

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	)	
	)	

REVISED AND CORRECTED TRANSCRIPT OPEN SESSIONS

Pages: 239 through 506 (with excerpts)
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CHIEF JUDGE CHENEY: And so if you were talking to an average person in your industry at this time about compensated gallium nitride, and you said to them, Go test this sample and see if it has compensated gallium nitride, what would that person do?

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

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

THE WITNESS: Yeah.

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

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

CHIEF JUDGE CHENEY: Okay.

THE WITNESS: So whenever you're looking in a gate of the FET, 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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1 C E R T I F I C A T E

2 TITLE: IMO: CERTAIN SEMICONDUCTOR DEVICES

3 INVESTIGATION NO.: 337-TA-1366

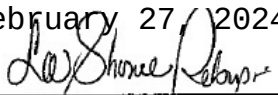
4 HEARING DATE: February 27, 2024

5 LOCATION: Courtroom A

6 NATURE OF HEARING: Evidentiary Hearing

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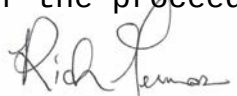
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