PUBLIC VERSION

[redacted]

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN SEMICONDUCTOR DEVICES, AND METHODS OF MANUFACTURING SAME AND PRODUCTS CONTAINING THE SAME**	**INV. NO. 337-TA-1366**

INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BOND

Chief Administrative Law Judge Clark S. Cheney

(July 5, 2024)

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Table of Abbreviations

CDX	Complainants' demonstrative exhibit
CIB	Complainants' initial post-hearing brief, available at EDIS Doc. ID 810943
COCCB	Complainants' opening claim construction brief, available at EDIS Doc. ID 803474
CRB	Complainants' responsive post-hearing brief, available at EDIS Doc. ID 811980
CX	Complainants' exhibit
CPX	Complainants' physical exhibit
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RPB	Respondents' pre-hearing brief, available at EDIS Doc. ID 808164
ROCCB	Respondents' opening claim construction brief, available at EDIS Doc. ID 803491
RRB	Respondents' responsive post-hearing brief, available at EDIS Doc. ID 811974
RRCCB	Respondents' responsive claim construction brief, available at EDIS Doc. ID 804368
SIB	Staff's initial post-hearing brief, available at EDIS Doc. ID 811583
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SPB	Staff's pre-hearing brief, available at EDIS Doc. ID 809438
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RX	Respondents' exhibit
RPX	Respondents' physical exhibit
SX	Staff's exhibit
Tr.	Transcript

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CERTAIN SEMICONDUCTOR DEVICES, AND METHODS OF MANUFACTURING SAME AND PRODUCTS CONTAINING THE SAME	**INV. NO. 337-TA-1366**

INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BOND

Chief Administrative Law Judge Clark S. Cheney

(July 5, 2024)

Pursuant to the Notice of Investigation, 88 Fed. Reg. 42756 (July 3, 2023) ("Notice of Investigation"), and 19 C.F.R. §§ 210.10(b), 210.42(a)(1)(i), this is the final initial determination in the matter of *Certain Semiconductor Devices, and Methods of Manufacturing Same and Products Containing the Same*, Investigation No. 337-TA-1366.

For the reasons stated herein, I have determined that no violation of section 337 of the Tariff Act of 1930, as amended, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain semiconductor devices, and methods of manufacturing same and products containing the same, based on the alleged infringement of U.S. Patent No. 8,404,508.

I have also determined that a violation of section 337 of the Tariff Act of 1930, as amended, has occurred in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor devices, and methods of manufacturing same and products containing the same, based on infringement of U.S. Patent No. 8,350,294.

[redacted]

I. INTRODUCTION

A. Procedural History

On May 26, 2023, complainant Efficient Power Conversion Corporation of El Segundo, California filed a complaint alleging violations of section 337 based on the importation into the United States, the sale for importation, and the sale within the United States after importation of certain semiconductor devices, and methods of manufacturing same and products containing the same by reason of the infringement of certain claims of U.S. Patent No. 8,350,294 ("the '294 patent"); U.S. Patent No. 8,404,508 ("the '508 patent"); U.S. Patent No. 9,748,347 ("the '347 patent"); and U.S. Patent No. 10,312,335 ("the '335 patent") (collectively, the "Asserted Patents"). Notice of Investigation at 42756. EPC supplemented the complaint by letter on June 14 and 15, 2023. *Id.*; EDIS Doc. ID 798596; EDIS Doc. ID 798734.

On July 5, 2024, the Commission instituted Investigation No. 337-TA-1366 to determine:

> [W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain products identified in paragraph (2) by reason of infringement of one or more of claims 1-3 of the '294 patent; claim 1 of the '508 patent; claims 1-3 of the '347 patent; and claims 1-7 of the '335 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337

Notice of Investigation at 42756. The Commission did not instruct the presiding administrative law judge to take evidence on the statutory public interest factors. *Id.*

The plain language description of the accused products, which defines the scope of the investigation, is "GaN-on-Si semiconductor devices, GaN FETs, GaN high electron mobility transistors, and products incorporating such transistors, which are bidirectional transistors, multichip modules, and demo boards." *Id.*; *see also* 19 C.F.R. § 210.10(b)(1) ("The notice will define the scope of the investigation in such plain language as to make explicit what accused

products or category of accused products provided in accordance with § 210.12(a)(12) will be the subject of the investigation[.]").

The Notice of Investigation named the following parties as respondents:

Innoscience (Zhuhai) Technology Company, Ltd.
No. 39, Jinyuan 2nd Road, High-Tech Zone
Zhuhai, Guangdong
519099 China

Innoscience America, Inc.
5451 Great America Pkwy, Suite 125
Santa Clara, CA 95054

Notice of Investigation at 42757.

The Office of Unfair Import Investigations ("Staff") is a party to this investigation. Notice of Investigation at 42757.

On July 19, 2023, I set a 15-month target date of October 3, 2024, for this investigation. Order No. 5 at 1 (July 19, 2023). On May 31, 2024, I extended the target date to November 4, 2024. Order No. 20 at 1 (May 31, 2024), *unreviewed*, Comm'n Notice, EDIS Doc. ID 824825 (July 1, 2024). On July 2, 2024, I extended that target date to November 5, 2024. Order No. 22 at 1 (July 2, 2024). Accordingly, this final determination is due no later than July 5, 2024. *Id.*

In accordance with the procedural schedule issued as Order Number 7, the parties proposed competing claim constructions for ten terms in the claims of the asserted patents. *See* EDIS Doc. ID 804365. The parties subsequently briefed their positions regarding the disputed terms in accordance with the procedural schedule.[1] Pursuant to *Markman v. Westview Instruments, Inc.*,

[1] Order No. 7 at 2; EDIS Doc. ID 804739 (Complainant's Opening Claim Construction Brief or COCCB); EDIS Doc. ID 804737 (Respondents' Opening Claim Construction Brief or ROCCB); EDIS Doc. ID 805170 (Staff's Opening Claim Construction Brief or SOCCB); EDIS Doc. ID 805559 (Complainant's Responsive Claim Construction Brief or CRCCB); EDIS Doc. ID 805539 (Respondents' Responsive Claim Construction Brief or RRCCB).

517 U.S. 370 (1996), a claim construction hearing was convened on October 13, 2023. The transcript of the claim construction hearing is available at EDIS Doc. ID 809276 ("*Markman* Tr.").

On December 13, 2023, the '347 patent was terminated from the investigation at EPC's request. EDIS Doc. ID 810281, *unreviewed*, Comm'n Notice, EDIS Doc. ID 811836 (Jan. 11, 2024). On February 12, 2024, the '335 patent was terminated from the investigation at EPC's request. EDIS Doc. ID 813901, *unreviewed*, Comm'n Notice, EDIS Doc. ID 815954 (Mar. 12, 2024).

I held a final prehearing conference and convened the evidentiary hearing on February 6, 2024.[2] The evidentiary hearing concluded on March 1, 2024.[3]

After the evidentiary hearing concluded, respondents Innoscience (Zhuhai) Technology Company, Ltd., and Innoscience America, Inc., filed an unopposed motion to reopen the evidentiary record to admit an exhibit, RX-0219, that "was inadvertently omitted from the list of exhibits submitted to the court reporter during the evidentiary hearing and the Joint Final Exhibit List submitted to the Court following the evidentiary hearing." Motion No. 1366-016 at 1. Motion Number 1366-016 was granted on April 22, 2024, and RX-0219 has been considered in rendering this final initial determination. Order No. 18 (April 22, 2024).

On April 4, 2024, the private parties filed a joint motion to correct the evidentiary hearing transcript. Motion No. 1366-017. The motion to correct the transcript was granted on April 24, 2024. Order No. 19 (April 24, 2024).

[2] The transcript of the final prehearing conference is available at EDIS Doc. ID 814979.

[3] The transcripts of the of the evidentiary hearing are available at EDIS Doc. ID 814981 (Day 1 public); EDIS Doc. ID 814980 (Day 1 confidential); EDIS Doc. ID 815087 (Day 2 public); EDIS Doc. ID 815085 (Day 2 confidential); EDIS Doc. ID 815251 (Day 3 public); EDIS Doc. ID 815250 (Day 3 confidential); EDIS Doc. ID 815336 (Day 4 public); EDIS Doc. ID 815334 (Day 4 confidential); EDIS Doc. ID 815555 (Day 5 public); EDIS Doc. ID 815553 (Day 5 confidential).

[redacted]

B. The Parties

1. Complainant EPC

Founded in 2007, complainant Efficient Power Conversion Corporation ("EPC" or "Complainant") is a Delaware corporation having a principal place of business in El Segunda, California. Tr. at 245:4-9 (Lidow); CX-0048-0004. EPC's business is centered on gallium nitride-based semiconductor devices. Tr. at 245:10-246:9 (Lidow). EPC employs labor in the United States to conduct research and development on gallium nitride-based semiconductors. *Id.*, 175:13-176:1. In recent years, EPC has spent about 80 percent of its revenue on domestic research and development. *Id.* at 175:13-176:1.

2. The Innoscience Respondents

Innoscience (Zhuhai) Technology, Ltd., has a principal place of business and headquarters at No. 39, Jinyuan 2nd Road, High-Tech Zone, Zhuhai, Guangdong, 519099 China. Resp. to Compl. ¶ 31 (August 4, 2023) (EDIS Doc. ID 801747) ¶ 22.

Innoscience America, Inc., is a corporation of California with a principal place of business at 5451 Great America Pkwy, Ste 125, Santa Clara, CA 95054. Id. ¶ 23.

Collectively, this determination refers to the respondents as "Innoscience," "the Innoscience Respondents," or "Respondents."

C. The Asserted '294 Patent

U.S. Patent No. 8,350,294 ("the '294 patent"), titled "Compensated Gate MISFET and Method for Fabricating the Same," issued on January 8, 2013, and names Alexander Lidow, Robert Beach, Jianjun Cao, Alana Nakata, and Guang Yuan Zhao as inventors. '294 patent at cover page.[4]

[4] A certified copy of the '294 patent is attached to the complaint (EDIS Doc. ID 797350) as Exhibit 1. The prosecution history of the '294 patent is attached as Appendix A (EDIS Doc. ID 797332) to the complaint.

[redacted]

The '294 patent issued from application no. 12/756,906, filed on April 8, 2010, and claims priority to provisional application no. 61/167,792, which was filed on April 8, 2009. EPC asserts claims 1 through 3 of the '294 patent in this investigation. The asserted claims are reproduced below with the limitations labeling used by the parties in this investigation.

> [1pre] 1. A column III Nitride transistor comprising:
>
> [1a] a substrate,
>
> [1b] a set of III-N transition layers above the substrate,
>
> [1c] a III-N buffer layer above the set of transition layers,
>
> [1d] a III-N barrier layer above the buffer layer,
>
> [1e] a compensated GaN layer above the barrier layer, and
>
> [1f] a gate contact above the compensated GaN layer.
>
> 2. The transistor of claim 1, wherein the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen.
>
> 3. The transistor of claim 2, where the acceptor type atoms are selected from the group consisting of Mg, Zn, Be and Ca.

'294 patent, claims 1-3 (bracketed limitation labels added).

D. The Asserted '508 Patent

U.S. Patent No. 8,404,508 ("the '508 patent"), titled "Enhancement Mode GAN HEMT Device and Method for Fabricating the Same," issued on March 26, 2013, and names Alexander Lidow, Robert Beach, Alana Nakata, Jianjun Cao, and Guang Yuan Zhao as inventors. '508 patent at cover page.[5] The '508 patent issued from application no. 12/756,906, filed on April 8, 2010, and claims priority to provisional application no. 61/167,792, which was filed on April 8, 2009.

[5] A certified copy of the '508 patent is attached to the complaint (EDIS Doc. ID 797350) as Exhibit 2. The prosecution history of the '508 patent is attached as Appendix C (EDIS Doc. ID 797332) to the complaint.

[redacted]

EPC only asserts claim 1 of the '508 patent in this investigation. Claim 1 is reproduced below with the limitation labeling used by the parties in this investigation.

> [1pre] 1. A method of forming an enhancement mode GaN transistor, the method comprising:
>
> [1a] nucleating and growing transition layers on a substrate;
>
> [1b] growing an III Nitride EPI layer over the transistor layers; [6]
>
> [1c] growing an III Nitride barrier layer over the EPI layer;
>
> [1d] growing a GaN layer with acceptor type dopants over the barrier layer;
>
> [1e] depositing a gate contact layer on the doped GaN layer;
>
> [1f] applying a gate photo resistant pattern;
>
> [1g] etching away the gate contact layer outside the gate region;
>
> [1h] etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact;
>
> [1i] removing the gate photo resistant pattern;
>
> [1j] depositing a dielectric layer;
>
> [1k] applying a contact photo resistant pattern;
>
> [1l] etching the dielectric layer to open the drain and source contact area;
>
> [1m] removing the contact photo resistant pattern;
>
> [1n] depositing an Ohmic contact metal;
>
> [1o] applying a metal photo resistant pattern;
>
> [1p] etching the Ohmic contact metal;

[6] The phrase "transistor layers" in claim element [1b] appears to be a typographical error that should instead read "transition layers," consistent with its antecedent basis provided in claim element [1a] on the previous line. EPC expressly recognizes the typographical error. *See* CIB at 100 n.393. Innoscience does not appear to disagree because it uses the phrase "transition layer" when analyzing claim element [1b]. *See* RIB at 74 (analyzing prior art disclosure of "growing an III Nitride EPI layer over the *transition* layers" under the heading "[1b]: growing an III Nitride EPI layer over the *transistor* layers") (emphasis added).

[redacted]

[1q] removing the metal photo resistant pattern; and

[1r] performing rapid thermal annealing to form Ohmic drain and source contacts.

'508 patent, claim 1 (bracketed limitation labels added).

E. The Domestic Industry Products

EPC manufactures and sells enhancement-mode gallium nitride (GaN) transistors and integrated circuits. Tr. at 119:21-188:1 (Lidow); *See, e.g.*, CX-0005 (product data sheet); CX-0006. EPC asserts 250 of its products practice the asserted claims, including both low-voltage and high-voltage domestic industry products. CX-0046C (listing 250 EPC products) ("the Domestic Industry Products").

F. The Accused Products

The accused products are gallium nitride (GaN) enhancement mode transistors manufactured and/or sold by Innoscience. CX-0875C at 0004, 0010-0011. Innoscience classifies the products as low voltage and high voltage. *Id.* On June 28, 2024, EPC, Innoscience, and Staff confirmed that the following is a complete list of Innoscience model numbers remaining for adjudication in this investigation (the "Accused Products"):

Low Voltage Accused Products	High Voltage Accused Products
INN040W048A	INN650D140A
INN040W080A	INN650DA140A
INN040W120A	INN650N140A
INN040FQ012A	INN650D190A
INN040FQ015A	INN650DA190A
INN040FQ043A	INN650N190A
INN100W032A	INN650D240A
INN100W027A	INN650DA240A
INN100W070A	INN650N240A
INN100FQ016A	INN650D350A
INN100FQ025A	INN650DA350A
INN150FQ032A	INN650N350A
INN150LA070A	INN650DA500A

[redacted]

ISG3201 INV100FQ030A	INN650N500A INN650DA600A INN650N600A INN650N05 INN650N2K2A INN650D080BS INN700DC140A INN700DC240A INN700DC350A INN650TA030AH

Order No. 21 (June 26, 2024); EDIS Doc ID 824750 (Joint Statement on Accused Product Model Numbers).

EPC alleges that the Accused Products embody the structures claimed in the '294 patent and that Innoscience infringes that patent when it imports, offers to sell, and sells the Accused Products. CIB at 23. EPC alleges that Innoscience practices the method of manufacture recited in claim 1 of the '508 patent and that Innoscience infringes that patent when it imports, offers to sell, and sells the Accused Products. *Id.*

1. Representative Accused Products

Innoscience stipulated that evidence about certain of its products is representative of all the Accused Products. CX-0875C at 0004, 0010-0011.

First, Innoscience epitaxial recipes describe the instructions given to machines that perform epitaxial deposition of certain layers in the manufacturing of Innoscience semiconductors. *See* Tr. at 338:3-18 (Beach). Innoscience has stipulated that two epitaxial recipes are representative of the epitaxial deposition process for all Accused Products. CPX-0126C (high-voltage Accused Products); CPX-0127C (low-voltage Accused Products); CX-0875C at 0004, 0010-0011.

Next, Innoscience fabrication process flow documents, also known as "travelers," describe the fabrication process flows after epitaxial growth, such as adding metal layers and structuring

layers. *See* Tr. 562:7-19 (Schubert). Two of these traveler documents, INN100W032A and INN650DA140A, are representative of the fabrication process for all Accused Products. CPX-0153C (INN100W032A traveler); CPX-0168C (INN650DA140A traveler); CX-0921C at 14-19 (high-voltage Accused Products) and 20-26 (low-voltage Accused Products); CIB at 8 (citing JX-0031C at 28:13-20, 29:8-22, 46:10-18, and 55:19-57:5 (Ni Dep. Tr.)).

Other relevant documents include secondary ion mass spectrometry, or SIMS reports. These studies determine the elemental composition of solid objects. *See* Tr. at 338:19-24 (Beach). Innoscience stipulated to fourteen SIMS reports as representative of the Accused Products. CX-0875C at 0004, 0010-0011. EPC's technical expert Dr. Schubert reviewed the SIMS reports and identified two that were representative of all Accused Products. CIB at 8 (citing Tr. at 454:24-455:2 (Schubert), CPX-0124C (high-voltage Accused Products); CPX-0134C (low-voltage Accused Products).

In sum, EPC has put forth argument and evidence that epitaxial recipes CPX-0126C (high-voltage Accused Products) and CPX-0127C (low-voltage Accused Products), traveler documents INN650DA140A (high-voltage Accused Products) and INN100W032A (low-voltage Accused Products), and SIMS reports CPX-0124C (high-voltage Accused Products) and CPX-0134C (low-voltage Accused Products) are representative of all Accused Products. Innoscience has presented no argument or evidence challenging EPC's characterization of this evidence as representative of all Accused Products.

II. JURISDICTION & IMPORTATION

A. Personal Jurisdiction

By filing a complaint and participating in this investigation, Complainant EPC has consented to personal jurisdiction at the Commission. *See Certain Toner Cartridges, Components*

[redacted]

Thereof, and Systems Containing the Same, Inv. No. 337-TA-1174, Initial Determination at 34-35 (July 23, 2020), *not reviewed*, Comm'n Notice (Sept. 8, 2020). The Innoscience Respondents have participated in this investigation by, among other things, responding to the complaint and notice of investigation and participating in discovery, thereby submitting themselves to the personal jurisdiction of the Commission. I therefore find that the Commission has personal jurisdiction over all parties. *See, e.g.*, *Certain Strontium-Rubidium Radioisotope Infusion Systems, and Components Thereof Including Generators*, Inv. No. 337-TA-1110, Initial Determination at 9 (Aug. 1, 2019), *not reviewed in pertinent part*, Comm'n Notice (Sept. 30, 2019).

B. Importation

The record contains testimony from an Innoscience corporate representative describing several methods that Innoscience employs to import the Accused Products into the United States. JX-0036C at 98:18-99:4 (Sun Dep. Tr.). For some Accused Products, [redacted]. *Id.* For other Accused Products, Innoscience [redacted]. *Id.*; CX-0833C ([redacted] customer); CX-0839 (purchase order indicating origination in Zhuhai, China). Additionally, Innoscience ships Accused Products [redacted]. JX-0036C at 98:18-99:4 (Sun Dep. Tr.). Innoscience also [redacted]. CPX-0121C (inventory of available samples in the United States); JX-0036C at 83:14-84:5, 84:14-15 (Sun Dep. Tr.); Tr. at 732:3-733:7 (Luo).

Innoscience does not dispute EPC's allegation that Innoscience has imported the Accused Products into the United States.

[redacted]

I find, based on the record evidence above, that Innoscience has imported the Accused Products into the United States. EPC has satisfied the importation requirement of section 337.

C. *In Rem* Jurisdiction

The record evidence discussed above demonstrates that the Accused Products have been imported into the United States. I therefore find the Commission has *in rem* jurisdiction over the Accused Products in this investigation. *See Sealed Air Corp. v. Int'l Trade Comm'n*, 645 F.2d 976, 985-86 (C.C.P.A. 1981) (noting the Commission has jurisdiction over imported goods).

D. Standing

"To bring a complaint before the International Trade Commission, at least one complainant must be the owner or exclusive licensee of the subject intellectual property." *Certain Active Matrix Organic Light-Emitting Diode Display Panels and Modules for Mobile Devices, and Components Thereof*, Inv. No. 337-TA-1351, Comm'n Op. at 14, *quoting Roku, Inc. v. Int'l Trade Comm'n*, 90 F.4th 1367, 1372 (Fed. Cir. 2024) (cleaned up) (EDIS Doc. ID 821542).

The evidence demonstrates that EPC is the owner by assignment of the Asserted Patents. CX-00973 ('294 patent recorded assignment); CX-0044 ('508 patent recorded assignment). Recording "creates a presumption of validity as to the assignment and places the burden to rebut such a showing on one challenging the assignment." *SiRF Tech., Inc. v. Int'l Trade Comm'n*, 601 F.3d 1319, 1328 (Fed. Cir. 2010). Innoscience does not dispute that EPC is the owner by assignment of the asserted patents. *See* CIB at 11.

