
8 between three types of contacts, the top part of the figure
9 was provided by Innoscience in its prehearing brief, and I
10 added the lower -- the lower contact.

11 So the top contact, if we have a metal contact
12 on the conducting semiconductor, and if we have a
13 rectifying current voltage characteristic, then we have
14 what is referred to as a Schottky contact, and so the
15 Schottky contact is shown at the top, and then the current
16 voltage diagram shows a red trace. That is the Schottky
17 current contact -- current voltage characteristic, and we
18 can see it is rectifying.

19 Turning to picture or device number two, if we
20 have a metal semiconductor contact, a metal on a conducting
21 semiconductor, and the metal semiconductor contact has a
22 linear current voltage characteristic, such as shown by the
23 blue trace, then we talk about an ohmic contact.

24 And finally, if we have a metal contact on a
25 passivated semiconductor or a insulating semiconductor or

1 insulating material, semi-insulating semiconductor, then we
2 have an MIS contact, and to the MIS contact is shown on the
3 right -- on the bottom right with a green trace.

4 Now, if we think about currents, in magnitude
5 of currents, it is consistent with our intuition that a
6 conducting semiconductor will pretty much always carry a
7 higher current than a nonconducting, a semi-insulating
8 semiconductor. And similarly, if we have a metal contact
9 or a gate metal contact on a conducting semiconductor, our
10 intuition tells us that the leakage current will be greater
11 than for a configuration where we have a metal contact or a
12 gate metal contact on a nonconducting, on a semi-insulating
13 semiconductor.

14 Q. And which type of contacts do the accused
15 products and the DI products have?

16 A. Say that again, please?

17 Q. Which type of contact do the accused products
18 and the DI products have?

19 A. Well, the '294 patent refers multiple times to
20 MIS contact. So the inventors I believe have held the same
21 view as I do now when they wrote the patent, and so if we
22 have the p-GaN layer, if the p-GaN layer is a passivated
23 layer, if it is a nonconducting, a semi-insulating layer,
24 then I would say the most appropriate way to describe that
25 particular situation is a MIS contact configuration.

1 MR. PARADKAR: If we could go to CDX, to
2 page 11, and I'd like to put this on the confidential
3 record as we're looking at EPC and Innoscience information.

4 CHIEF JUDGE CHENEY: We're now in the
5 confidential record.

6 (Whereupon, the hearing proceeded in
7 confidential session.)

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CHIEF JUDGE CHENEY: Please take your seats.

We're back on the record now.

On the public record for the time being.

Before the afternoon break, we were listening to the direct examination of Complainant's technical expert, Dr. Schubert.

Counsel, where do we go from here?

MR. PARADKAR: Thank you, Your Honor.

CHIEF JUDGE CHENEY: On the public record?
Confidential record?

MR. PARADKAR: Confidential record, please.

CHIEF JUDGE CHENEY: Okay. Whose information?

MR. PARADKAR: It is Innoscience and EPC confidential informatoin.

CHIEF JUDGE CHENEY: Okay. If you're not authorized to view the confidential information of both parties, please leave the hearing room.

(Whereupon, the hearing proceeded in confidential session.)

O P E N S E S S I O N

BY MR. PARADKAR:

Q. Dr. Schubert, you underlined certain parts of the slide. Can you explain why?

A. (Indicating.)

Q. You underlined certain parts of this slide. Can you explain why?

A. Yes. Those are the relevant limitations. I underlined a compensated gallium nitride layer. That is the relevant claim limitation that is contested and a similar phrase is highlighted in claim two. Claim two is more specific because the compensation is specified as passivation with hydrogen.

MR. PARADKAR: Let's go to CDX2, page 18.

CDX2, page 18, please.

Q. What does this slide show?

A. This shows the first limitation. The first limitation is a common III nitride transistor comprising.

MR. PARADKAR: Let's go to CDX2, page 19.

A. On this slide we see data sheets from Innoscience, the 100-volt low voltage device data sheet is at the top. The 650-volt high voltage data sheet is at the bottom, and the data sheets disclose that the transistor is an enhancement-mode gallium nitride power transistor.

1 Based on the data sheet, the claim limitation is met.

2 Q. And you were relying on CX0535 and CX0551?

3 A. Correct.

4 Q. And you said that this claim limitation is
5 literally met by the Innoscience devices?

6 A. Yes, literally met.

7 MR. PARADKAR: Let's go to CDX2, page 20.

8 Q. What does this slide show?

9 A. Here I show corresponding EPC data sheets. On
10 the left-hand side, the low data low voltage data sheet, on
11 the right-hand side, the high voltage data sheet and we can
12 read: Enhancement mode power transistor and the
13 transistors are made from gallium nitride. So again, the
14 claim limitation is met based on these data sheets.