Because the evidence demonstrates that EPC is the owner by assignment of the asserted patents, I conclude that EPC is an appropriate party to bring this section 337 complaint.

[redacted]

III. LEGAL PRINCIPLES

A. Infringement

In a section 337 investigation, the complainant bears the burden of proving infringement of the asserted patent claims by a preponderance of the evidence. *See Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1349 (Fed. Cir. 2010). This standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

"[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a). To prevail on a claim on infringement, the patent owner "must supply sufficient evidence to prove that the accused product or process contains, either literally or under the doctrine of equivalents, every limitation of the properly construed claim." *Eli Lilly & Co. v. Hospira, Inc.*, 933 F.3d 1320, 1328 (Fed. Cir. 2019) (citation omitted). "To infringe a method claim, a person must have practiced all steps of the claimed method." *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1317 (Fed. Cir. 2009). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008).

B. Claim Construction

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*) (internal citations omitted), *aff'd*, 517 U.S. 370 (1996).

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Claim construction resolves legal disputes between the parties regarding claim scope. *See Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319 (Fed. Cir. 2016).

Evidence intrinsic to the application, prosecution, and issuance of a patent is the most significant source of the legally operative meaning of disputed claim language. *See Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (*en banc*); *see also Markman*, 52 F.3d at 979. As the Federal Circuit explained in *Phillips*, courts examine the intrinsic evidence to determine the "ordinary and customary meaning of a claim term" as understood by a person of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1313.

"[T]he claims themselves provide substantial guidance as to the meaning of particular claim terms." *Id.* at 1314; *see Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) ("In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to 'particularly point[ ] out and distinctly claim[ ] the subject matter which the patentee regards as his invention.'"). The context in which a term is used in an asserted claim can be "highly instructive." *Phillips*, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or un-asserted, may also provide guidance as to the meaning of a claim term. *Id.*

The specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). "[T]he specification may reveal a special definition given to a claim term by the patentee that differs from

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the meaning it would otherwise possess. In such cases, the inventor's lexicography governs." *Id.* at 1316. "In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor." *Id.* As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Id.* at 1323. In the end, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be . . . the correct construction." *Id.* at 1316 (quoting *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

Only when the evidence intrinsic to the patent record does not establish the meaning of a claim may extrinsic evidence like treatises, inventor testimony, or expert testimony be considered. *Phillips*, 415 F.3d at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Id.* "The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence." *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

C. Domestic Industry

For a patent-based complaint, a violation of section 337 can be found "only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established." 19 U.S.C. § 1337(a)(2). The complainant bears the burden of showing by a preponderance of the evidence that the domestic industry requirement is satisfied. *Certain Multimedia Display & Navigation Devices & Systems, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-694, Comm'n Op. at 5 (August 8, 2011). That domestic

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industry requirement of section 337 is often described as having an economic prong and a technical prong. *InterDigital Commc'ns, LLC v. Int'l Trade Comm'n*, 707 F.3d 1295, 1298 (Fed. Cir. 2013).

Section 337(a)(3) sets forth the following criteria for determining whether the economic prong of the domestic industry requirement is satisfied in such investigations:

> [A]n industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned --
>
> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3). Because these criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the economic prong of the domestic industry requirement. *See Certain Printing & Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm'n Op. at 26, USITC Pub. No. 4289 (Nov. 2011).

The technical prong of the domestic industry requirement is satisfied when the complainant in a patent-based section 337 investigation establishes that it is practicing or exploiting the patents at issue. *See* 19 U.S.C. § 1337(a)(2)-(3); *Certain Microsphere Adhesives, Process for Making Same & Prods. Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 8, USITC Pub. No. 2949 (Jan. 1996). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, i.e., a comparison of domestic products to the asserted claims." *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent. *See Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 38 (Aug. 1, 2007).

[redacted]

IV. CLAIM CONSTRUCTION

A. Level of Ordinary Skill in the Art

Innoscience proposes the same standard for a person of ordinary skill in the art would apply to both the '294 patent and the '508 patent. RIB at 20. Innoscience states such a person would have:

> at least a bachelor's degree in electrical engineering, chemical engineering, physics, or material science or a closely related field and at least two years of experience in semiconductor device design or fabrication, including the processing of semiconductor materials, analysis of device operation, or the development of new device topologies.

Id. (citing Tr. at 847:16-848:9 (Lebby)). Staff generally agrees a person of ordinary skill in the art would have "at least a bachelor of science degree in electrical engineering, physics, material science, or a related discipline, with at least two years of relevant work experience in the field of semiconductor fabrication." SOCCB at 4-5. Staff also asserts that "any differences in the parties' proposals would not affect the construction of the terms now at issue." *Id.* EPC did not argue for a different level of ordinary skill.

To the extent it is necessary to determine the level of ordinary skill in the art, I find Innoscience's proposal is consistent with the weight of the record evidence, and I adopt it.

B. The '294 Patent

1. "a compensated GaN layer"

The parties proposed competing constructions for the term "a compensated GaN layer," which appears in asserted claim 1 of the '294 patent. The term is also a necessary element of asserted claims 2 and 3 because they depend from claim 1. The parties' proposed constructions for this term are summarized as follows:

[redacted]

Term	EPC Proposed Construction	Innoscience Proposed Construction	Staff Proposed Construction
"a compensated GaN layer" (Claim 1 of the '294 patent)	a semiconductor GaN gate material in which one type of impurity (for example, donor) cancels the electrical effects of the other type of impurity (for example, acceptor)[7] Not a "product-by-process" limitation.	"a doped GaN layer formed with a step to passivate its impurities" Which is a "product-by-process" limitation.	"a GaN layer in which one type of impurity cancels the electric effects of another type of impurity"

Joint Claim Construction Chart at 2 (EDIS Doc ID 804365); CRCCB at 6.

EPC and Staff offer specific constructions of the claim term, but also argue their proposed constructions are consistent with the plain and ordinary meaning of the term. COCCB at 4 ("EPC's construction applies the plain meaning to a POSA of "GaN layer" and "compensated."); SOCCB at 6 ("EPC and the Staff agree that the term should be afforded its plain and ordinary meaning consistent with the specification and the Authoritative Dictionary of IEEE Standards."). Notwithstanding those statements, EPC's proposed "plain meaning" of the "compensated GaN layer" differs from Staff's proposal and from Innoscience's proposal. Specifically, EPC argues that the compensated GaN layer must be limited to "a GaN ***gate*** material." CCOB at 4 (emphasis in original). On the other hand, Innoscience argues the claim term is a product-by-process

[7] In its responsive claim construction brief, EPC stated it was "amenable to revising its proposed construction to make it consistent with the Staff's construction." CRCCB at 6. EPC's revised construction is shown above. The construction proposed by EPC in the Joint Claim Construction Chart was "a semiconductor GaN gate material in which one type of dopant, impurity, or imperfection (for example, donor) partially cancels the electrical effects of the other type of dopant, impurity, or imperfection (for example, acceptor)." Joint Claim Construction Chart at 2.

limitation and should be "defined according to its process for formation (the compensation step)." ROCCB at 18.

a) EPC's Proposed Construction

I first address EPC's arguments. EPC leads with an argument about the language of claim 1. EPC points out that in claim 1 a "compensated GaN layer" is formed "above the barrier layer" and "a gate contact" is formed "above the compensated GaN layer." COCCB at 5. EPC contends this arrangement indicates the GaN layer limited to GaN gate material. *Id.* Otherwise, EPC argues, claim 1 could cover a compensated GaN layer that is "in contact with the source and the drain." *Id.* at 9.

I conclude that a careful consideration of all of the words in claim 1 cuts against EPC's proposed construction. In particular, EPC's construction does not sufficiently account for the use of the word "layer" in the disputed claim term "compensated GaN layer." Claim 1 is directed to structures organized in the vertical direction: the claim requires "layer above" "layer above" "layer":

> [1pre] 1. A column III Nitride transistor comprising:
> [1a] a substrate,
> [1b] a set of III-N transition **layers above** the substrate,
> [1c] a III-N buffer **layer above** the set of transition layers,
> [1d] a III-N barrier **layer above** the buffer layer,
> [1e] a compensated GaN **layer above** the barrier layer, and
> [1f] a gate contact above the compensated GaN layer.

'295 patent, claim 1 (emphasis added). Only two elements in claim 1 lack the express recitation of a "layer": the "substrate" and the "gate contact." Precedent tells us that these differences are "highly instructive." *See Phillips*, 415 F.3d at 1314. The fact that some claim elements are defined as a "layer" and others are not counsels against interpreting "a compensated GaN layer" to be inherently restricted to something other than a layer. *See id.* (where a claim refers to "steel baffles,"

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that language "strongly implies that the term 'baffles' does not inherently mean objects made of steel).

This difference between layers and other components is reflected in the '294 patent specification. For example, Figure 7 of the '294 patent illustrates "a compensated semiconductor layer 38 over the barrier layer 34" before any gate structures are formed:

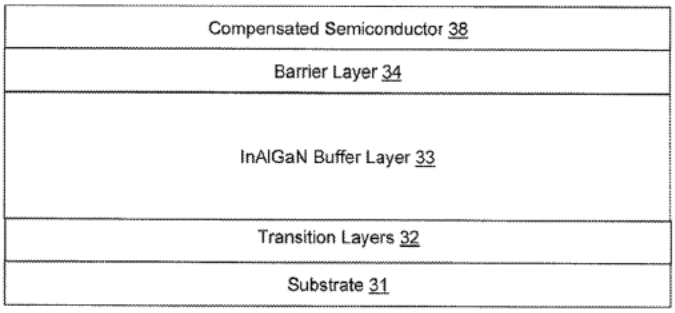


FIG. 7

See '294 patent at Fig. 7, 3:30-31. The patent states that this compensated layer can be a compensated GaN layer. *Id.* at 3:7-17. Thus, it would be incorrect to conclude, as EPC appears to, that the '294 patent exclusively describes a compensated GaN layer as being associated with a gate.

It is true that the '294 patent specification describes an embodiment of the invention formed by "etch[ing] away the compensated semiconductor layer 38, except the portion beneath gate contact layer," but claim 1 has no language indicating that it is restricted only to structures made by that etching process. '294 patent at 3:34-37. Claim 1 is directed to a different aspect of the invention. *See Baran v. Med. Device Techs., Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010) ("It is not necessary that each claim read on every embodiment.").

Beyond the claim language, EPC also asserts "the entirety of the specification refers solely to a compensated GaN gate material." COCCB at 5. EPC notes that the title of the '294 patent is

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"Compensated Gate MISFET and Method for Fabricating Same," and EPC contends a person of ordinary skill in the art would understand from the '294 patent specification that the claimed "compensated GaN layer" is restricted to a GaN gate material. COCCB at 4-7.

EPC's reading of the specification is not borne out in the record. First, the '294 patent specification correlates certain features of the invention with compensated semiconductor material generally, not just with a compensated GaN layer. For example, the specification says "[c]ompensated semiconductor layer 38 preferably comprises *AlGaN or* GaN with a deep level passivated p-type impurity . . ." '294 patent at 3:10-11 (emphasis added). Thus, this is not a case where the specification discloses only an invention having a certain type of GaN layer. Non-asserted claims 4, 7, and 10 reinforce the point that the '294 patent covers more than devices with a certain type of GaN layer, as those claims do not recite a GaN layer at all.

As for the patent title referring to a "compensated gate," nowhere else in the patent is that term used except for in the preamble to non-asserted claim 10. As such, this is not a case where "the patentee used the term throughout the specification in a way that was consistent with only one meaning." *See Info-Hold, Inc. v. Applied Media Techs. Corp.*, 783 F.3d 1262, 1267 (Fed. Cir. 2015). And the fact that claim 10 uses the phrase "compensated gate," while other claims do not, is significant. "There is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims." *Tandon Corp. v. U.S. Int'l Trade Comm'n*, 831 F.2d 1017, 1023 (Fed. Cir. 1987). EPC has not shown evidence that the presumption has been overcome here. Accordingly, a construction that would equate the "compensated GaN layer" in claim 1 with the term "compensated gate" in claim 10 is not correct.

As for EPC's argument that an ordinary artisan would understand that a compensated GaN layer in the '294 patent means GaN that "contributes to reducing gate leakage, not some other type

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of GaN layer," *see* COCCB at 6, neither the '294 patent specification nor claim 1 contain language that requires the compensated GaN layer to reduce gate current leakage. EPC has shown no reason to depart from the precedents holding that "device claims are not limited to devices which operate precisely as the embodiments described in detail in the patent." *Va. Panel Corp. v. MAC Panel Co.*, 133 F.3d 860, 866 (Fed. Cir. 1997).

Even if it were true that "the entirety of the specification refers solely to a compensated GaN gate material," as EPC incorrectly contends (*see* COCCB at 5), it is "not enough that the only embodiments, or all of the embodiments, contain a particular limitation. We do not read limitations from the specification into claims; we do not redefine words. Only the patentee can do that. To constitute disclaimer, there must be a clear and unmistakable disclaimer." *Thorner v. Sony Computer Ent. Am. LLC*, 669 F.3d 1362, 1366–67 (Fed. Cir. 2012). EPC has not cited any such clear and unmistakable disclaimer here.

In sum, EPC has shown no reason to depart from the plain and ordinary meaning of the term "a compensated GaN layer."

b) Innoscience's Proposed Construction

Innoscience contends that a "compensated GaN layer" should be construed to be a product-by-process term. ROCCB at 14-18. Innoscience argues "while the claim uses 'compensated' as an adjective, that adjective derives from a past-tense verb. The past-tense form of 'compensated' suggests that the step of compensating had occurred." *Id.* at 16. Innoscience also focuses on a teaching in the '294 patent specification about passivation of a p-type impurity using hydrogen, which the specification calls the "critical step" that "differentiates the device of the present invention from the prior art device." '294 patent at 3:43-49; ROCCB at 12.

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The product-by-process doctrine allows certain claims to be "limited by and defined by the process," and a determination of patentability is "based on the product itself." *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985). The purpose of the doctrine is to "enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made." *Id.* The Federal Circuit has laid out an analytical framework for construing a term alleged to be a product-by-process term. *See In re Nordt Dev. Co., LLC*, 881 F.3d 1371, 1375 (Fed. Cir. 2018). First, the tribunal should determine if the term at issue "is a process or structural limitation." *Id.* If the disputed words connote structure, then "by default" those words are "interpreted in their structural sense, unless the patentee has demonstrated otherwise." *Id.* at 1376 (quoting *3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371–72 (Fed. Cir. 2003).

Here, the record clearly indicates that "a compensated GaN layer" connotes structure. For example, Figures 2, 7, 8, and 9 each illustrate a structural layer 38 labeled "Compensated Semiconductor." The written description confirms the structural nature of this layer by describing its constituent materials: "Compensated semiconductor layer 38 preferably comprises AlGaN or GaN with a deep level passivated p-type impurity such as, for example, Mg, Zn, Be, Cd, or Ca." '294 patent at 3:10-12. The written description also confirms that the compensated semiconductor or GaN layer can be "etch[ed] away," which again confirms the layer is a structure. *Id.* at 3:33-37.

The mere fact that "compensated" is a past-tense verb does not compel a construction where a compensated GaN layer is a product-by-process. The body of case law is replete with examples of claim constructions involving past-tense verbs construed based on their structural limitations. *Hazani v. U.S. Int'l Trade Comm'n*, 126 F.3d 1473, 1479 (Fed. Cir. 1997) (holding that "chemically engraved" is not a product by process limitation because it "describes the product more by its structure than by the process used"); *In re Garnero*, 412 F.2d 276, 279 (C.C.P.A. 1969)

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(noting prior constructions of "'intermixed,' 'ground in place,' 'press fitted,' 'etched,' and 'welded,' all of which at one time or another have been separately held capable of construction as structural, rather than process, limitations."). Instead, the proper analysis is whether the disputed words connote structure. *See In re Nordt,* 881 F.3d at 1376.

In sum, Innoscience has not shown that "a compensated GaN layer" should be construed as a product-by-process limitation.

c) Staff's Proposed Construction

Staff proposes that a compensated GaN layer is "a GaN layer in which one type of impurity cancels the electric effects of another type of impurity." Beyond the private party proposals to restrict the term to "gate material" or to a product-by-process limitation, both addressed above, there is no dispute that a compensated GaN layer has one type of impurity which cancels out the electrical effects of another type of impurity, as Staff proposes. Accordingly, there is no need to substitute the words proposed by Staff for the words of the claim. *See Vivid Techs., Inc. v. Am. Science & Eng'g, Inc.*, 200 F.3d 795, 803, (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.").

d) Conclusion

Based on the parties' briefing, arguments at the claim construction hearing, and evidence presented in the investigation record, I construe the term "a compensated GaN layer" to have its plain and ordinary meaning.

[redacted]

C. The '508 Patent

The parties presented two claim construction disputes relating to claim 1 of the '508 patent. Each is addressed below.

1. "etching away the doped GaN layer except a portion of the doped layer beneath the gate contact"

The following chart summarizes the parties' proposals for interpreting this disputed term:

Term	EPC Proposed Construction	Innoscience Proposed Construction	Staff Proposed Construction
"etching away the doped GaN layer except a portion of the doped layer beneath the gate contact" (Claim 1 of the '508 patent)	"etching away the doped GaN layer without etching beneath the gate contact"	"etching away the doped GaN layer in all regions extending outside the gate contact" Alternatively: "etching away the doped gallium nitride layer where it is not beneath the gate contact without etching beneath the gate contact"	Plain and ordinary meaning. No construction necessary. But if construed: "etching away the doped GaN layer without etching beneath the gate contact"

Joint Claim Construction Chart at 2 (EDIS Doc ID 804365). The parties' dispute focused on which areas of the GaN layer need to be etched to satisfy the claim. During the claim construction hearing, Innoscience proposed the alternative construction in the chart above, namely, "etching away the doped gallium nitride layer where it is not beneath the gate contact without etching beneath the gate contact." *See* Markman Tr. at 153:13-154:7. The parties agreed to the alternative construction. *See id.* at 155:15-22. Therefore, the claim term "etching away the doped GaN layer except a portion of the doped layer beneath the gate contact" is construed as "etching away the doped gallium nitride layer where it is not beneath the gate contact without etching beneath the gate contact."

[redacted]

2. Order of Steps

Claim 1 of the '508 patent is a method claim. The parties dispute whether four steps of the claimed method must be performed in the specified order. The following chart summarizes the parties' positions:

Term	EPC Proposed Construction	Innoscience Proposed Construction	Staff Proposed Construction
[1f] "applying a gate photo resistant pattern; [1g] etching away the gate contact layer outside the gate region; [1h] etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact; [1i] removing the gate photo resistant pattern" (Claim 1 of the '508 patent)	There are 4 distinct steps.	"applying a gate photo resistant pattern; using the gate photo resistant pattern to etch away the gate contact layer outside the gate region; using the gate photo resistant pattern to etch away the doped GaN layer in all regions extending outside the gate contact; removing the gate photo resistant pattern"	Steps must be performed in order.

Joint Claim Construction Chart at 2.

At a high level, there is no dispute that four steps in at issue are: [1f] applying a gate photo resistant pattern; [1g] performing a first kind of etching of the gate contact layer; [1h] performing a second kind of etching of the doped GaN layer; and [1i] removing the pattern. *See* Markman Tr. at 165:8-17. During the claim construction hearing, the parties agreed that the claim should be

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construed to require that the first etching step [1g] be performed at some point after the pattern application step [1f]. Markman Tr. at 293:10-22. Additionally, EPC concedes that removing the gate photo resistant pattern in step [1i] must occur at some point after applying the photo resistant pattern in step [1f] "as a matter of logic." COCCB at 15.

The remaining dispute is whether the claim covers a scenario where a gate photo resistant pattern is removed after etching the gate contact layer but before etching the doped GaN layer, as in the following hypothetical order of steps:

> [1f] applying a gate photo resistant pattern;
> [1g] etching away the gate contact layer outside the gate region;
> *[1i] removing the gate photo resistant pattern;*
> [1h] etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact

In such a scenario, the portions of the gate contact layer left after the first etching step [1g] would be used to protect certain areas of the doped GaN layer from being etched in step [1h]. *See* Markman Tr. at 160:25-161:5. EPC argues the claim covers such a process while Innoscience and Staff argue it does not. CRCCB at 9; ROCCB at 28-30; SOCCB at 17.

More particularly, Innoscience argues for a restriction on the order of steps because "the '508 patent repeatedly describes its 'present invention' as using a single photomask to etch both the gate contact and doped GaN layer," citing the '508 patent at 1:53-2:19, 3:1-6; 4:6-17, 4:55-59. ROCCB 28. While Innoscience admits "the claim language does not specify whether a single photomask or two separate masks are used to etch the gate contact and doped GaN layer," it contends a construction of using a single photomask to etch the gate contact and doped GaN layer is required to "tether the claims to what the specifications indicate the inventor actually invented." ROCCB at 29 (quoting *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1305 (Fed. Cir. 2011)). Innoscience also argues that allowing the claim to cover a different order of

steps would allow the claim to read on a prior art method of using two separate masks to etch the gate contact layer and doped GaN layer. ROCCB at 30.

Staff joins Innoscience in arguing that the '508 patent specification never describes a process where a gate photo resistant pattern is removed (step [1i]) after etching the gate contact layer (step [1g]) but before etching the doped GaN layer (step [1h]). *See* SOCCB at 18 ("The specification does not describe such an embodiment . . ."); ROCCB at 29 ("The '508 patent never represents that using any structure other than a single mask—such as two masks—to align and etch the gate contact and doped GaN layer is within the scope of its invention.").

EPC admits that the '508 patent specification describes the "present invention" as "using a single photo mask to etch both the gate contact and doped GaN layer." CRCCB at 9. But EPC argues the plain language of claim 1 is broad enough to cover (a) an embodiment where a single photo mask is used to etch both the gate metal and the doped GaN layer, as well as (b) an embodiment where "a single photo mask can be used to pattern a photoresist mask which is then used to etch the metal, the photoresist mask is removed, and the metal is used as a hard mask subsequently etch the gate material." CRCCB at 9. EPC contends that neither the specification nor claim 1 contains language requiring that a single photo mask must be used to etch both the gate contact and doped GaN layer. CRCCB at 8-10.

When the order of method steps is disputed, the analysis begins with "a general rule the claim is not limited to performance of the steps in the order recited, unless the claim explicitly or implicitly requires a specific order." *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1345 (Fed. Cir. 2008); *Interactive Gift Exp., Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1342 (Fed. Cir. 2001) ("Unless the steps of a method actually recite an order, the steps are not ordinarily

[redacted]

construed to require one."). Neither Innoscience nor Staff have shown that the general rule should not be followed here.

Innoscience admits that the plain language of claim 1 "does not specify" the construction it wants to "insert". *See* ROCCB at 29; Markman Tr. at 165:18-21 ("[W]e want to insert the use of the gate photoresist pattern for the first etch and the second etch."). Instead, Innoscience and Staff focus on the fact that the '508 patent specification does not expressly disclose an embodiment where a gate photo resistant pattern is removed after etching the gate contact layer but before etching the doped GaN layer. That circumstance is not enough to restrict the claim. "[A]n applicant is not required to describe in the specification every conceivable and possible future embodiment of his invention." *Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1344 (Fed. Cir. 2001). If claims were to be limited to a precise, "specification-described embodiment . . . , there would be no need for claims." *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc). Allowing a flexible order of steps would not, as Innoscience argues, result in a construction "divorced from what the specification conveys is the invention." *Cf.* ROCCB at 29 (quoting *Retractable Techs.*, 653 F.3d at 1305). The '508 patent specification coveys that "[t]he present invention is an enhancement mode GaN HEMT device with a gate metal material and a doped GaN or AlGaN material that are self-aligned, and a method for making such a device." *See* '508 patent at 3:1-4; ROCCB at 28 (citing same). If the claimed steps were performed in the order [1f] – [1g] – [1i] – [1h], the method would still result in "an enhancement mode GaN HEMT device with a gate metal material and a doped GaN or AlGaN material that are self-aligned," the same invention as the specification teaches.

To the extent that Innoscience argued at the claim construction phase that claim 1 of the '508 patent would be invalid if the order of the steps in question were flexible, Innoscience never

proved that to be the case. *Compare* ROCCB at 30 with RIB 68-70 (raising no argument that the prior art invalidates claim 1 when the order of steps is allowed to be flexible). In any event, the canon of construing claims to preserve their validity is "a doctrine of limited utility" and has no applicability here, where the plain language of the claims is not ambiguous. *See Phillips*, 415 F.3d at 1328.

In sum, I determine that step [1g] (etching away the gate contact layer) and [1i] (removing the photo resistant pattern) must be performed at some point after step [1f] (applying the gate photo resistant pattern) as a matter of logic and because no party disputes that construction. Beyond that restriction, the four steps in question need not be performed in any particular order.

V. INFRINGEMENT

A. The '294 Patent

EPC contends that the Innoscience Accused Products infringe claims 1, 2, and 3 of the '294 patent, which are apparatus claims. CIB at 23. I review the evidence related to each claim below.

1. Claim 1

[1pre]: "A column III Nitride transistor comprising:"

No party argues that the preamble of claim 1 is limiting. In any event, the parties do not dispute that the Accused Products are column III Nitride transistors. Data sheets for the Innoscience products describe the Accused Products as enhancement-mode gallium nitride transistors. Tr. at 460:18-461:6 (Schubert); CX-0535 at 1 ("100V Enhancement-mode GaN Power Transistor"); CX-0051 at 1 ("650V GaN Enhancement-mode Power Transistor"). Gallium (Ga) is a column III element on the periodic table. I find the Accused Products are column III Nitride transistors.

[redacted]

[1a]: "a substrate,"

EPC contends that the Accused Products have a silicon substrate that satisfies limitation [1a]. CIB at 24-25; Tr. at 463:5-12 (Schubert). EPC's technical expert Dr. Schubert explained that SIMS data and TEM images in the record demonstrate that a silicon layer is present in the Accused Products. Tr. at 463:5-12 (Schubert); CX-0950 at 6; CX-0951C at 6; CPX-0134C; CPX-0124C.

Innoscience and Staff do not dispute that the Accused Products meet this limitation.

I find that the Accused Products satisfy limitation [1a].

[1b]: "a set of III-N transition layers above the substrate,"

EPC contends that the Accused Products have a set of III-N transition layers above the substrate. CIB at 24-25. EPC's expert Dr. Schubert explained the purpose of the transition layers in the Accused Products:

> Silicon has a cubic crystal structure. Gallium nitride has a different crystal structure, a hexagonal crystal structure and due to the different crystal structures a transition layer is needed in order to ensure a smooth transition from the silicon cubic crystal to the gallium nitride hexagonal crystal.

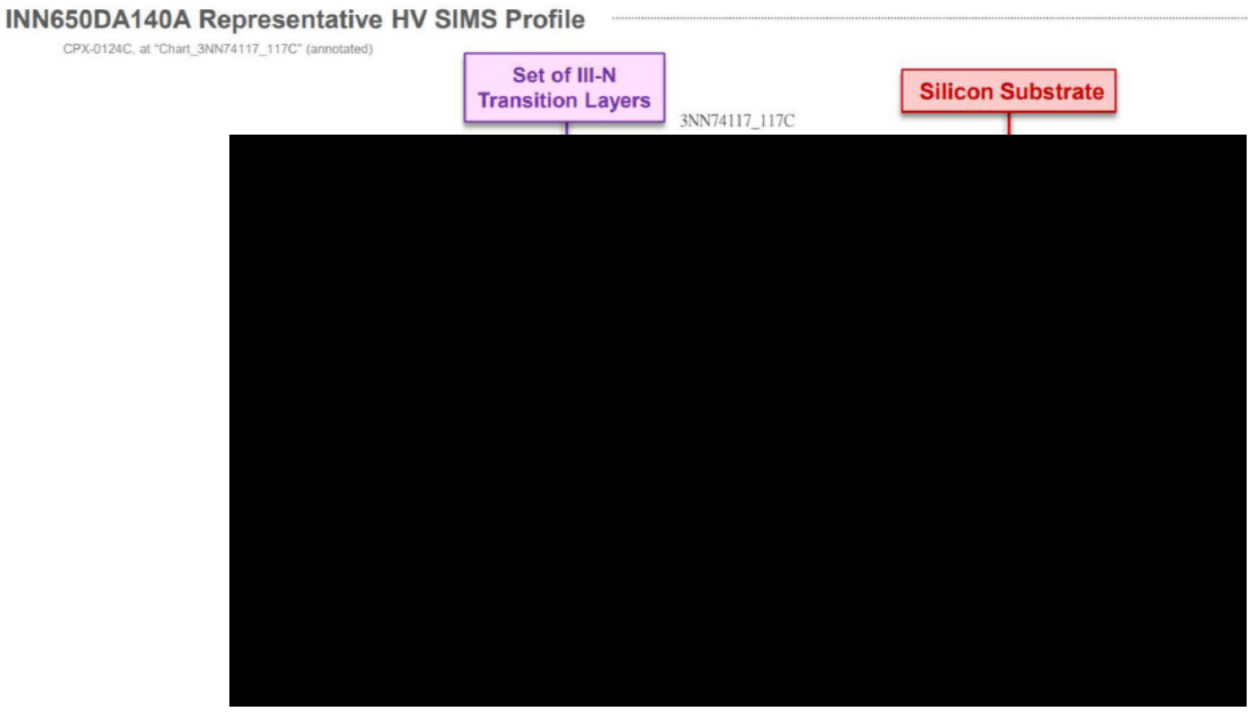
Tr. at 463:5-12 (Schubert). Dr. Schubert annotated SIMS data for the Accused Products to show the presence of transition layers above the substrate:

[redacted]



Tr. at 464:2-15 (Schubert) ("The bottom layer is on the right-hand side, that's the silicon substrate and then the next higher layer to the left is -- are the transition layers and to the transition layers are on top of the silicon substrate"). CDX-0002C.23 (citing CPX-0134C at Chart_3CJI3191 Center).

[redacted]



Tr. at 465:4-14 (Schubert). CDX-0002C.25 (citing CPX-0124C at Chart_3NN74117_117C).

Dr. Schubert also identified the Innoscience epitaxial recipes that produce the transition layers. Tr. at 463:13-465:2 (Schubert). CPX-0126C (recipe [redacted] layer formulas); CPX-0127C (recipe [redacted] layer formulas).

Innoscience and Staff do not dispute that the Accused Products meet this limitation.

I find that the Accused Products satisfy limitation [1b].

[1c]: "a III-N buffer layer above the set of transition layers,"

EPC contends that the Accused Products meet limitation [1c]. CIB at 26-27. EPC's expert Dr. Schubert opined that [redacted] of Innoscience's epitaxy recipes are buffer layers containing gallium nitride. Tr. at 467:21-468:6 (Schubert); CPX-0126C at recipe ([redacted] column in recipe including [redacted]); CPX-0127C at recipe (same). Dr. Schubert also

[redacted]

explained that the Innoscience SIMS data shows buffer layers above the transition layers. Tr. at 468:11-469:14 (Schubert); CPX-0134C at Chart_3CJI3191 Center (showing a gallium nitride portion above the transition layers); CPX-0124C at Chart_3NN74117_117C (same).

Innoscience and Staff do not dispute that the Accused Products meet this limitation.

I find that the Accused Products satisfy limitation [1c].

[1d]: "a III-N barrier layer above the buffer layer,"

EPC contends that the Accused Products meet limitation [1d]. CIB at 26-27. Dr. Schubert opined Innoscience's epitaxy recipes contain an aluminum gallium nitride layer that is a barrier layer. Tr. at 467:21-468:6 (Schubert); CPX-01127C (recipe [redacted]) CPX-0126C (recipe [redacted]). Dr. Schubert also explained that the Innoscience SIMS data shows a barrier layer above the buffer layer. Tr. at 468:11-469:14 (Schubert); CPX-0134C at Chart_3CJI3191 Center (showing a portion containing aluminum, gallium, and nitride above the previously identified buffer layer); CPX-0124C at Chart_3NN74117_117C (same).

Innoscience and Staff do not dispute that the Accused Products meet this limitation.

I find that the Accused Products satisfy limitation [1d].

[1e]: "a compensated GaN layer above the barrier layer, and"

EPC contends that the Accused Products have "a compensated GaN layer above the barrier layer." CIB at 27-41. Staff agrees. SIB at 18-22. Innoscience argues the Accused Products do not contain the claimed compensated GaN layer because its products have a conducting pGaN layer which, in its view, differs from the claimed compensated GaN layer. RRB at 17-54.

In order to evaluate the parties' arguments, some undisputed background is in order. If an acceptor-type impurity, like magnesium, is added to a gallium nitride layer, it will want to attract

[redacted]

an electron. Tr. at 103:13-19 (Lidow). If there is hydrogen in the vicinity, it will bind with the magnesium, donating an electron. *Id.*; Tr. at 1069:6-19 (Doolittle). The magnesium-hydrogen complex becomes inactive and the GaN layer becomes compensated. Tr. at 103:13-19, 212:6-13 (Lidow); Tr. at 443: 3-18 (Schubert); Tr. at 877:7-11 (Lebby).

The parties disagree on how to determine if a GaN layer is the claimed compensated GaN layer. EPC contends five corroborating factors confirm the presence of a compensated GaN layer in the Accused Products:

(1) Innoscience performs epitaxial growth of the GaN layer [redacted];

(2) Innoscience does not include a hydrogen expulsion step during [redacted];

(3) Innoscience does not perform hydrogen expulsion during [redacted];

(4) Innoscience SIMS data shows a [redacted] the presence of magnesium and the presence of hydrogen; and

(5) The electrical characteristics of the finished Innoscience devices are those of a device with a compensated GaN layer.

CIB at 29. Staff supports EPC's analysis and supporting evidence. SIB at 18-20.

Innoscience presents different metrics for determining the presence of a compensated GaN layer. Innoscience contends that a compensated GaN layer can be identified by:

(1) the resistivity or conductivity of the GaN layer, and

(2) hydrogen concentration on par with or greater than the doping atom concentration.

RRB at 11-12.

[redacted]

The factors identified by the parties are examined in more detail below.

i) Epitaxial Growth [redacted]

EPC argues that by growing the "Mg-doped GaN layer [redacted], Innoscience [redacted] passivates the magnesium and results in compensation." CIB at 29-30. EPC relies on Innoscience's epitaxy recipes [redacted] *Id.*; Tr. at 475:22-476:6 (Schubert); CPX-0127C at recipe, [redacted] CPX-0126C at recipe, [redacted]. Dr. Schubert opined [redacted] passivating the conductivity of the magnesium. CIB at 29-30; Tr. at 474:13-18 (Schubert).

I find this evidence weighs in favor of finding the Accused Products have a compensated GaN layer.

ii) Lack of a Hydrogen Expulsion Step During [redacted];

EPC argues that Innoscience's manufacturing process lacks a step [redacted] to expel hydrogen [redacted] in the Accused Products. CIB at 31-33. Dr. Schubert opined that one way to force hydrogen to diffuse out of the material is to expose the material to an environment without available hydrogen at 800 degrees Celsius for 20 minutes. Tr. at 475:9-18 (Schubert). The Innoscience epitaxy recipes indicate [redacted]. CIB at 31-32; Tr. at 478:3-17 (Schubert); CPX-0127C at "recipe," [redacted] CPX-0126C at "recipe," [redacted].

[redacted]

I find this evidence weighs in favor of finding the Accused Products have a compensated GaN layer.

iii) No Hydrogen Expulsion During [redacted];

EPC contends that there is also no expulsion of hydrogen during [redacted] of the Accused Products, and more specifically that [redacted]. CIB at 33-34. Dr. Schubert opined that [redacted] Tr. at 481:24-483:4 (Schubert). Corporate testimony from Innoscience indicates that [redacted]. JX-0033C at 126:15-128:3 (Ni Dep. Tr.). Dr. Schubert stated that there was [redacted]. Tr. at 482:21-483:7 (Schubert) ([redacted]); RX-0193C at 72; CPX-0153C, [redacted]; CX-0921C at 23; CPX-0168C, [redacted] CX-0921C at 15.

I find this evidence weighs in favor of finding the Accused Products have a compensated GaN layer.

iv) SIMS Data Regarding the Presence of Magnesium and Hydrogen

EPC contends that the SIMS profiles for the Accused Products show (1) hydrogen and magnesium concentrations occur in the same layer location, and (2) hydrogen and magnesium

[redacted]

concentrations substantially change [redacted] and drop to background noise levels outside of that layer. CIB at 35-36.

Innoscience challenges EPC's interpretation of the SIMS data as "based on unfounded, false premises." RRB at 29-31. Innoscience's technical expert Dr. Doolittle stated "the measured hydrogen concentration [redacted]. And that means [redacted] to make it conductive." Tr. at 1171:18-22 (Doolittle). Innoscience argues correlation between hydrogen and magnesium concentrations do not indicate a compensated GaN layer because "hydrogen is in every pGaN layer" and published scientific articles show correlation between hydrogen and magnesium concentrations in conductive material. Tr. at 1166:20-1167:16 (Doolittle); RX-0344 at 2; RX-0340 at 8-9. Instead of mere correlation between hydrogen and magnesium concentrations, Dr. Doolittle stated "[y]ou have to know the relative amount of hydrogen and magnesium" to determine whether a GaN layer has been compensated. Tr. at 1167:12-16 (Doolittle).

Innoscience notes technical literature, such as *Properties and Effects of Hydrogen in GaN* by Pearton et al. (RX-0344), do not support EPC's position that close tracking of magnesium and hydrogen concentrations indicate a compensated GaN layer. RRB at 30. The Pearton article states: "The following information is firmly established for the behavior of hydrogen in GaN. . . . The residual hydrogen concentration in all GaN(Mg) tracks the acceptor concentration." RX-0344 at 2. The article continues:

> For the case of p-GaN, the hydrogen concentration is usually the same as the active Mg (i.e. ~ 1% of 10^{20} cm^{-3}) after growth. A 700 °C, 20 min post-growth anneal in N_2 only reduces the hydrogen concentration by a factor of 2 or 3, but this is enough to have strong p-type conductivity.

RX-0344 at 3.

[redacted]

Because a correlation between hydrogen and magnesium concentrations does not necessarily distinguish a compensated GaN layer from a potentially conductive one, I afford this evidence little weight in determining whether the Accused Products have a compensated GaN layer. However, I find that EPC's evidence about the presence of hydrogen and magnesium is not inconsistent with a finding that the Accused Products have a compensated GaN layer.

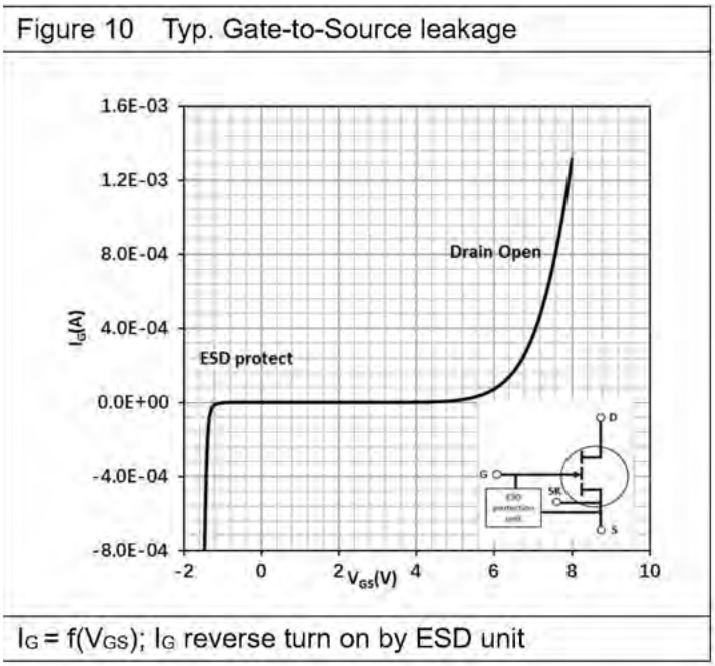
v) Electrical Characteristics of the Finished Innoscience Devices

EPC contends that the electrical characteristics of the Accused Products are consistent with electrical characteristics of the invention described in the '294 patent. CIB at 39-42. The '294 patent states that one of the distinguishing characteristics of the present invention compared to the prior art is the ability to drive the gate bias higher with minimal gate current leakage:

> [T]ypically, in the prior art, the gate begins to conduct current between 2.5V to 3.5V[, while] the present invention can be driven to 5V without dramatic gate leakage occurring . . . .

'294 patent at 4:20-27. Innoscience's documentation for the Accused Products indicates little to no gate leakage until applying greater than 5V:

[redacted]



CX-0551 at 9 (Fig. 10 showing significant current increase when exceeding approximately 5V); Tr. at 492:1-23 (Schubert); *see also* CX-0535C at 5 (Table 6 indicating "Gate-to-Source Forward Leakage" at 5V). EPC also relies on additional independent testing that shows the Accused Products do not exhibit substantial gate leakage until approximately 5V. Tr. at 492:24-493:9 (Schubert).

I find this evidence weighs in favor of finding the Accused Products have a compensated GaN layer.

vi) Innoscience's licensed technology

Innoscience argues that the Accused Products use a conductive pGaN layer and a Schottky gate based on technology Innoscience licensed from Belgian entity Interuniversitair Micro-Elektronica Centrum (IMEC). RRB at 17-21; RX-0748C. Dr. Marcon testified about some of the research and development performed by IMEC related to Schottky gates and HEMTs. Tr. at 796:6-807:8 (Marcon). Dr. Marcon testified that Innoscience describes its products as using Schottky gates in presentations and publications. *Id.* at 808:14-811:17; RX-0284.2 (Interview with Dr.

[redacted]

Marcon); CX-0935C.7 (power electronics conference presentation); RX-0701.14 (journal article). EPC and Staff argue Dr. Marcon's testimony and the IMEC technology licenses are irrelevant to the infringement analysis. CSB at 4; SRB at 18.

I find Innoscience's licensing of IMEC's technology and the testimony relating to it by Dr. Marcon unpersuasive evidence of non-infringement. At best, Innoscience has shown evidence that it has licensed some technology. But the record does not correlate what Innoscience has licensed to the structures of the Accused Products. As EPC and Staff note, Innoscience's witness Dr. Marcon testified he lacks knowledge about the structure and manufacturing process of the Accused Products:

> Q. You do not know the epitaxial structure of the Innoscience products; do you?
>
> A. No, I don't.
>
> Q. And you're not involved in the manufacture of the Innoscience gallium nitride power devices?
>
> A. No, I'm not involved.
>
> Q. And you're not involved in the research and development of Innoscience gallium nitride devices?
>
> A. No.
>
> Q. And you do not know the manufacturing process of Innoscience devices?
>
> A. No.