15 Q. Are you relying on CX5 and CX6?

16 A. Correct.

17 Q. And you're saying this preamble limitation is
18 literally met by the EPC DI products?

19 A. Correct. Literally met.

20 MR. PARADKAR: Let's go to CDX2, page 21.

21 Q. What are you showing here?

22 A. Here I show two limitations. The first
23 limitation is a substrate and the second limitation is a
24 set of 35 nitrite transition layers above the substrate.

25 Q. And is this a contested term, to your

1 knowledge?

2 A. Not contested according to my knowledge, yes,
3 correct.

4 MR. PARADKAR: Before being to the next slide,
5 Your Honor, can we go on the confidential record as we will
6 have EPC and Innoscience CDI?

7 (Whereupon, the hearing proceeded in
8 confidential session.)

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1	C O N T E N T S				
2	INDEX OF WITNESSES				
3			RE -	RE -	
4	WITNESS	DIRECT	CROSS	DIRECT	CROSS STAFF
5	Dr. Alexander Lidow			252	264 244
6	Dr. Thomas Vander Veen	290	317		323
7	Dr. Robert Beach	337	349	400	375
8	Dr. Fred Schubert	423			
9					
10	AFTERNOON SESSION				396
11					
12	CONFIDENTIAL SESSION.....			258	- 284
13	CONFIDENTIAL SESSION.....			298	- 316
14	CONFIDENTIAL SESSION.....			319	- 329
15	CONFIDENTIAL SESSION.....			341	- 348
16	CONFIDENTIAL SESSION.....			352	- 365
17	CONFIDENTIAL SESSION.....			367	- 369
18	CONFIDENTIAL SESSION.....			380	- 391
19	CONFIDENTIAL SESSION.....			397	- 397
20	CONFIDENTIAL SESSION.....			404	- 408
21	CONFIDENTIAL SESSION.....			450	- 451
22	CONFIDENTIAL SESSION.....			453	- 459
23	CONFIDENTIAL SESSION.....			463	- end
24					
25					

1 EXHIBIT LISTS SUBMITTED FOR ADMISSION:
2 Joint List of Unopposed Exhibits
3 CPX-0003C
4 CPX-0004C
5 CPX-0005C
6 CPX-0006C
7 CPX-0049C
8 CPX-0051C
9 CPX-0101C
10 CPX-0111C
11 CPX-0115C
12 CPX-0121C
13 CPX-0122C
14 CPX-0125C
15 CPX-0126C
16 CPX-0127C
17 CPX-0153C
18 CPX-0157C
19 CPX-0168C
20 CPX-0175C
21 CPX-0177C
22 CX-0001
23 CX-0003
24 CX-0004
25 CX-0005

1	CX-0010C
2	CX-0013
3	CX-0017
4	CX-0018
5	CX-0019
6	CX-0020
7	CX-0035
8	CX-0044
9	CX-0047
10	CX-0085C
11	CX-0093C
12	CX-0225
13	CX-0226
14	CX-0227
15	CX-0228
16	CX-0397C
17	CX-0458C
18	CX-0486C
19	CX-0486C
20	CX-0488C
21	CX-0502
22	CX-0535C
23	CX-0549C
24	CX-0832C
25	CX-0833C

1	CX-0839C
2	CX-0853
3	CX-0866C
4	CX-0868C
5	CX-0869
6	CX-0870
7	CX-0871
8	CX-0872
9	CX-0873C
10	CX-0874C
11	CX-0875C
12	CX-0889C
13	CX-0898C
14	CX-0916C
15	CX-0921C
16	CX-0934C
17	CX-0941C
18	CX-0960C
19	CX-0963C
20	CX-0970C
21	CX-0973
22	JX-0003
23	JX-0004
24	JX-0006
25	JX-0008

1	JX-0009
2	JX-0010
3	JX-0011
4	JX-0012
5	JX-0013
6	JX-0014
7	JX-0015
8	JX-0018C
9	JX-0019C
10	JX-0020C
11	JX-0021C
12	JX-0024C
13	JX-0025C
14	JX-0026C
15	JX-0028C
16	JX-0029C
17	JX-0030C
18	JX-0031C
19	JX-0032C
20	JX-0033C
21	JX-0034C
22	JX-0035C
23	JX-0036C
24	JX-0037C
25	JX-0040C

1	JX-0041C
2	JX-0042C
3	JX-0043C
4	JX-0044C
5	RPX-0001C
6	RX-0003
7	RX-0009C
8	RX-0130C
9	RX-0158C
10	RX-0159
11	RX-0166
12	RX-0182C
13	RX-0189C
14	RX-0634C
15	RX-0635C
16	RX-0636C
17	RX-0637C
18	RX-0753
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1 C E R T I F I C A T E

2 TITLE: IMO: CERTAIN SEMICONDUCTOR DEVICES

3 INVESTIGATION NO.: 337-TA-1366

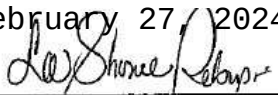
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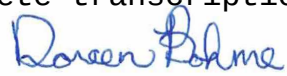
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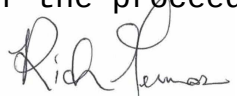
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