Tr. at 825:16-826:3 (Marcon); CSB at 4; SRB at 18.

Even if the Accused Products practice some of the technology licensed from IMEC, that would not necessarily preclude a finding of infringement, particularly if the licensed technology itself infringes.

[redacted]

I find this factor does not counterbalance other evidence that the Accused products have a compensated GaN layer.

vii) Hydrogen [redacted]

Innoscience argues that SIMS data for the Accused Products shows [redacted] RRB at 31-34. Dr. Doolittle opined that when [redacted]. Tr. at 1095:15-1097:4, 1099:22-1100:2 (Doolittle). According to Dr. Doolittle, [redacted]. Dr. Doolittle illustrated that data as follows:

[redacted]



RDX-0012C at slide 50 (Dr. Doolittle's graphical representation of SIMS data from CPX-0028C); Tr. at 1097:5-1099:21 (Doolittle).

In the graph above, the surface of the device is represented at the left edge, and the horizontal axis indicates increasing depth below that surface, in nanometers. Tr. at 1096:9-11 (Doolittle). Both experts agree that SIMS data loses reliability near the surface of a device, particularly when, as here, the surface has been ground off to allow testing. Tr. at 1099:2-9 (Doolittle) ("[Y]ou don't tend to regard that analysis as accurate near the surface. I think Dr. Schubert, from what I understood of his testimony, would agree with that. This is especially true in these modified devices where they ground off and edged off these layers to get back to the p-type surface."); *id*. at 488:5-14 (Schubert) ("[S]ome of the p-GaN has been removed, the surface

[redacted]

is going up and down and that is not a good condition for SIMS measurement."); *see also id.* at 1086:11-23 (Doolittle). Dr. Doolittle marked the unreliable data from the area near the surface—data from a depth of 0 nm to about 10 nm—with a vertical green bar. Tr. at 1099:2-6 (Doolittle).

Zooming in, Dr. Doolittle highlighted the data he concluded shows outward diffusion of hydrogen with a dashed red circle:

[redacted]

RDX-0012C at slide 51 (Dr. Doolittle's graphical representation of SIMS data from CPX-0028C). Dr. Doolittle called "this downward profile" (downward when viewed moving from the right to left, or from deep within the device towards the surface) "a characteristic fingerprint, if you will, of a hydrogen out diffusion." Tr. 1096:25-1097:4 (Doolittle).

From this data, Dr. Doolittle concluded that "there is a reduction in the hydrogen concentration somewhere in the process, most likely [redacted]" Tr. at 1099:22-1100:2 (Doolittle).

I find that the conclusions Dr. Doolittle drew from the SIMS data are not justified. As can be observed in the graph, there is an inflection point in the hydrogen intensity data just to the left of the data Dr. Doolittle circled. Between the circled red data and the green unreliable surface region, the cyan hydrogen intensity signal actually increases moving towards the surface. This

increase nearer to the surface is inconsistent with Dr. Doolittle's opinion that out-diffusion of hydrogen would result in lower hydrogen readings moving closer the surface.

On the other hand, Dr. Schubert acknowledged that the region near the surface for these test results were "not a good condition for SIMS measurement" and he did not "want to overinterpret these results," only stating that both hydrogen and magnesium are found close to the surface. Tr. at 488:5-14 (Schubert).

I do not find either expert has demonstrated sufficient reliability of the SIMS data near the surface of device samples in question. Even accepting the general showing that hydrogen and magnesium are near the surface, I do not find this evidence indicates either a compensated or conductive pGaN layer with any certainty.

viii) Electrical testing of Innoscience wafers that were made for this litigation

Dr. Doolittle testified that directly testing the electrical conductivity of the pGaN layer in the finished Accused Products is impossible, so he directed Innoscience to manufacture certain wafers for this litigation to facilitate certain electrical tests. Tr. at 1102:12-1104:7 (Doolittle). Dr. Doolittle stated that wafers manufactured for this litigation were made using the Innoscience "commercial fabrication process" using "the Innoscience process line." Tr. at 1103:9-16 (Doolittle). Innoscience argues that tests using the litigation-made wafers show that the pGaN layer in the wafers is conductive, not insulative. RRB at 34-40 (citing Tr. at 1104:8-1111:15 (Doolittle)).

Specifically, Dr. Doolittle looked at the effect of [redacted] on the test wafers. He subjected some of the test wafers to the same [redacted] used by Innoscience to make the Accused Products, and the [redacted] wafers had significantly higher conductivity in their pGaN layers than wafers [redacted] Tr. at 1107:17-1109:7

[redacted]

(Doolittle). Additionally, Dr. Doolittle tested the resistivity of the Innoscience pGaN material in the test wafers using the transfer length method (TLM). Tr. at 1115:2-1117:7 (Doolittle). Dr. Doolittle explained that general semi-insulative material has resistivity of 10^7 ohm-cm, and he concluded that resistivity of the pGaN material in the Innoscience test wafers [redacted]. Tr. at 1117:23-1118:13 (Doolittle); *see also id.* at 1242:25-1243:9 (Doolittle). Dr. Doolittle concluded that [redacted]. Tr. at 1122:24-1123:5 (Doolittle).

EPC argues that Dr. Doolittle's test wafers provide little insight into analysis of the accused products because the imported Accused Products substantially differ from the litigation-made wafers. CIB at 47. For example, it is undisputed that the Accused Products include additional layers and features not found on the test wafers, [redacted]. Tr. at 536:1-23 (Schubert).

I give little, if any, weight to the conclusions Dr. Doolittle drew about the Accused Products from testing the made-for-litigation wafers. As has been noted, the wafers Dr. Doolittle tested did not include all of the layers and features of the Accused Products. Dr. Doolittle himself provided testimony that the presence of additional layers could affect the electrical properties of a finished device. Tr. at 1159:12-1161:1 (Doolittle) ("[T]here's a whole bunch of other intervening layers that could exist that could affect the leakage current and the gate turn-on voltage."). Additionally, Dr. Schubert testified that the TLM method used by Dr. Doolittle to measure resistivity in the test wafers required the presence of ohmic contacts to be valid, and the wafers prepared for Dr. Doolittle had no ohmic contacts. Tr. at 696:3-24 (Schubert). Dr. Doolittle's trial testimony confirmed the relevance of an ohmic contact when characterizing a device. *See, e.g.*, Tr. at

[redacted]

1075:17-1076:11, 1078:9-17, 1159:13-1160:1 (Doolittle) (contrasting the characteristics of ohmic and Schottky contacts).

Given the differences between the Accused Products and the made-for-litigation wafers, as well as the weight of the record evidence that those differences are material, I give little, if any, weight to the tests of the electrical properties of the wafers.

ix) The resistivity or conductivity of the GaN layer

Innoscience contends that the Accused Products use a Schottky gate contact that requires a conductive pGaN layer, which cannot satisfy the claimed compensated GaN layer. RRB at 23-24. Innoscience's expert Dr. Doolittle opined that the Accused Products have a titanium nitride gate contact, and "titanium nitride is known throughout the industry and the academic literature as being a Schottky contact to p-type gallium nitride. Tr. at 1078:2-17 (Doolittle). Dr. Doolittle also relied on public statements by Innoscience that characterizes its products as using Schottky contacts. Tr. at 1079:24-1080:5 (Doolittle); RX-0166.4; CX-0935C.7.

As noted above, Dr. Doolittle commissioned some devices to be constructed for this litigation to illustrate his opinion as to the electrical effects occurring in the Accused Products. Tr. at 1079:4-9 (Doolittle). The specially built devices comprised a titanium nitride and pGaN contact. Dr. Doolittle then conducted tests on those specially built devices and testified that those devices exhibited "classic rectifying behavior that you would see from a Schottky contact, where the current increases exponentially as you increase the voltage . . . ." Tr. at 1079:4-9 (Doolittle). Dr. Doolittle's testing of the made-for-litigation wafers is discussed in detail above in Section V.A.1.viii).

EPC and Staff object to Innoscience's theory that the Accused Products do not infringe because they contain a Schottky gate as untimely. CIB at 49-50; CSB at 2-4; SRB at 17-18. EPC

argues that Innoscience did not assert a theory based on the presence of a Schottky gate in its non-infringement contentions. CIB at 49-50. EPC and Staff admit, however, that Dr. Doolittle did discuss Schottky contacts in connection with his testing of the made-for-litigation wafers. CIB at 49-50; CSB at 2-3; SRB at 17.

Innoscience does not dispute that it failed to disclose the Schottky theory at issue in its non-infringement contentions. *See generally* RSB at 1-5. Instead, Innoscience argues Dr. Doolittle disclosed his Schottky opinions in his expert reports and deposition. RSB at 1-4. Innoscience further argues EPC has suffered no prejudice even if the theory was untimely disclosed because Dr. Schubert addressed Schottky gates in his deposition and at the evidentiary hearing. RSB at 4-5.

Reviewing the record, I find EPC and Staff recognize Dr. Doolittle opined on Schottky contacts in connection to the testing of the made-for-litigation wafers, and thus his testimony on at least those opinions is appropriate. There is no dispute that Dr. Doolittle offered his opinions on the made-for-litigation wafers in support of Innoscience's theory that its allegedly similar finished Accused Products do not infringe. EPC has not specified what additional evidence it was unable to present to rebut Innoscience's broader theory that the Accused Products contain a Schottky contact. Accordingly, having found EPC had some notice of the theory during discovery, and seeing no particularized showing of prejudice, I will not strike the testimony and evidence adduced by Innoscience related to Schottky contacts.

In addition to its timeliness objections, EPC addresses Dr. Doolittle's opinions on the merits. EPC correctly points out that the '294 patent discloses use of a titanium nitride gate contact with the claimed invention. '294 patent at 3:4-7 ("A gate contact 37, formed of for example, Ta,

[redacted]

Ti, TiN, W, or WSi_2"). This undercuts Dr. Doolittle's conclusion that titanium nitride as the metal contact over p-type gallium nitride necessarily indicates a compensated GaN layer is not present.

On the whole, the record does not indicate the Accused Products contain a Schottky gate. Dr. Doolittle cites Innoscience's general statements about products using Schottky contacts, but does not provide analysis to indicate how those statements specifically apply to the Accused Products. As discussed above, I do not find the test result from the made-for-litigation wafers to be persuasive.

x) Conclusion

On the present record, I credit EPC's showing that the Innoscience Accused Products are made by epitaxial growth of a GaN layer with magnesium impurities [redacted]. I further credit a lack of significant opportunities in the Innoscience process to expel that hydrogen or otherwise reactivate the GaN layer. Other evidence, like the electrical properties of the finished Innoscience devices, is not inconsistent with the presence of a compensated GaN layer. I find EPC has demonstrated the Accused Products have the claimed compensated GaN layer, and therefore meet limitation [1e].

[1f]: "a gate contact above the compensated GaN layer."

EPC contends that the Accused Products include a titanium nitride gate that meets the claim limitation "a gate contact above the compensated GaN layer." CIB at 42. Dr. Schubert opined that the TEM images of the products show "the gate metal contact is located on the compensated gallium nitride layer." Tr. at 527:19-528:8 (Schubert); CX-0950C at 6; CX-0951C at 6. Dr. Schubert supported his opinion with the Innoscience traveler documents:

> [W]e have the Innoscience low voltage device. [redacted] which means gate titanium nitride deposition.

[redacted]

On the right-hand side, we have the high voltage device and I identified [redacted]

If we go to [redacted].

Tr. at 529:18-530:6 (Schubert); CPX-0153C (showing the titanium nitride deposition for the low voltage device [redacted]); CPX-0168C (showing titanium nitride deposition [redacted] for the high voltage device).

While Innoscience disputes that there is no "compensated GaN layer" for a gate contact to be "above" in the Accused Products, Innoscience does not dispute that the Accused Products have a gate contact above the layer that EPC has identified as, and that I have found to be, a compensated GaN layer. Accordingly, I find that the Accused Products satisfy limitation [1f].

Claim 1 Conclusion

EPC has demonstrated that the Accused Products include each element of claim 1 of the '294 patent. In the event that claim 1 is not determined to be invalid, I find that Innoscience has infringed claim 1 of the '294 patent through the importation and sale of the Accused Products.

2. Claim 2: "The transistor of claim 1, wherein the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen."

Claim 2 of the '294 patent recites "[t]he transistor of claim 1, wherein the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen." EPC contends that the Accused Products meet the additional limitation of claim 2 based on the same evidence discussed in connection with claim limitation [1e]. CIB at 42; *see also* Tr. at 531:25-532:17 (Schubert) ("I showed that the compensated gallium nitride layer, indeed, contains acceptors, magnesium and also I showed that the dopant atoms are passivated with hydrogen. I showed the presence of

[redacted]

hydrogen in SIMS profiles."). Innoscience's expert on validity, Dr. Lebby, confirmed that magnesium in a GaN layer acts as an acceptor-type dopant atom that can be passivated with hydrogen. Tr. at 867:8-20, 871:16-872:5-25 (Lebby). Based on at least the evidence discussed in connection with claim limitation [1e], *see* V.A.1.[1e], I find the Accused Products are passivated with hydrogen.

EPC has demonstrated that the Accused Products include each element of claim 2 of the '294 patent. I find that Innoscience has infringed claim 2 of the '294 patent through the importation and sale of the Accused Products.

3. Claim 3: "The transistor of claim 2, where the acceptor type atoms are selected from the group consisting of Mg, Zn, Be and Ca."

EPC relies on the same evidence discussed in connection with claim limitation [1e] to show the acceptor type atoms in the compensated GaN layer of the Accused Products are magnesium (Mg). CIB at 43. Innoscience does not dispute that the Accused products have magnesium acceptor atoms in the layer I have found to be a compensated GaN layer. Accordingly, I find the accused products infringe claim 3 based on at least the evidence discussed in connection with claim limitation [1e].

B. The '508 Patent

EPC contends that the process used to make the Accused Products literally infringes claim 1 of the '508 patent. CIB at 57. Innoscience and Staff argue the process of making the Accused Products does not include limitation [1h], "etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact," and the limitations [1f] through [1i] are not performed in the order specified in claim 1. RRB at 85-86; SIB at 38-44.

[redacted]

As discussed in further detail below, I find that Innoscience does not practice limitation [1h] when making the Accused Products, and therefore, infringement of claim 1 of the '508 patent has not been shown.

[1pre]: "A method of forming an enhancement mode GaN transistor, the method comprising:"

No party argues that the preamble of claim 1 is limiting. In any event, the parties do not dispute that when Innoscience manufactures the Accused Products, it undertakes steps that form "an enhancement mode GaN transistor." Innoscience's own documentation describes the Accused Products as enhancement-mode GaN power transistors. *See*, *e.g.*, CX-0535 at 1 ("100V Enhancement-mode GaN Power Transistor"); CX-0051 at 1 ("650V GaN Enhancement-mode Power Transistor"); JX-0033C at 160:2-6 (Ni Dep. Tr.) ("Currently, all [Innoscience] products in mass production are enhancement mode gallium nitride transistors."); *see also* Tr. at 552:17-553:17 (Schubert). I find the Accused Products are made using a method for forming an enhancement-mode GaN transistor.

[1a]: "nucleating and growing transition layers on a substrate;"

[1b]: "growing an III Nitride EPI layer over the transistor layers;"[8]

[1c]: "growing an III Nitride barrier layer over the EPI layer;"

[1d]: "growing a GaN layer with acceptor type dopants over the barrier layer;"

EPC addresses limitations [1a] through [1d] together, primarily relying on expert testimony and representative epitaxy recipes to demonstrate satisfaction of these limitations. CIB at 58-59.

[8] As noted in fn.6 above, the parties appear to agree that claim element [1b] has a typographical error and refers to "transition" layers, not "transistor" layers.

[redacted]

EPC's expert Dr. Schubert gave testimony explaining how Innoscience recipes for making two representative Accused Products—INN100W032A LV and INN650DA140A—each meet steps [1a]-[1d] of claim 1. Dr. Schubert illustrated his analysis by annotating Innoscience recipe documents for the two representative products. The annotated recipe for INN100W032A LV follows:

[redacted]

See CDX-0002C.99; CPX-017C; CDX-0002C.98-99; CPX-0134C; CX-0950-0011.

The annotated recipe for INN650DA140A HV follows:

[redacted]

Tr. at 554:7-559:11 (Schubert); CDX-0002C.101; CPX-0126C; CDX-0002C.100-101; CPX-0124C; CX-0950-0011; CX-0601C.

Dr. Schubert used colors to map the steps in claim 1 to the recipe steps as follows:

- [redacted] claim step [1a].
- [redacted] claim step [1b].
- [redacted] claim step [1c].

[redacted]

- The steps highlighted in blue show growing a GaN layer with acceptor type dopants (Mg) over the barrier layer in accordance with claim step [1d].

Tr. at 554:7-559:11 (Schubert).

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim elements [1a], [1b], [1c], and [1d].

I find that the Accused Products are made by a process that satisfies claim elements [1a], [1b], [1c], and [1d].

[1e]: "depositing a gate contact layer on the doped GaN layer;"

EPC adduced evidence that Innoscience's process for making the Accused Products includes "depositing a gate contact layer on the doped GaN layer" as required by limitation [1e]. CIB at 59-60. Dr. Schubert testified that Innoscience manufacturing documents describe a gate metal titanium nitride deposition step that meets the limitation. Tr. at 560:8-14 (Schubert). Additionally, an Innoscience corporate representative confirmed that the Innoscience manufacturing process includes deposition of "titanium nitride" "on the EPI wafer." JX-0031C at 31:2-14 (Ni. Dep. Tr.). Dr. Schubert testified that transmission electron microscopy images and traveler documents for the Accused Products similarly confirm a gate contact layer of titanium nitride on the doped GaN layer. Tr. at 560:8-562:6 (Schubert); CX-0921C at 14, 20; CX-0950C at 11; CX-0597C at 1; CPX-0153C; CPX-0168C.

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1e].

I find that the Accused Products are made by a process that satisfies claim element [1e].

[1f]: "applying a gate photo resistant pattern;"

EPC adduced evidence that Innoscience applies a gate photo resistant pattern when making the Accused Products. Testimony from an Innoscience corporate testimony and Innoscience

[redacted]

process flow documents show [redacted] during manufacture of the Accused Products. CX-0921C at 14, 20 ([redacted]); JX-0031C at 31:17-32:1, 57:19-58:11. Dr. Schubert further elaborated that Innoscience traveler documents describe [redacted]. Tr. at 563:16-567:21 (Schubert).

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1f].

I find that the Accused Products are made by a process that satisfies claim element [1f].

[1g]: "etching away the gate contact layer outside the gate region;"

EPC adduced evidence that Innoscience etches away the gate contact layer outside the gate region when it manufactures the Accused Products. CIB at 62-64. Innoscience's process flow diagrams for making the Accused Products describe and show [redacted]

[redacted]



CX-0921C at 14; *see also, id.* at 20. EPC's expert Dr. Schubert testified that this is consistent with transmission electron microscopy images of the Accused Products and Innoscience traveler documents [redacted]. Tr. at 567:22-570:5 (Schubert); CX-0950C at 11; CX-0951C at 18; CPX-0168C.

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1g].

I find that the Accused Products are made by a process that satisfies claim element [1g].

[1h]: "etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact;"

EPC contends that the Accused Products are made by "etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact" in accordance with limitation [1h]. *See* CIB at 65-69. The parties agreed during the claim construction hearing that this limitation is properly construed as "etching away the doped gallium nitride layer where it is not beneath the gate contact without etching beneath the gate contact." *See* Markman Tr. at 153-155,

[redacted]

291-292. Innoscience and Staff contend that Innoscience does not perform this step of the method because the etching step in the Innoscience process leaves unetched a portion of the GaN layer around the perimeter of the gate contact. *See* RIB at 234-240; SIB at 38-42.

I find the process Innoscience uses to create the Accused Products differs from claim step [1h] due to the use of [redacted] as a mask when the GaN layer is etched. [redacted] *See* RX-0164C at 14, 21. When Innoscience etches the GaN layer, [redacted], which leaves a section of the GaN layer beyond the gate contact. *See id.* The following figures from Innoscience documents illustrate the processes used to create the Accused Products. In the figures, etching happens between the top illustration and the middle illustration of each figure:

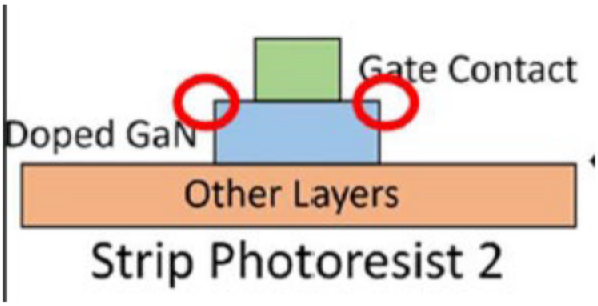
[redacted]

[redacted]

[redacted]

See id.

The figures above show that part of the GaN layer that is not beneath the gate contact remains entirely unetched [redacted] *See id.* Innoscience's expert Dr. Doolittle gave credible testimony that Innoscience does not etch away the section of the GaN layer [redacted]. He illustrated his testimony with the following figure:



RDX-0012C at slide 179. Dr. Doolittle testified, in reference to the figure, "Innoscience leaves these portions [ ] marked in red circles unetched [redacted]." Tr. at 1190:7-11 (Doolittle). Dr. Doolittle further provided a persuasive analysis of why the claim is not met by fabrication of the Accused Products, noting that there were areas not masked by the gate contact that were not "etched, in part or in whole." *See* Tr. at 1184:1-1190:11, 1239:6-1240:8 (Doolittle).

[redacted]

Because a section of the GaN layer that is not beneath the gate contact remains entirely unetched, I find that Innoscience's process for creating the Accused Products does not practice step [1h], which requires "etching away the doped gallium nitride layer where it is not beneath the gate contact."

EPC's arguments to the contrary are not persuasive. EPC contends that etching any section of the GaN layer that is not beneath the gate contact satisfies this claim limitation. *See* CIB at 65-69. EPC therefore contends that the Accused Products were made in the manner required by the claim because Innoscience etches a section of the GaN layer—[redacted]—while the area of the GaN layer beneath the gate contact is unetched. *See id.*

EPC analogizes the Accused Products to embodiments of the invention shown in Figures 8-10 of the '508 patent. *See id.* at 68. In both finished products, the bottom of the gate metal contact and the top of the GaN layer do not have the same dimension; the GaN layer extends beyond the perimeter of the gate contact. For example, Figure 9 of the '508 patent shows GaN layer 15 beneath the gate contact, but extending beyond the left and right sides of the gate contact:

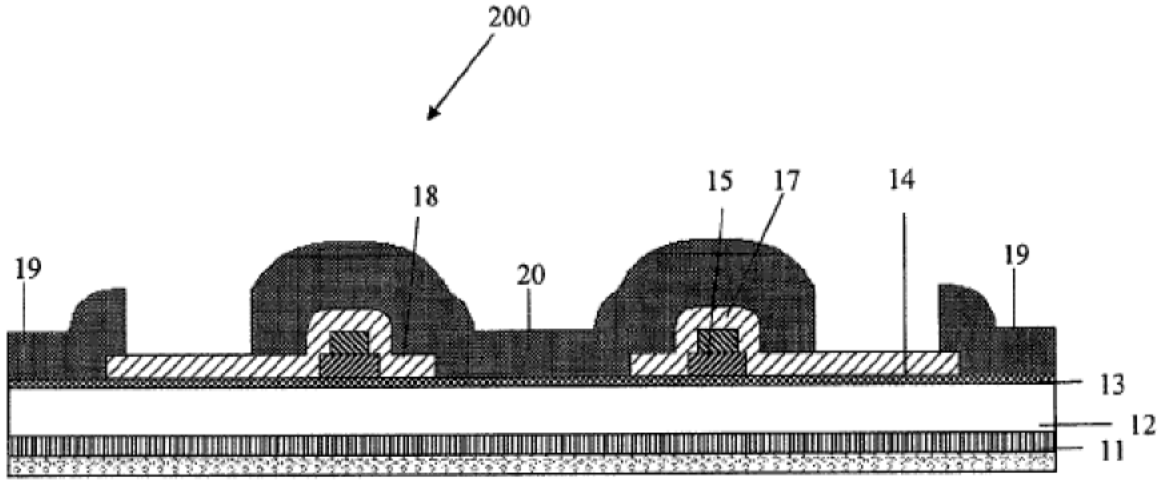


FIG. 9

[redacted]

JX-0015 ('508 patent) at Fig 9.

Although the '508 patent figures cited by EPC show a resulting structure that looks similar to the Accused Products, EPC's argument ignores the fact that claim 1 of the '508 patent is a claim to a method, not a claim to a structure. The patent illustrates the claimed method with several figures, including the following Figure 3B:

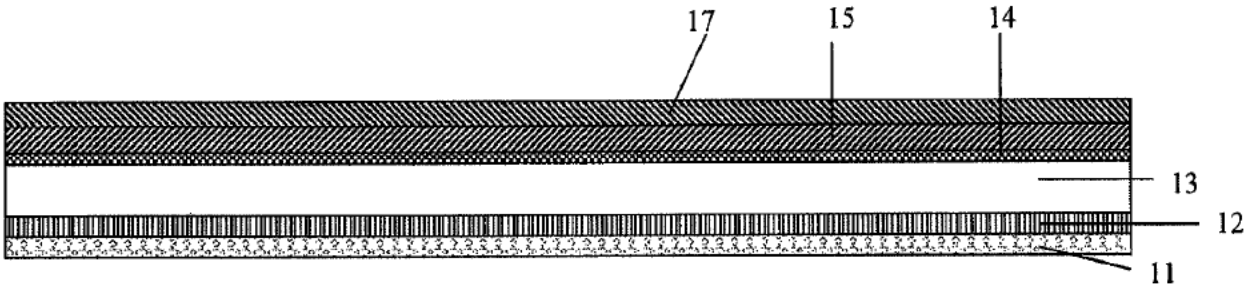


FIG. 3B

Id. at Fig. 3B. In Figure 3B, a gate metal 17 is deposited on a GaN layer 15. As shown in Fig. 3C below, after patterning and etching the gate contact layer to create a mask, every point along the surface of the GaN layer is etched except the portion of the GaN layer beneath the gate contact:

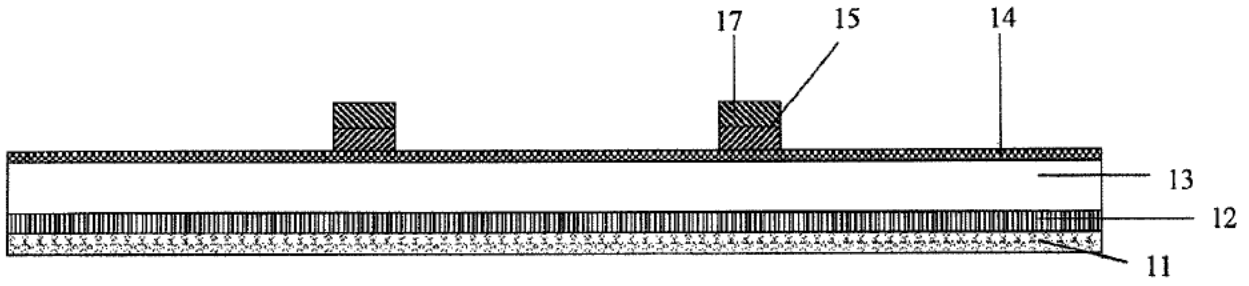


FIG. 3C

Id. at Fig. 3C. In each embodiment of the method, at least some of the GaN layer's surface—if not the entire depth of the GaN layer—is etched away everywhere except for the area beneath the gate contact. *See id.* Unlike in Innoscience's method, the embodiments in the '508 patent show etching away the doped gallium nitride layer where it is not beneath the gate contact. After

[redacted]

etching the GaN layer, the inventive method of the '508 patent then patterns and further etches part of the remaining gate contact layer to reduce its size relative to the GaN layer beneath. *Id.* at Col. 5. That is what produces the structures shown in Figures 8-10 of the patent. Contrary to EPC's position, the figures of the '508 patent do not demonstrate a method of etching where the surface of a portion of the GaN layer beyond the gate contact remains unetched. I therefore find that EPC's attempt to analogize the Innoscience Accused Products to the figures of the '508 patent does not persuasively demonstrate that Innoscience's fabrication method infringes the method claimed in claim 1.

EPC also relies on testimony from its expert Dr. Schubert to argue that Innoscience's fabrication process meets step [1h]. *See* CIB at 69. When asked if, based on his analysis, making the Accused Products practices limitation [1h], Dr. Schubert's entire response was two words: "Yes, correct." *See* Tr. at 571:21-572:1 (Schubert). Dr. Schubert did not provide any further reasoning for his answer. In contrast, Innocence's expert Dr. Doolittle provided a complete analysis of why step [1h] is not met by the fabrication method of the Accused Products. *See* Tr. at 1184:1-1190:11, 1239:6-1240:8 (Doolittle). Dr. Doolittle's testimony is also corroborated by [redacted] *See* RX-0164C at 14, 21. Viewing the record as a whole, Dr. Schubert's conclusory testimony on this claim limitation is not persuasive.

I find, based on the weight of the record evidence, that Innoscience does not "etch[] away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact" as claim element [1h] requires. For at least this reason, EPC has not shown infringement of claim 1 of the

[redacted]

'508 patent. *See* "*Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1317 (Fed. Cir. 2009) ("To infringe a method claim, a person must have practiced all steps of the claimed method.").

[1i]: "removing the gate photo resistant pattern;"

EPC adduced evidence that, when fabricating the Accused Products, Innoscience removes the gate photo resistant pattern applied as discussed in connection with limitation [1f] above. CIB at 64-65. Referring to the Innoscience traveler documents for the Accused Products, Dr. Schubert testified [redacted] Tr. at 574:1-10 (Schubert); CPX-0153C at No. 31. Testimony from an Innoscience corporate witness corroborates Dr. Schubert's opinions. JX-0031C at 57:19-58:11 [redacted], 33:2-22 (discussing high voltage products, [redacted]); CX-0921C at 0014, 0020.

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1i].

I find that the Accused Products are made by a process that satisfies claim element [1i].

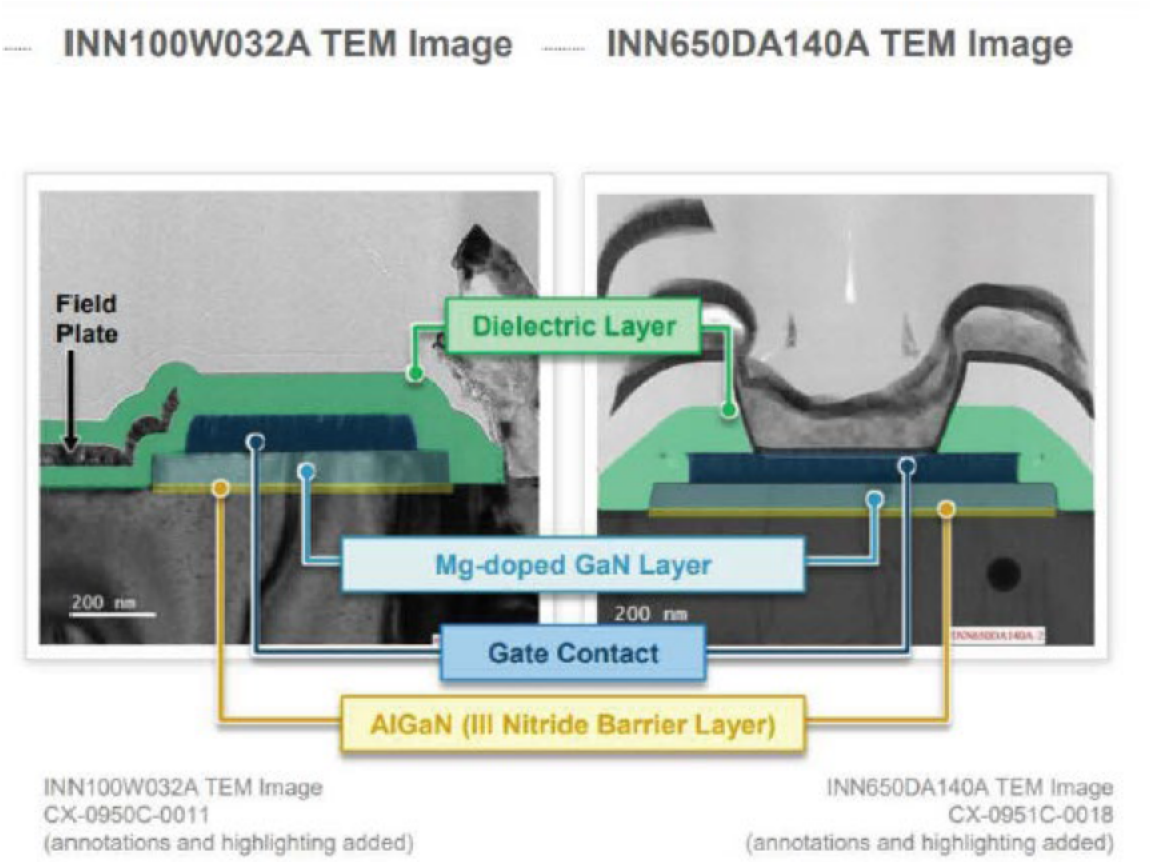
[1j]: "depositing a dielectric layer;"

EPC adduced evidence that Innoscience deposits a dielectric layer during the fabrication of the Accused Products. CIB at 69-70. Dr. Schubert explained that Innoscience process flow documents show that [redacted]. Tr. at

[redacted]

575:12-577:18 (Schubert); CX-0921C at 15, 21; CX-0950C at 11; CPX-0153C; CPX-0168C. This is consistent with the testimony of an Innoscience corporate witness. JX-0031C at 33:17-22 [redacted]

Dr. Schubert further annotated transmission electron microscopy (TEM) images of the Accused Products to show the dielectric layer in green:



See CDX-2C at 129.

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1j].

I find that the Accused Products are made by a process that satisfies claim element [1j].

[redacted]

[1k]: "applying a contact photo resistant pattern;"

[1l]: "etching the dielectric layer to open the drain and source contact area;"

[1m]: "removing the contact photo resistant pattern;"

EPC addresses limitations [1k], [1l], and [1m] together. CIB at 70-71. EPC relies on figures from Innoscience process documents to illustrate these steps. The figures, reproduced below, show process steps for making a representative low-voltage Accused Product (first figure) and a representative high-voltage Accused Product (second figure). [redacted]

[redacted]

CX-0921C at 22.

[redacted]



CX-0921C at 15. EPC's expert Dr. Schubert testified that these figures are consistent with transmission electron microscopy (TEM) images of the Accused Products and descriptions in the Innoscience traveler documents. Tr. at 577:24-581:9 (Schubert); CX-0950C at 7, 0046; CPX-0153C; CX-0951C at 9; CPX-0168C.

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim elements [1k], [1l], and [1m].

I find that the Accused Products are made by a process that satisfies claim elements [1k], [1l], and [1m].

[redacted]

[1n]: "depositing an Ohmic contact metal;"

[1o]: "applying a metal photo resistant pattern;"

[1p]: "etching the Ohmic contact metal;"

[1q]: "removing the metal photo resistant pattern; and"

EPC addresses limitations [1n], [1o], [1p], and [1q] together. EPC's expert Dr. Schubert analyzed the following Innoscience process flow diagrams for the representative low- and high-voltage Accused Products:



CX-0921 at 23.



CX-0921 at 15.

Dr. Schubert gave the following testimony about the steps illustrated in the figures above:



Tr. at 581:24-582:9 (Schubert). Dr. Schubert also testified that the traveler documents for the Accused Products show the performance of these steps. Tr. at 582:23-584:20 (Schubert); CPX-0153C (

); CPX-068C (

).

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim elements [1n], [1o], [1p], and [1q].

[redacted]

I find that the Accused Products are made by a process that satisfies claim elements [1n], [1o], [1p], and [1q].

[1r]: "performing rapid thermal annealing to form Ohmic drain and source contacts."

EPC contends that Innoscience performs rapid thermal annealing to form Ohmic drain and source contacts when fabricating the Accused Products. CIB at 73-75. EPC's expert Dr. Schubert analyzed representative Innoscience process flow documents and [redacted] "the ohmic metal is subjected to rapid thermal annealing." Tr. at 584:21-585:10 (Schubert); CX-0921C at 15, 23. Dr. Schubert also testified that the Innoscience traveler documents for the Accused Products demonstrate the performance of this annealing step. Tr. at 585:13-586:3 (Schubert); CPX-0153C ([redacted] showing [redacted]); CPX-0168 ([redacted] showing same).

Innoscience and Staff do not dispute that the Accused Products are made by a process that meets claim element [1r].

I find that the Accused Products are made by a process that satisfies claim element [1r].

Conclusion

I find EPC has failed to demonstrate that Innoscience performs step [1h] of claim 1 of the '508 patent when making the Accused Products. I therefore conclude EPC has failed to prove infringement of claim 1 of that patent.

VI. INVALIDITY

Innoscience asserts affirmative defenses based on the prior art, contending that all asserted claims of the '294 and '508 patents are invalid for anticipation under 35 U.S.C. § 102 and obviousness under 35 U.S.C. § 103. RIB 20.

[redacted]

A patent is presumed valid. *See* 35 U.S.C. § 282; *Microsoft Corp. v. i4i Ltd. P'ship*, 131 S. Ct. 2238, 2242 (2011). A respondent who has raised patent invalidity as an affirmative defense has the burden of overcoming this presumption by clear and convincing evidence. *See Microsoft*, 131 S. Ct. at 2242.

Under 35 U.S.C. § 102, a claim is anticipated, and therefore invalid, when "the four comers of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation." *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000).

Under 35 U.S.C. § 103, a claim may be found invalid as obvious if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a). Because obviousness is determined at the time of invention, rather than the date of litigation, "[t]he great challenge of the obviousness judgment is proceeding without any hint of hindsight." *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1375 (Fed. Cir. 2011).

When a claim is challenged as obvious, the critical inquiry in determining the differences between the claimed invention and the prior art is whether there is an apparent reason to combine known elements in the fashion claimed by the patent at issue. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417-418 (2007). Thus, when a respondent relies upon a combination of multiple prior art references to show obviousness, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, or carry out the claimed process, and would have had

[redacted]

a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007) (citations omitted).

Obviousness is a determination of law based on underlying determinations of fact. *Star Scientific*, 655 F.3d at 1374. The factual determinations behind a finding of obviousness include: (1) the scope and content of the prior art, (2) the level of skill in the art, (3) the differences between the claimed invention and the prior art, and (4) secondary considerations of non-obviousness. *KSR*, 550 U.S. at 399 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)). The considerations of non-obviousness, or "*Graham* factors," include commercial success, long felt but unresolved need, and the failure of others. *Id.* When present, the *Graham* factors "give light to the circumstances surrounding the origin of the subject matter sought to be patented," but they are not necessarily dispositive on the issue of obviousness. *Geo. M. Martin Co. v. Alliance MachSys. Int'l*, 618 F.3d 1294, 1304-06 (Fed. Cir. 2010). For evidence of non-obviousness to be given substantial weight in the obviousness determination, its proponent must establish a nexus between the evidence and the merits of the claimed invention. *See W. Union Co. v. MoneyGram Payment Sys. Inc.*, 626 F.3d 1361, 1372-73 (Fed. Cir. 2010) (citing *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995)).

A. The '294 Patent

1. Anticipation of claims 1, 2, and 3 by Uemoto

Innoscience appears to argue claims 1, 2, and 3 of the '294 patent are invalid under 35 U.S.C. § 102 due to anticipation because all of the elements of those claims are disclosed in U.S. patent publication No. 2008/0087915A1, which lists Uemoto et al. as inventors. RIB at 20-21, 50 (citing RX-0073 ("Uemoto")). It is undisputed that the Uemoto application, filed on July 24, 2007, and published on April 17, 2008, is prior art to the '294 patent under pre-AIA 35 U.S.C. § 102(a).

[redacted]

A prior art reference anticipates when it discloses or contains all the claimed limitations "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012).

For reference, claim 1 of the '294 patent follows, with the elements most material to the analysis of Uemoto emphasized:

> [1pre] "A column III Nitride transistor comprising:"
> [1a] "a substrate,"
> [1b] "**a set of III-N transition layers** above the substrate,"
> [1c] "a III-N buffer layer above the **set of transition layers**,"
> [1d] "a III-N barrier layer above the buffer layer,"
> [1e] "**a compensated GaN layer** above the barrier layer, and"
> [1f] "a gate contact **above the compensated GaN layer**."

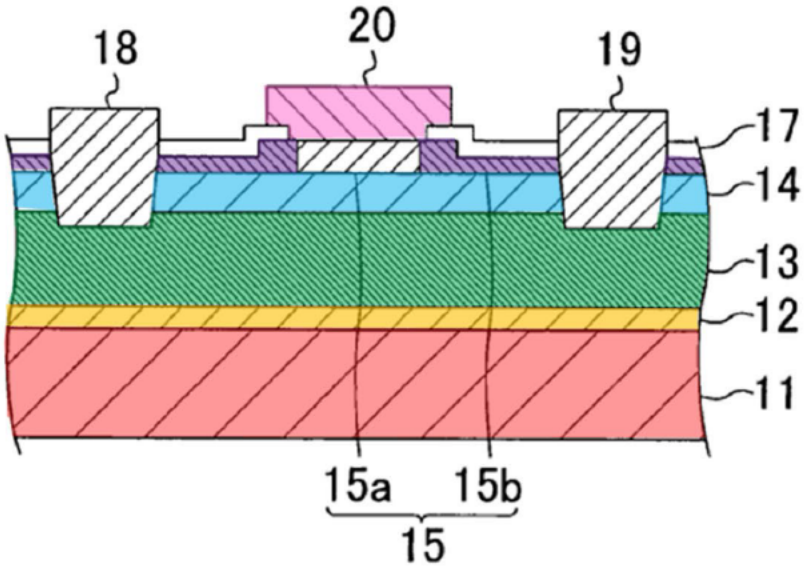
'294 patent, claim 1 (emphasis and limitation labels added).

EPC contends that Uemoto does not disclose at least claim element [1e], "a compensated GaN layer." CRB at 32-38. Staff concurs that Uemoto does not disclose at least claim element [1e]. SIB at 33-34. Neither EPC nor Staff address in their briefs whether Uemoto discloses elements [1pre], [1a], [1b], [1c], and [1d].

Figure 7 of Uemoto appears below, as annotated by Innoscience. Figure 7 depicts a cross sectional view of a nitride semiconductor transistor:

[redacted]

FIG. 7



Uemoto at Fig. 7; ¶ [0023].

Beginning from the bottommost layer of Figure 7, Uemoto discloses "a substrate 11" (red) and "a buffer layer 12" (yellow). Uemoto ¶ [0031]. Uemoto also discloses "[a] first nitride semiconductor layer 13" (green), "a second nitride semiconductor layer 14" (light blue), and "a third nitride semiconductor layer 15" (purple). *Id.* ¶¶ [0032]-[0033]. Layer 15 has "a control region 15a" (white) and "a high resistive region 15b" (purple); "a drain electrode 19" (white), and "a gate electrode 20" (pink). *Id.* ¶¶ [0033]-[0035], [0063].

[1pre] "A column III Nitride transistor"

No party argues that the preamble of claim 1 is limiting. Nevertheless, Innoscience argues Uemoto discloses "a column III Nitride transistor." RIB at 24. For completeness, I find Uemoto is directed to "nitride semiconductor transistors." Uemoto ¶ [0003]. Specifically, Uemoto discloses a semiconductor having layers made of GaN (gallium nitride) and AlGaN (aluminum gallium nitride). *Id.* ¶¶ [0032]-[0033]; Tr. at 874:18-22 (Lebby). "Column III" refers to those

[redacted]

elements with three valence electrons organized together in a column of the periodic table. *See* Markman Tr. at 94:5-24 (Schubert); Tr. at 425:7-11 (Schubert). Gallium is a Column III element.

EPC and Staff do not address element [1pre] in their briefing.

I find Uemoto discloses a column III Nitride transistor as recited in the preamble of claim 1.

[1a] "a substrate"

Innoscience argues Uemoto discloses "a substrate." RIB at 25. I find Uemoto discloses a "substrate" "made of silicon." Uemoto ¶ [0031]; Tr. at 875:1-6 (Lebby). EPC and Staff do not dispute the disclosure of this element in Uemoto.

[1b] "a set of III-N transition layers above the substrate"

Innoscience argues Uemoto's buffer layer 12 is a set of III-N transition layers above the substrate. RIB at 25-26. In support, Innoscience notes the buffer layer in Uemoto is formed with aluminum nitride (AlN), which Innoscience states is "the same material as the transition layers described in the '294 patent." RIB at 25.

EPC and Staff do not address this limitation in their briefs.

I find Innoscience has failed to adequately demonstrate that "buffer layer 12" disclosed in Uemoto is "a set of transition layers" required by limitation [1b] of the'294 patent. Innoscience states somewhat revealingly that "Uemoto discloses *or at least renders obvious* [1b]," suggesting tacitly that Uemoto does not expressly disclose element [1b]. RIB at 25 (emphasis added).

Innoscience's argument that Uemoto's buffer layer corresponds to the claimed transition layers because both are made of the "same material"—aluminum nitride—is unpersuasive for several reasons. First, that interpretation is completely unsupported in the record. Innoscience's expert Dr. Lebby gave no opinion at trial that Uemoto's buffer layer 12 corresponds to the claimed set of transition layers because both were made of aluminum nitride. *See* Tr. at 875:9-17 (Lebby).

[redacted]

Dr. Lebby's testimony on this limitation was entirely conclusory and was illustrated with annotation of a single layer 12 in Uemoto, without any mention of the layer material. Tr. at 875:9-17 (Lebby); RDX-0013 at slide 47.

Additionally, Uemoto discloses that aluminum nitride can be used to form various structures in a semiconductor, such as "a buffer layer 12" or a "hydrogen diffusion barrier film 16." *See* Uemoto ¶¶ [0005], [0031], [0034], [0046]. Given that Uemoto teaches multiple ways to implement aluminum nitride in a transistor, it would be error to assume on this sparse record that Uemoto's layer 12 is necessarily structured as a set of transition layers merely because it is made of aluminum nitride. *See Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002) (stating anticipation requires each claim element is necessarily present, not merely probably or possibly present, in the prior art); *Endo Pharms. Sols., Inc. v. Custopharm Inc.*, 894 F.3d 1374, 1381 (Fed. Cir. 2018) (noting an unrecognized but inherent characteristic of the prior art can be part of an obviousness analysis, but the presence of inherent characteristic may not be established by probabilities or possibilities). Without evidence that the aluminum nitride in Uemoto's layer 12 is structured as a set of transition layers, Innoscience has failed to identify limitation 1[b] in the prior art. *See id.*

For all of these reasons, and not withstanding the fact that the presence of this limitation was uncontested by EPC and Staff, I conclude Innoscience has not persuasively shown that Uemoto discloses "a set of III-N transition layers" as required by limitation [1b] of the '294 patent.

[1c] "a III-N buffer layer above the set of transition layers"

Innoscience argues Uemoto's "nitride semiconductor layer 13 of undoped GaN" corresponds to "a III-N buffer layer above the set of transition layers" as required by limitation [1c]. RIB at 26; Tr. at 875:24-876:2 (Lebby). Innoscience notes Uemoto's nitride semiconductor

[redacted]

layer 13 is formed with the same material the '294 patent associates with a "buffer layer." RIB at 26; *compare* '294 patent at 3:12-15 ("Buffer layer 33 and barrier layer 34 are made of a III Nitride material.") *with* Uemoto ¶ [0032] ("A first nitride semiconductor layer 13 of undoped GaN.").

EPC and Staff do not address this limitation in their briefs.

I find that Uemoto teaches that "at the heterointerface between the first nitride semiconductor layer 13 and the second nitride semiconductor layer 14," "the conduction band is located at a lower level than the Fermi level, and thus 2DEG [two-dimensional electron gas] is created" along at least some portion of the interface. Uemoto ¶ [0038]. Claim 5 of Uemoto also discloses a "two-dimensional electron gas induced at the interface between the first nitride semiconductor layer and the second nitride semiconductor layer." These teachings confirm that a person of skill in the art would understand that Uemoto's nitride semiconductor layer 13 is a buffer layer. *See* Tr. at 433:23-434:16 (Schubert) (prior art devices "have a buffer layer and a barrier layer, and so this bi-layer configuration creates a two-dimension electron gas and sheet of electrons at the interface at the boundary between these two layers"). I therefore find Uemoto discloses a III-N buffer layer at least through the disclosure of "nitride semiconductor layer 13 of undoped GaN."

However, as discussed above in the context of limitation [1b], Innoscience has not shown Uemoto discloses the claimed "set of III-N transition layers." Accordingly, I conclude Innoscience has not shown in Uemoto "a III-N buffer layer *above the set of transition layers*," as required by limitation [1c]. *See Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (It is insufficient for anticipation to merely show that prior art elements "could have been arranged" in a way that meets the patent claim; anticipation requires disclosure of all elements "arranged as in the claim.").

[redacted]

[1d] "a III-N barrier layer above the buffer layer"

Innoscience argues that "a second nitride semiconductor layer 14 of undoped AlGaN" in Uemoto corresponds to a barrier layer formed above the claimed buffer layer, as required by limitation [1d]. RIB at 27 (citing Uemoto ¶ [0032] and Tr. 876:4-13 (Lebby)). Innoscience argues Uemoto's second nitride semiconductor layer 14 meets limitation [1d] because it is formed with the same material the '294 patent associates with the "barrier layer." *Compare* '294 patent at 3:12-15 ("Buffer layer 33 and barrier layer 34 are made of a III Nitride material.") *with* Uemoto ¶ [0032] ("a second nitride semiconductor layer 14 of undoped $Al_{0.15}Ga_{0.85}N$").

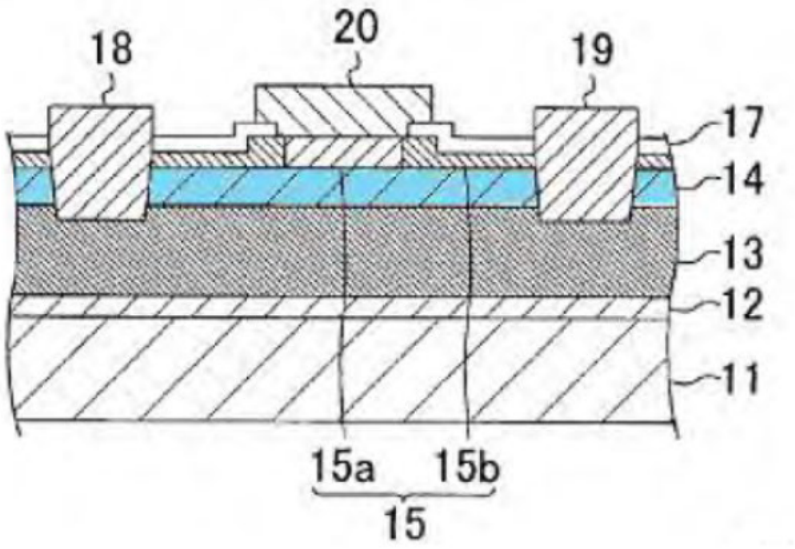
EPC concedes that "*Uemoto* discloses a barrier layer 14," but does not address whether that barrier layer is above the required buffer layer and set of transition layers. *See* CRB at 10.

Staff does not specifically address this limitation in its briefs.

I find Uemoto discloses a III-N barrier layer 14 above a buffer layer 13. Innoscience's expert Dr. Lebby annotated Figure 7 of Uemoto to show in light blue the barrier layer 14 he identified in that reference:

[redacted]

FIG. 7



See RDX-0013 at slide 49; Tr. 876:4-13 (Lebby).

I find objective evidence corroborates Dr. Lebby's testimony that layer 14 of Uemoto is a barrier layer. As noted with respect to limitation [1c], Uemoto teaches that "at the heterointerface between the first nitride semiconductor layer 13 and the second nitride semiconductor layer 14," "the conduction band is located at a lower level than the Fermi level, and thus 2DEG [two-dimensional electron gas] is created" along at least some portion of the interface. Uemoto ¶ [0038]. These teachings confirm that a person of skill in the art would understand that Uemoto's nitride semiconductor layer 13 is a buffer layer. *See* Tr. at 433:23-434:16 (Schubert) (prior art devices "have a buffer layer and a barrier layer, and so this bi-layer configuration creates a two-dimension electron gas and sheet of electrons at the interface at the boundary between these two layers"). I therefore find Uemoto discloses a III-N buffer layer at least through the disclosure of "a second nitride semiconductor layer 14 of undoped AlGaN."

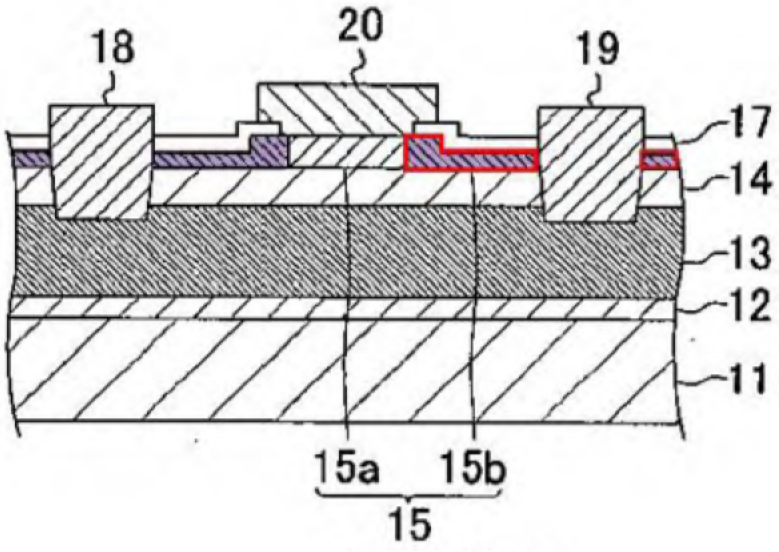
[redacted]

That is as far as my finding on this limitation can go. Innoscience still has not identified a set of transition layers in Uemoto (limitation [1b]) or a buffer layer above that set of layers (limitation [1c]). So this record lacks evidence that Uemoto discloses a barrier layer arranged above the required buffer and transition layers in the manner required by claim 1 of the '294. *See Therasense*, 593 F.3d at 1332 (stating anticipation requires disclosure of all elements "arranged as in the claim").

[1e] "a compensated GaN layer above the barrier layer"

Innoscience argues that Uemoto discloses a compensated GaN layer above the barrier layer. RIB at 27-30. Innoscience and its expert Dr. Lebby point to "high resistive region 15b" as corresponding to the claimed compensated GaN layer:

FIG. 7



RDX-0013 at slide 52. Dr. Lebby opined that layer 15 in Uemoto is formed of gallium nitride (GaN) and that region 15b of that layer includes magnesium (Mg) passivated with hydrogen (H) to inactivate the magnesium and make the layer highly resistive. Tr. (Lebby) 876:15-878:7 (citing

[redacted]

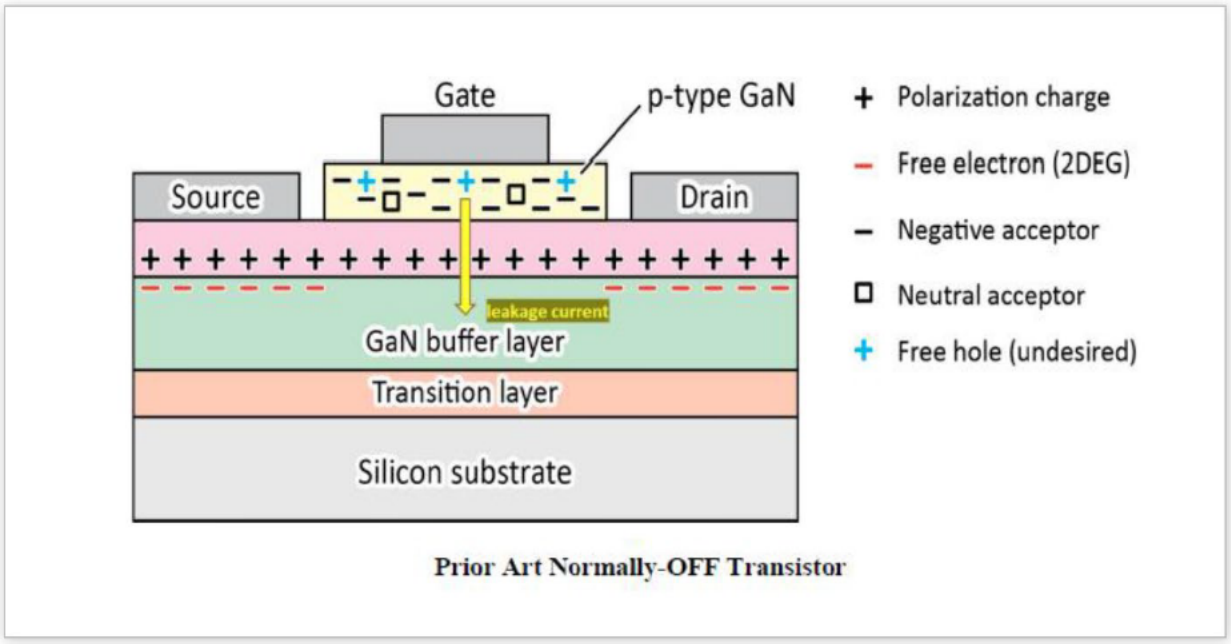
Uemoto ¶¶ [0033], [0049], [0054], and [0050]). This, according to Dr. Lebby, is disclosure of a compensated GaN layer. *Id.*

EPC argues that "because the 2DEG is present under Uemoto's high resistive region 15b, it cannot correspond to the compensated GaN layer of claim 1."[9] CRB at 34 (citing Tr. at 962:7-21 (Schubert)). In other words, EPC contends that unless a two-dimensional electron gas is depleted under the portion of the a layer beneath the transitor gate, that layer is not the claimed compensated GaN layer. Staff agrees Uemoto does not disclose the compensated GaN layer. SIB at 33.

To understand EPC's argument, some background may assist. EPC's expert Dr. Schubert explained what happens when a thin layer of aluminum gallium nitride (AlGaN) is added to the surface of gallium nitride (GaN) in a transistor. The properties of the two materials create "an electrical field that attracts electrons to the GaN surface." COCCB, Schubert Decl. ¶ 27. That attraction of electrons results in the formation of a two-dimensional electron gas, or 2DEG, on the GaN surface. *Id.*; *see also* Tr. at 434:1-16 (Schubert). Dr. Schubert illustrated his testimony at trial with the following diagram:

[9] Innoscience contends that EPC has waived any argument that the presence of 2DEG under region 15b means it cannot correspond to the claimed compensated GaN layer because it did not timely present such an argument. RSB at 10. Staff disagrees, stating "EPC's argument . . . logically follows from the arguments set forth in its pre-hearing brief and explained at length by Dr. Schubert in his expert report, at his deposition, and at trial." SRB at 19. I find no waiver. Although EPC did not specifically argue the presence of 2DEG in Uemoto in its pre-hearing brief, EPC described Uemoto as an enhancement-mode device that does not have a compensated GaN layer above the barrier layer. CPB at 332-333. EPC's pre-hearing brief argued generally that "an enhancement-mode device has no 2DEG under the gate," putting Innoscience on notice of the argument. *See, e.g., id.* at 332.

[redacted]



Prior Art Normally-OFF Transistor

CDX-0002C at slide 4; Tr. at 434:1-16 (Schubert).

Dr. Schubert explained that the 2DEG is highly conductive and able to carry a large current. COCCB, Schubert Decl. ¶ 27. Dr. Schubert opined, "The layering of GaN and AlGaN, and associated 2DEG, is the basis of high electron mobility transistors (HEMTs), such as those disclosed in the Asserted Patents." *Id.*

EPC's overarching theory in this investigation is that "the 2DEG must be depleted under the compensated GaN layer of the '294 Patent's transistor for it to operate as described." CRB at 34. As Dr. Schubert testified at trial in connection with the diagram above, "the two-dimension electron gas is missing or depleted under the gate, which means that the channel between source and drain is interrupted. The transistor, if you look at it as a switch, is turned off." Tr. at 434:1-16 (Schubert).

Returning to EPC's characterization of Uemoto, EPC admits that region 15b in Uemoto is a "p-doped high resistive region" of GaN. CRB at 32-33. But EPC argues that "because the 2DEG

[redacted]

is present under Uemoto's high resistive region 15b, it cannot correspond to the compensated GaN layer of claim 1." CRB at 34 (citing Tr. at 962:7-21 (Schubert)).

For the reasons discussed below, I find that Uemoto discloses a compensated GaN layer 15b above a barrier layer 14. EPC's expert Dr. Schubert admitted that a person of skill in the art would understand Uemoto's layer 15b "is gallium nitride. It is doped with magnesium and it is passivated by hydrogen. So if we look at layer 15B in isolation then one could say that's the compensated gallium nitride layer we're looking for." Tr. at 964:1-7 (Schubert).

Admittedly, Dr. Schubert went on to explain why he thought it would be inappropriate to look at layer 15b in isolation. *See id.* at 964:8-968:7 (Schubert). He opined that the device disclosed in Uemoto would not function in the same manner as the device disclosed in the '294 patent. But that opinion is not relevant to the anticipation inquiry at issue. Claim 1 of the '294 patent is directed to a transistor structure, as EPC admitted in its opening claim construction brief. COCCB at 10 (stating an ordinary artisan "would have readily understood that the term 'compensated GaN' layer refers to a GaN layer having certain structural and electric characteristics"). Claim 1 does not recite a particular manner of operating the transistor it claims. Thus, even if Dr. Schubert is correct that the transistor of Uemoto operates differently than the transistors disclosed in the '294 patent, "[i]t is well settled" that the relevant question for anticipation is whether the claimed structure was known, not whether the prior art shows the claimed structure being used for a particular function. *See In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

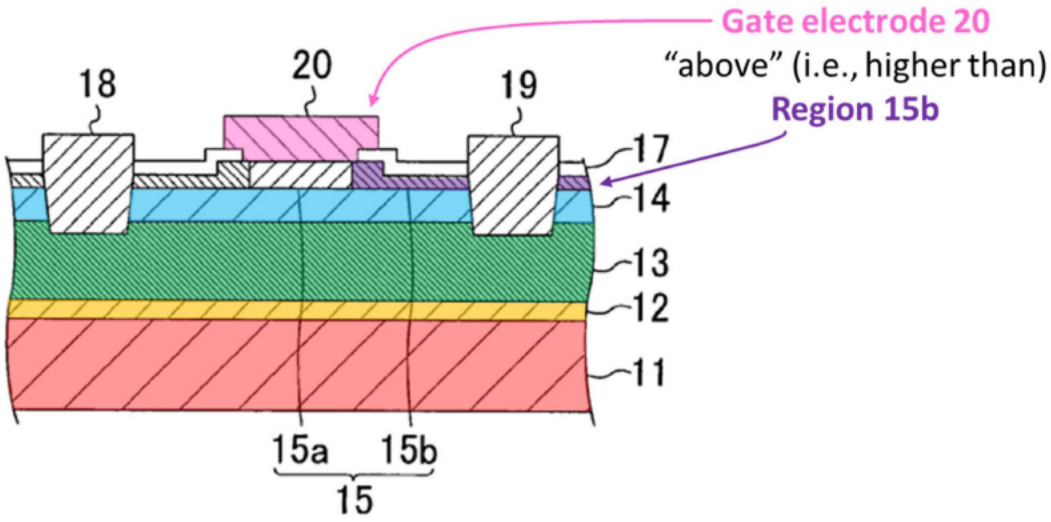
Considering the plain and ordinary meaning of "compensated GaN," the intrinsic evidence cited by the parties, expert testimony, and the arguments of the parties, I find Innoscience has shown that Uemoto discloses limitation [1e].

[redacted]

[1f] "a gate contact above the compensated GaN layer"

No party disputes that *Uemoto* discloses "a gate contact," which is element 20 in Figure 7. *See* Uemoto Fig. 7; RDX-0013 at slide 53 (annotated). Instead, the private parties dispute whether gate contact 20 is "above" compensated GaN element 15b. RIB at 29-31; CRB at 36-38. Staff does not address this claim limitation. *See* SIB at 32-33; SRB at 5-8.

Innoscience avers that in Figure 7 of Uemoto, element 15b appears above and at least minimally in contact with gate electrode 20.



RIB at 28-29 (reproducing Uemoto Fig. 7 with annotations as in RDX-0013 at slide 53). Innoscience also cites testimony from EPC's expert Dr. Schubert, who, even as voicing disagreement with Innoscience's view of Uemoto, admitted that "if we look at the structure, the gate electrode is above a small region of layer 15B" in Uemoto. RIB at 30 (citing Tr. 965:3-19, 966:21-24 (Schubert)).

In opposition, EPC cites testimony from Dr. Schubert that there is no "narrative teaching" in Uemoto that gate contact 20 is located above layer 15b. CRB at 37 (citing Tr. at 964:22-965:19, 968:1-6 (Schubert)). EPC contends that in Uemoto, it is activated region 15a that is below the gate, not element 15b. *Id.* EPC also reiterates arguments that element 15b is not a compensated

GaN layer, so the Uemoto device lacks the relevant structure for the gate to be "above." *Id.* at 36-38.

EPC's position is not persuasive. Figure 7 of Uemoto shows that layer 20 is located on a higher plane than layer 15b, and the two layers are visibly in contact. EPC's own expert Dr. Schubert also admitted that "if we look at the structure, the gate electrode is above a small region of layer 15B" in Uemoto. *See* Tr. at 965:3-13 (Schubert). Nothing in Uemoto casts any doubt on the positional relationship between gate contact 20 and GaN layer 15b shown in Figure 7.

I find Uemoto discloses element [1f], "a gate contact above the compensated GaN layer."

Claim 1 Conclusion

I determine Innoscience has not shown by clear and convincing evidence that claim 1 of the '294 patent is invalid under 35 U.S.C. § 102 due to anticipation by Uemoto. A reference only anticipates a claimed invention when it discloses every element of the asserted patent claim "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co.*, 683 F.3d at 1361. Because Innoscience has not shown in Uemoto at least "a set of III-N transition layers" as required by limitation [1b], and other elements of claim 1 arranged as required above those layers, Innoscience has not shown Uemoto anticipates claim 1.

Claim 2

Claim 2 of the '294 patent depends from claim 1 and adds the additional requirement that "the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen." '294 patent at claim 2. Innoscience argues this limitation is met in layer 15 of Uemoto. RIB at 31. Uemoto discloses "semiconductor layer 15 of $Al_{0.15}Ga_{0.85}N$ is grown with Mg-doped as a p-type impurity." Uemoto ¶ [0046]. Innoscience's expert Dr. Lebby explained a person of ordinary skill would understand a p-type impurity like magnesium to be an acceptor type dopant. Tr. at

[redacted]

880:19-881:5 (Lebby). Uemoto discloses using hydrogen to inactivate the impurities. Uemoto ¶ [0063] ("[H]ydrogen from the hydrogen diffusion film 17 is supplied during a thermal treatment for selectively inactivating impurities."). EPC's expert Dr. Schubert agrees layer 15b in Uemoto is passivated with hydrogen. Tr. at 964:1-5 (Schubert). EPC and Staff do not dispute that Uemoto discloses this limitation.

I find Uemoto discloses a compensated GaN layer that contains acceptor type dopant atoms passivated with hydrogen.

Even though Uemoto discloses the additional limitations of claim 2, I determine Innoscience has not shown by clear and convincing evidence that claim 2 of the '294 patent is invalid under 35 U.S.C. § 102 due to anticipation by Uemoto. A reference only anticipates a claimed invention when it discloses every element of the asserted patent claim "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co.*, 683 F.3d at 1361. Claim 2 depends from claim 1, and therefore requires "a set of III-N transition layers" as required by limitation [1b]. Because Innoscience has not shown in Uemoto at least "a set of III-N transition layers" as required by limitation [1b], and other elements of claim 1 arranged as required above those layers, Innoscience has not shown Uemoto anticipates claim 2.

Claim 3

Claim 3 of the '294 patent depends from claim 2 and adds the additional requirement that "the acceptor type atoms are selected from the group consisting of Mg, Zn, Be and Ca." '294 patent at claim 3. As discussed in the context of claim 2, Uemoto discloses doping a GaN layer with magnesium. Uemoto ¶ [0046]. EPC and Staff do not dispute that Uemoto discloses this limitation.

[redacted]

I find Uemoto discloses a compensated GaN layer that contains magnesium, which are acceptor type dopant atoms.

Even though Uemoto discloses the additional limitation of claim 3, I determine Innoscience has not shown by clear and convincing evidence that claim 3 of the '293 patent is invalid under 35 U.S.C. § 102 due to anticipation by Uemoto. A reference only anticipates a claimed invention when it discloses every element of the asserted patent claim "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co.*, 683 F.3d at 1361. Claim 3 depends from claim 1 and claim 2, and therefore requires "a set of III-N transition layers" as required by limitation [1b]. Because Innoscience has not shown in Uemoto at least "a set of III-N transition layers" as required by limitation [1b], and other elements of claim 1 arranged as required above those layers, Innoscience has not shown Uemoto anticipates claim 3.

2. Obviousness of claims 1, 2, and 3 in view of Uemoto

Innoscience argues claims 1, 2, and 3 of the '294 patent are invalid under 35 U.S.C. § 103 because Uemoto renders the invention in those claims obvious.[10] RIB at 24.

I find Innoscience has failed to meet its burden to show obviousness based on Uemoto. First, as I determined above in the anticipation analysis of Uemoto, Uemoto does not disclose at least "a set of III-N transition layers" as required by limitation [1e]. Accordingly, Innoscience is required to show "by clear and convincing evidence" that an ordinary artisan at the time of the invention "would have had reason to attempt to make" the Uemoto device with the required

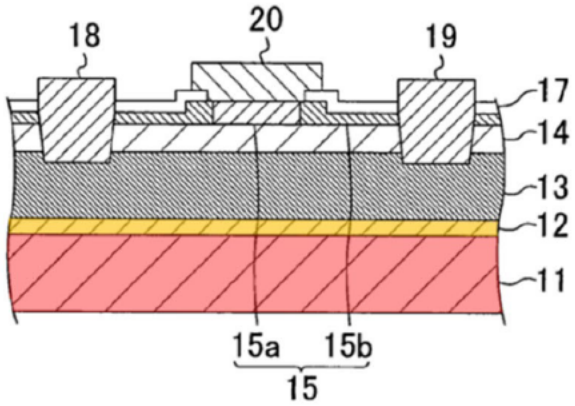
[10] EPC contends that Innoscience has waived any argument that the claimed invention is obvious in view of Uemoto because it did not timely present such an argument. CRB at 38. I find no waiver. In its pre-hearing brief, Innoscience argued Uemoto renders claims 1, 2, and 3 obvious. RPB at 178 ("Uemoto renders all elements in claims 1-3 obvious by itself . . . ."). Moreover, Innoscience's arguments in its post-hearing briefing are consistent with those disclosed in its pre-hearing briefing. *See id.* at 185-190.

[redacted]

transition layers, and reason to arrange the other components in Uemoto to arrive at the invention described in claim 1. *PharmaStem Therapeutics*, 491 F.3d at 1360. But the entirety of Innoscience's briefing on this point is as follows:

> Uemoto renders obvious [1b]. Tr. (Lebby) 875:9-17; RDX-0013.47. EPC does not dispute that Uemoto satisfies [1b]. Tr. (Lebby) 875:11-22. Uemoto discloses or at least renders obvious [1b] by describing a "buffer layer 12 of AlN having a thickness of 100 nm is formed on the principal plane of the substrate 11," which is formed with the same material as the transition layers described in the '294 patent. RX-0073 ¶ [0031]; Tr. (Lebby) 875:9-17. Uemoto's buffer layer 12, located above substrate 11, teaches or suggests the claimed III-N transition layers as highlighted in Figure 7 below.

FIG. 7



RDX-0013.47; RX-0073 Fig. 7 (annotated)

RIB at 23-24. As can be seen, Innoscience presents only the conclusory statement that Uemoto "renders obvious [1b]" because "buffer layer 12, located above substrate 11, teaches or suggests the claimed III-N transition layers." *Id.* Innoscience has not shown an ordinary artisan "would have had reason to attempt to make" the Uemoto device with the required transition layers. *See PharmaStem Therapeutics*, 491 F.3d at 1360. While Innoscience cites three times to the same passage of testimony from its expert Dr. Lebby, that passage is as conclusory as Innoscience's brief:

[redacted]

Q. Dr. Lebby, does Uemoto disclose element 1B of the '294 patent?

A. Element 1B is a set of III-N transition layers. This is not disputed, and I've also brought in on the top right-hand corner of this slide paragraph 31. I've annotated in yellow, as well as parts of figure seven, and yes, Uemoto discloses a set of III-N transition layers that are above the substrate, and this invalidates claim element 1B of the '294.

See Tr. at 875:9-17 (Lebby). Not only is Dr. Lebby's testimony unsupported by the evidence he cited, it is not directed to obviousness at all. Dr. Lebby did not explain any difference between the claimed invention and the prior art, as required by *Graham* and *KSR*. Neither did he explain how the single buffer layer 12 in Uemoto teaches or suggests the claimed set of transition layers required by claim 1. I give Dr. Lebby's testimony on this point no weight.

For all of the reasons noted in the anticipation analysis above, and after considering the objective indicia of non-obviousness discussed later, I find Uemoto does not teach or suggest transition layers. I further determine Innoscience has not met its burden to adduce "clear and convincing evidence" that an ordinary artisan at the time of the invention "would have had reason to attempt to make" the Uemoto device with the required set of transition layers. *See PharmaStem Therapeutics*, 491 F.3d at 1360. All three asserted claims of the '294 patent require the set of transition layers missing from Uemoto. Accordingly, I find Innoscience has failed to present an affirmative defense that claims 1, 2, and 3 are invalid under 35 U.S.C. § 103 as obvious in view of Uemoto.

3. Anticipation of claim 1 by Beach189

Innoscience argues that claim 1 of the '294 patent is invalid under 35 U.S.C. § 102 due to anticipation because all of the elements of that claim are disclosed in U.S. patent application publication US2006/0145189A1, which lists EPC founder Robert Beach as the sole inventor. RIB

[redacted]

at 32-50 (citing RX-0011 ("Beach189")). Beach189 published July 6, 2006, and it is undisputed that Beach189 is prior art to the '294 patent under pre-AIA 35 U.S.C. § 102(b).

As discussed in further detail below, I find Beach189 anticipates the invention in claim 1 of the '294 patent, rendering that claim invalid under 35 U.S.C. § 102.

[1pre] "A column III Nitride transistor comprising:"

No party argues that the preamble of claim 1 is limiting. Nevertheless, Innoscience argues Beach189 discloses "a column III nitride transistor." RIB at 32-33. For completeness, I find Beach189 discloses a "III-nitride power semiconductor device includ[ing] a drain electrode, a source electrode and a gate electrode disposed between the drain electrode and the source electrode" where the "gate electrode controls the current between the source electrode and the drain electrode." Beach189 ¶¶ [0002]-[0003]. Dr. Lebby opined that this is a column III nitride transistor. Tr. at 854:9-13 (Lebby).

EPC and Staff do not dispute that Beach189 discloses a column III nitride transistor.

I find Beach189 discloses a column III nitride transistor as recited in the preamble of claim 1.

[1a] "a substrate,"

Innoscience argues Beach189 discloses a substrate as required by limitation [1a]. RIB at 33. Beach189 discloses a "support body 12 is a combination of a substrate material and if required a buffer layer on the substrate." Beach189 ¶ [0041]. The substrate is also shown in Figure 4 of Beach 189:

[redacted]

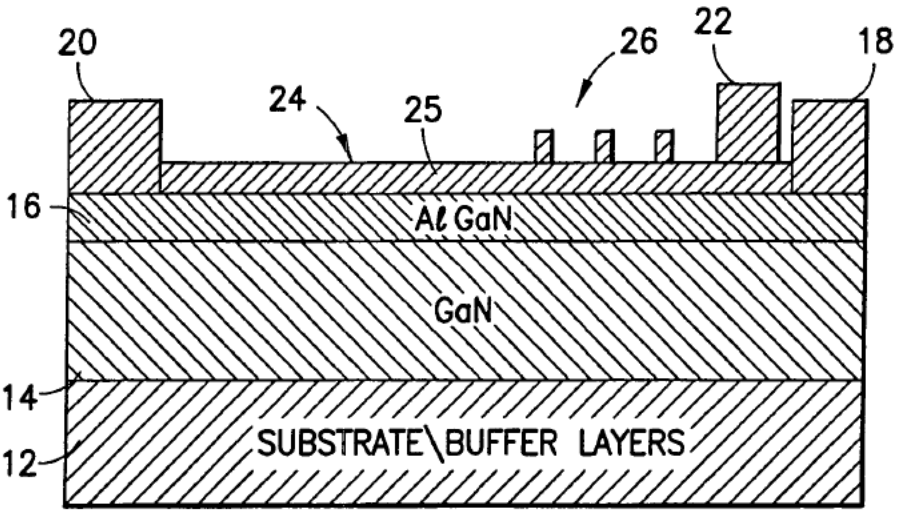


FIG.4

Beach189 at Fig. 4.

EPC and Staff do not dispute that Beach189 discloses a substrate.

I find Beach189 discloses limitation [1a].

[1b] "a set of III-N transition layers above the substrate,"

Innoscience argues Beach189 discloses "a set of III-N transition layers above the substrate." RIB at 33-34. Beach189 states

> support body 12 is a combination of a substrate material and if required a buffer layer on the substrate to compensate for the lattice and thermal mismatch between the substrate and first III-nitride semiconductor body 14. . . . AlN is a preferred material for a buffer layer. However, a multi-layer or graded transitional III-nitride semiconductor body may also be used as a buffer layer without deviating from the scope and the spirit of the present invention.

Beach189 ¶¶ [0041]-[0042].

[redacted]

EPC and Staff do not dispute that Beach189 discloses a set of III-N transition layers above the substrate.

I find Beach189 discloses "a multi-layer or graded transitional III-nitride semiconductor body" implemented "to compensate for the lattice and thermal mismatch between the substrate" and upper layers. Beach189 ¶¶ [0041]-[0042]. I find that is a disclosure of a set of III-N transition layers in accordance with limitation [1b].

[1c] "a III-N buffer layer above the set of transition layers,"

Innoscience argues "a first III-nitride semiconductor body 14" in Beach189 is disclosure of the claimed "III-N buffer layer above the set of transition layers." RIB at 34 (citing Beach189 ¶¶ [0025], [0040]). EPC and Staff do not dispute that assertion.

Figure 4 of Beach shows layer 14 is disposed above layer 12, which I have found to be a set of transition layers:

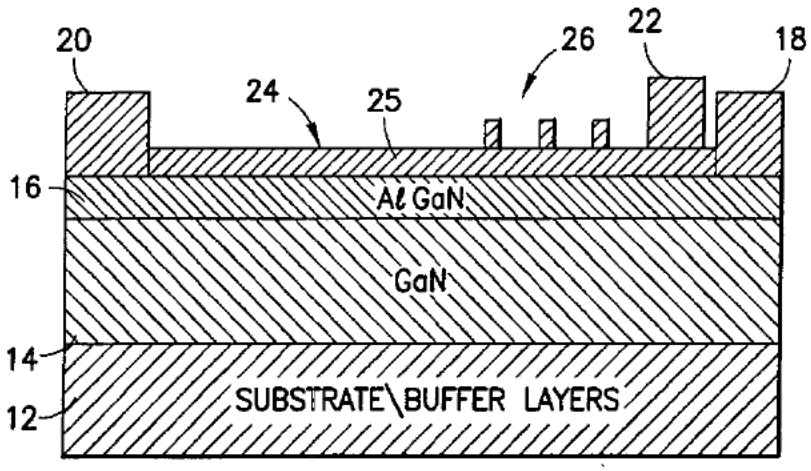


FIG.4

[redacted]

Beach189 at Fig. 4, ¶ [0025]. Beach teaches that layer 14 has a second Ill-nitride semiconductor body 16 disposed over it. *Id*. Beach teaches that layer 16 has "a band gap that is different from" layer 14, "whereby a two-dimensional electron gas is formed due to the heterojunction" of the two layers "as is well known in the art." *Id*. ¶ [0040].

The record shows there is no dispute about what Beach189 calls the "well-known" phenomenon of the formation of a two-dimensional electron gas, or 2DEG, at the boundary between a buffer layer and a barrier layer. EPC's expert Dr. Schubert described the prior art generally at the beginning of his trial testimony. He stated that prior art devices "have a buffer layer and a barrier layer, and so this bi-layer configuration creates a two-dimension electron gas and sheet of electrons at the interface at the boundary between these two layers." *See* Tr. at 433:23-434:16 (Schubert). By describing the 2DEG phenomenon between layer 14 and layer 16, Beach189 confirms that a person of ordinary skill in the art would understand layer 14 is a buffer layer.

I find Beach189 discloses limitation [1c].

[1d] "a III-N barrier layer above the buffer layer,"

Innoscience argues "a second III-nitride semiconductor body 16," which is located above buffer layer 14 in Beach189, is a III-N barrier layer above the buffer layer. RIB at 35 (citing Beach189 ¶¶ [0025], [0040]). EPC and Staff do not dispute that assertion.

As noted above in connection with limitation [1c], Beach's teaching that a two-dimensional electron gas forms between layer 14 and layer 16 confirms that Beach's layer 16 is a barrier layer.

I find Beach189 discloses limitation [1d].

[redacted]

[1e] "a compensated GaN layer above the barrier layer, and"

Innoscience argues that field plate 25 in Beach189 is "a compensated GaN layer above the barrier layer." RIB at 35-36 (citing Beach189 ¶ [0026]). EPC argues that field plate 25 is a "field relaxation feature," not a compensated GaN layer. CRB at 24-27. EPC contends a compensated GaN layer and a field relaxation feature "perform disparate functions in a transistor, such that one cannot correspond to the other." CRB at 24. Staff argues a person of ordinary skill in the art would not understand the field plate in a depletion mode device to be the compensated GaN layer. SRB at 6-8.

I find the layer in Beach189 identified as field plate 25 is a compensated GaN layer above the barrier layer 16. There is no dispute that the layer of field plate 25 is above barrier layer 16 in the Beach189 device. At trial, Innoscience's expert highlighted the layer of field plate 25 in purple and the barrier layer 16 in light blue:

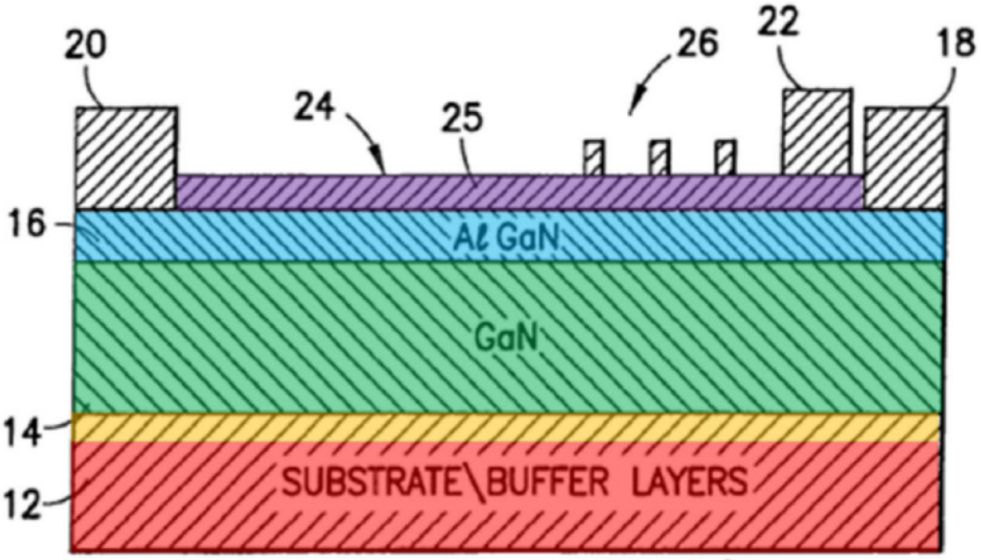


FIG.4

[redacted]

RDX-0013 at slide 24 (annotating Beach189 Fig. 4). Beach189 expressly states field plate 25 is "formed with a highly electrically resistive material, such as, silicon rich SiN, compensated GaN or the like material." Beach189 at ¶ [0026]. That evidence is dispositive.

EPC and Staff raise several arguments as to why Beach189 does not disclose the claimed compensated GaN layer, but, as discussed below, none are persuasive. *Cf.* CRB at 13-27; SRB at 6-8.[11]

First, EPC and Staff contend that claim 1 of the '294 patent is restricted to an enhancement-mode device and Beach189 discloses only a depletion-mode device.[12] CRB at 13-16; SRB at 6-8. But at the claim construction stage of the investigation, no party proposed that the claims of the '294 patent are limited to enhancement-mode transistors. And even now EPC and Staff point to no language in the words of claim 1 or in the '294 patent specification that would require the structure in claim 1 to be either an enhancement-mode transistor or a depletion-mode transistor.

Contrary to the view of EPC and Staff, the '294 patent specification expressly describes "the present invention" broadly, without limitation to enhancement-mode operation or depletion-mode operation:

> The present invention is directed to a MISFET, such as a GaN transistor, with low gate leakage. In one embodiment, the gate leakage is reduced with a compensated GaN layer below the gate contact and above the barrier layer. In another embodiment, the gate leakage is reduced by employing a semi-insulating layer below the gate contact and above the barrier layer.

[11] Telling, Staff admits that the GaN layer 25 in Beach189 is at least "partially compensated." SRB at 8.

[12] It is undisputed that an ordinary artisan at the time of the invention would understand that an enhancement-mode device acts like a switch that is off when no voltage is applied at its gate and that a depletion-mode device acts like a switch that is on when no voltage is applied at its gate. *See* Tr. at 615: 13-15, 998:22-999:1 (Schubert); *id*. at 903:2-4, 934:17-19 (Lebby).

[redacted]

'294 patent at 2:13-19. The '294 patent specification also expressly describes a depletion mode embodiment:

> By appropriate application of gate voltage, the device can be changed to a depletion mode device, such that it is on at 0V on the gate. Alternatively, the device can be changed to an enhancement mode device that requires more than the gate drive to turn on, effectively making an open circuit.

'294 patent at 4:55-60. Innoscience's expert Dr. Lebby confirmed that the '294 patent discloses both enhancement-mode and depletion-mode devices. *See* Tr. at 936:2-6 (Lebby).

Similarly, claim 1 of the '294 patent is directed simply to a "column III Nitride transistor," with no limitation of its mode of operation. '294 patent at claim 1. To limit claim 1 to an enhancement mode transistor on this record would commit "one of the cardinal sins of patent law—reading a limitation from the written description into the claims"—and I decline to do so. *See Phillips*, 415 F.3d at 1320 (quoting *SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1340 (Fed.Cir.2001).

Having established that claim 1 is not limited to an enhancement-mode device, the relevant task is to compare the structure identified in the claim to the structure disclosed in Beach189, not to resolve disputes about how the structure in Beach189 could be used hypothetically. *See In re Schreiber*, 128 F.3d at 1477. Accordingly, I need not resolve whether Beach189 discloses a transistor that could be operated as an enhancement-mode device.[13]

[13] EPC objects to Dr. Lebby's trial testimony that one could apply an increased voltage to the gate of the Beach189 transistor to produce a two-dimensional electron gas that would extend throughout the field plate layer from the source to the drain. EPC contends this testimony was outside the scope of Dr. Lebby's opinions presented at deposition or in expert reports. CRB at 18-21. I find that EPC was given timely notice of Dr. Lebby's opinion that Beach189 can operate as an enhancement-mode device. EPC's expert was prepared to testify at trial immediately after Dr. Lebby—with slides exchanged in advance addressing Dr. Lebby's opinion that Beach189 could operate in enhancement mode. *See, e.g.*, Tr. at 954:11-955:12. Those circumstances undercut any claim of undue surprise. I find Dr. Lebby's testimony was a fair defense of his previously disclosed opinions. EPC's objection is overruled.

EPC and Staff argue that the field plate of Beach189 performs a different function than the compensated GaN layer of the '289 patent, so Beach189 does not disclose the compensated GaN layer required by limitation [1e]. CRB at 24-27 (citing Tr. at 950:14-951:8 (Schubert)); SRB at 7. Specifically, Dr. Schubert opined that the field plate in Beach189 must be conductive, while the compensated GaN layer of the '298 patent must be non-conductive. Tr. at 950:14-951:8 (Schubert). I give Dr. Schubert's opinion on this point little weight for at least two reasons. First, Dr. Schubert appears to distinguish field plate 25 from the claimed invention based on its "purpose." *See* Tr. at 951:1-8 (Schubert). But the relevant question for anticipation is whether the prior art discloses the claimed structure, not the purpose of the prior art structure. *See In re Schreiber*, 128 F.3d at 1477. Second, Dr. Schubert's opinion is contradicted by objective evidence about the structure of field plate 25 in Beach189: field plate 25 is "formed with a highly electrically resistive material, such as, silicon rich SiN, compensated GaN or the like material." Beach189 ¶ [0026].

I find Beach189 discloses limitation [1e].

[1f] "a gate contact above the compensated GaN layer."

Innoscience argues that "gate structure 22" in Beach189 is "a gate contact above the compensated GaN layer," as required by limitation [1f]. RIB at 36-37. EPC and Staff do not dispute that assertion.

I find Beach189 discloses that "gate structure 22 may include a gate electrode" and in some embodiments "gate structure 22 is disposed on field plate 25 only." Beach189 at ¶¶ [0025], [0028], [0040], Fig. 4. As noted above, I have determined that Beach189 discloses a structure in which field plate 25 is a compensated GaN layer. Innoscience's expert Dr. Lebby testified that limitation

[redacted]

[1f] is satisfied by gate electrode 22 above field plate 25. Tr. (Lebby) 865:14-866:7; RDX-0013 at slide 29.

I find Beach189 discloses limitation [1f].

Claim 1 Conclusion

I determine Innoscience has shown by clear and convincing evidence that claim 1 of the '294 patent is invalid under 35 U.S.C. § 102 due to anticipation by Beach189. Beach189 discloses a transistor structure with every element of the claim 1 "arranged or combined in the same way as in the claim." *Wm. Wrigley Jr. Co.*, 683 F.3d at 1361. Accordingly, there is no violation of section 337 based on alleged infringement of claim 1.

4. Obviousness of claims 2 and 3 in view of Beach189 and Kigami

Innoscience contends that claims 2 and 3 of the '294 patent are invalid under 35 U.S.C. § 103 as obvious in view of Beach189 and Japanese patent publication JP2006253224A, which lists Kigami et al. as inventors. RIB at 42-49 (citing Beach189 and RX-0079 ("Kigami")). Kigami published September 21, 2006, and it is undisputed that Kigami is prior art to the '294 patent under pre-AIA 35 U.S.C. § 102(b).

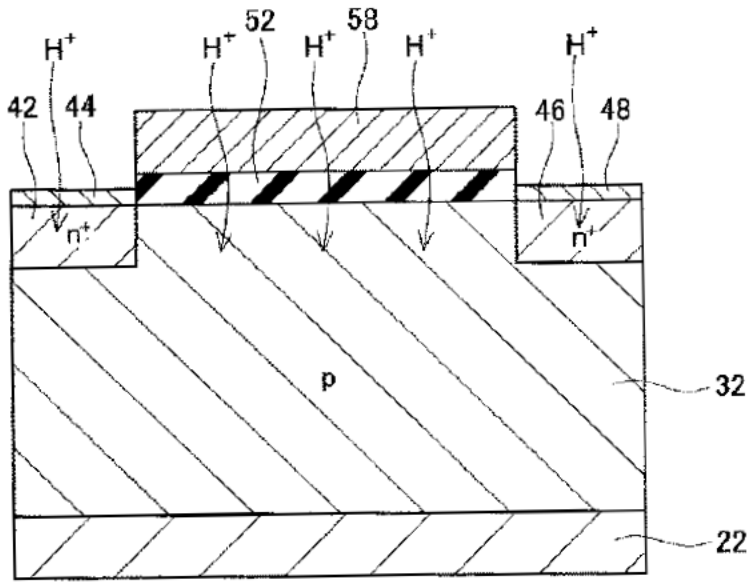
Claim 2

Claim 2 of the '294 patent depends from claim 1 and adds the additional limitation of "wherein the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen." '294 patent at claim 2. Above I determined that Beach189 discloses a structure having every element of claim 1 of the '294 patent, including field plate 25, which is "a compensated GaN layer" required by element [1e]. Innoscience acknowledges that Beach189 does not expressly disclose that field plate 25 "contains acceptor type dopant atoms passivated with hydrogen." RIB at 42-43. But Innoscience argues that because "*Beach189* itself includes no express disclosure of

[redacted]

how to dope or passivate the GaN to form the compensated GaN," an ordinary artisan "would, therefore, have been motivated to look for additional disclosures for how to form the compensated GaN, including *Kigami*—which teaches a standard process for magnesium doping and hydrogen passivation." *Id.*

I find Kigami is directed to a semiconductor device where III-V group compound layers containing p-type impurities are inactivated by hydrogen atoms. Kigami ¶ [0007]. Kigami describes forming a gallium nitride (GaN) layer 32 on a substrate 22:



Id. ¶ [0020], Fig. 5. Kigami teaches, "Magnesium is added to the semiconductor layer 32, and the magnesium acts as a p-type impurity of the semiconductor layer 32." *Id.* Kigami describes introducing hydrogen atoms to passivate the surface of layer 32. *Id.* ¶¶ [0020], [0026]-[0027]. "The hydrogen atoms introduced form a composite (MgH) with the magnesium existing in the semiconductor layer 32" and create the passivated local region illustrated with H+ labels in Figure 5 above. *Id.* ¶ [0026].

[redacted]

EPC does not dispute that Kigami discloses a compensated GaN layer containing acceptor type dopant atoms passivated with hydrogen but argues there is no motivation to combine Beach189 and Kigami because it "would illogically require a [person of skill in the art] to combine a depletion-mode transistor (*Beach189*) with an enhancement-mode transistor (*Kigami*), and then retrospectively change the location of the hydrogen passivation in *Kigami* to match claims 2 and 3." CRB at 28-32. EPC also argues Staff makes similar arguments. SIB at 6-7.

Innoscience responds that "[t]he proposed combination is the application of *Kigami*'s technique to form highly resistive material to form *Beach189* 'compensated GaN layer,' not the substitution of layers or the inclusion of one of *Kigami*'s layers into *Beach189*'s device." RIB at 48. Innoscience states a person of skill in the art would be motivated to combine these two prior art references because "both disclos[e] III-nitride transistors and fabrication techniques to improve them;" the combination would combine "prior art elements according to known methods to yield predictable results of forming a highly resistive field plate . . . applying a known technique to known device that is ready for improvement" that a person of skill in the art would have a reasonable expectation of success in doing so. RIB at 43-44 (citing Tr. at 870:5-871:11 (Lebby)).

I find the record of this investigation does not show a person of ordinary skill in the art at the time of the invention would read Beach189 and, absent hindsight, undertake to make the compensated GaN layer 25 with "acceptor type dopant atoms passivated with hydrogen," as required by claim 2. Although EPC's witness Dr. Lidow established that "compensating a semiconductor is a well-known idea," Tr. at 280:7-16 (Lidow), the record also establishes that a GaN layer doped with magnesium could "just as easily" be compensated with oxygen or silicon, *see* Tr. at 390:5-391:7 (Beach). Innoscience has not shown "by clear and convincing evidence" that an ordinary artisan at the time of the invention "would have had reason to attempt to make"

[redacted]

the Beach189 field plate device with GaN having a dopant compensated by hydrogen as opposed to some other element to arrive at the invention described in claim 2. *See PharmaStem Therapeutics*, 491 F.3d at 1360. In fact, Innoscience's stated motivation to combine—because "Beach189 does not specify any particular method for forming the disclosed compensated GaN field plate"—would leave the artisan with an unrestricted world of compensation choices, not lead the artisan to the specific compensation process in Kigami. *See* RIB at 42.

Additionally, EPC's expert Dr. Schubert opined that Kigami discloses hydrogen passivation below a gate insulator to reduce threshold voltage, which is further down in the semiconductor structure than the compensated GaN layer recited in the '294 patent and field plate of Beach189. Tr. 957:17-958:17 (Schubert); CDX-0003 at slide 18; Kigami ¶ [0004]. This casts additional doubt on a motivation to apply Kigami's compensation method to Beach189.

For all of the reasons noted above, and after considering the objective indicia of non-obviousness discussed later, I find no reason, absent hindsight, that a person of skill in the art would be motivated to combine the teachings of Beach189 and Kigami to arrive at the invention of claim 2. Accordingly, I find Innoscience has failed to present an affirmative defense that claim 2 of the '294 patent is invalid under 35 U.S.C. § 103 as obvious.

Claim 3

Because Innoscience relies on the same combination of Beach189 and Kigami with respect to claim 3 of the '294 patent, Innoscience also fails to prove claim 3 is invalid as obvious over the prior art as there is not motivation to combine Beach189 and Kigami references as discussed in the analysis of claim 2.

For completeness, claim 3 requires that transistor of claim 2 have acceptor type atoms "selected from the group consisting of Mg, Zn, Be and Ca." '294 patent at claim 3. But

[redacted]

Innoscience has not shown "by clear and convincing evidence" that an ordinary artisan at the time of the invention "would have had reason to attempt to make" the Beach189 field plate device with GaN having acceptor type atoms "selected from the group consisting of Mg, Zn, Be and Ca" as opposed to other possible elements. *See PharmaStem Therapeutics*, 491 F.3d at 1360. For all of the reasons noted above, and after considering the objective indicia of non-obviousness discussed later, I find no reason, absent hindsight, that a person of skill in the art would be motivated to combine the teachings of Beach189 and Kigama to arrive at the invention of claim 3. Accordingly, I find Innoscience has failed to present an affirmative defense that claim 3 of the '294 patent is invalid under 35 U.S.C. § 103 as obvious.

5. Objective Indicia of Non-obviousness

EPC contends objective indicia indicate that the invention of claims 1, 2, and 3 of the '294 patent are not obvious. EPC provides moderate evidence of secondary considerations related to the obviousness of the '294 patent. As discussed below, I find this evidence is not such that it would sway the obviousness analysis in this case in either direction.

a) Commercial success and industry praise

EPC argues its GaN transistors were "quickly commercially successful" and adopted by multiple major corporations, including Velodyne, Google, Microsemi Corporation, Texas Instruments, national Semiconductor, and STMicroelectronics. CIB at 119. Dr. Lidow also provided testimony indicating the GaN transistors incorporating the technology of the '294 and '508 patents had early adoption across multiple industries. Tr. at 160:10-165:10 (Lidow). EPC's GaN transistors also received several industry awards. *Id.* at 188:22-190:12. Staff concurs that EPC's commercial success weighs in favor of patentability. SIB at 34.

[redacted]

Innoscience argues that EPC has failed to show a nexus between the alleged secondary considerations and the claim elements. RIB at 51.

"[T]o accord substantial weight to secondary considerations in an obviousness analysis, . . . 'there must be a legally and factually sufficient connection between the evidence and the patented invention.'" *Fox Factory, Inc. v. SRAM, LLC.*, 944 F.3d 1366, 1373 (Fed. Cir. 2019). I find EPC has not persuasively shown that its commercial success is attributable to the invention of claim 1 in the '294 patent. The news articles and awards praising EPC's innovation are general in nature and do not evidence a link to the features of the patented invention. *See* CIB at 120. The testimony cited by EPC is primarily directed to GaN transistors, and not tied specifically to the invention of the '294 patent. *See, e.g.*, Tr. at 1009:18-1011:15 (Schubert). The lack of a nexus is even more pronounced when evaluating the distinct inventions of claims 2 and 3. I do not find EPC's evidence of commercial success and industry praise to have any material effect on the obviousness analysis.

b) Long felt but unsolved needs and failure of others

EPC employee Dr. Lidow also testified that patent '294's enhancement-mode transistor design was the only product of its kind, except for a Panasonic product, which was an "enhancement-mode device with the high leakage gate." Tr. at 157:20-175:5 (Lidow). Dr. Schubert also referred to the "fast switching speed" of the '294 patent as the "success story." Tr. (Schubert) 1011:7-15. EPC argues that others attempted to develop similar products, but patent '294 was distinguished by its low gate leakage and low gate capacitance. *See* CIB at 122; Tr. (Schubert) 1009:21-1010:23.

I find the testimony adduced by EPC fails to show an unsolved need prior to the time of the invention. The "mere passage of time without the claimed invention is not evidence of nonobviousness." *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004).

[redacted]

Even if similar products from other companies "launched devices shortly after [EPC's] in March of 2010," the record describes no problems faced by the industry prior to that time, and no attempts that had failed prior to that time. *See* Tr. (Lidow) 158:10-14. I do not find EPC's evidence of commercial success and industry praise to have any material effect on the obviousness analysis.

c) Copying

EPC offers no direct evidence that Innoscience copied EPC's semiconductor designs. Instead, EPC relies upon circumstantial evidence of the substantial similarities of Respondent's products. *See* RIB 120-21. For evidence of substantial similarities, EPC employee Dr. Lidow testified that Innoscience published a paper discussing "enhancement-mode GaN on silicon HEMT" that showed devices with "electrical characteristics . . . identical to EPC's." Tr. at176:3-18, 181:6-15, 182:12-21 (Lidow). Dr. Lidow stated in a sworn declaration that two of EPC's employees with access to proprietary information joined Innoscience and "Innoscience's GaN products began to closely mimic EPC's products in design and performance." Complaint, ex. 11 ¶¶ 9-11. Finally, EPC points Innoscience's product presentations in which Innoscience's GaN power devices are described as "pin-to-pin compatible" with EPC's power devices and have "similar specifications." CX-0003-0015; *see also* JX-0036C at 0130-0132.

EPC has not shown persuasive evidence that Innoscience's processes were directly copied from EPC. Dr. Lidow's statement shows the potential opportunity for copying, but EPC cites no other evidence of direct copying that would corroborate his speculation. For example, the record does not contain evidence of step-for-step copying of EPC epitaxy recipes. I do not find EPC's evidence of copying to have any material effect on the obviousness analysis.

[redacted]

B. The '508 Patent

1. Obviousness of Claim 1 in view of Hikita, Sheppard, and Beach624

Innoscience argues claim 1 of the '508 patent is invalid under 35 U.S.C. § 103 as obvious in view of U.S. patent application publication No. 2006/0273347 (RX-0041, "Hikita"), U.S. Patent No. 7,238,560 (RX-0288, "Sheppard"), and international patent application publication No. WO 2005/057624 (RX-0286, "Beach624"). RIB at 56-91. Hikita published December 7, 2006; Sheppard published July 3, 2007; and Beach624 published June 23, 2005. *Id*. These is no dispute that Hikita, Sheppard, and Beach624 are prior art to the '508 patent under pre-AIA 35 U.S.C. § 102(b).

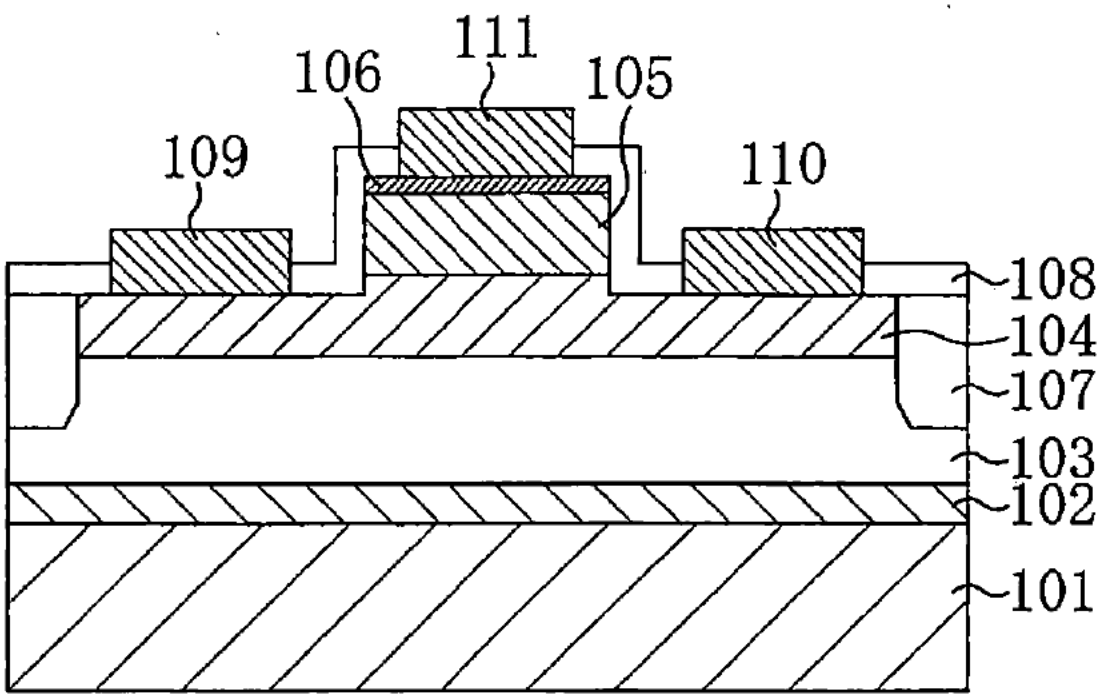
EPC contends that Innoscience has provided only "general statements concerning motivation to combine types of features, but it failed to tie that motivation to the particular references or explain how the 'pieces of the jigsaw' actually even fit together" to arrive at the invention as a whole. CRB at 48. Specifically, EPC argues the record lacks any evidence of a motivation to replace Hikita's single mask source and drain formation with Beach624's two photo mask process. *See id*. at 53-56.

Staff contends that the combination proposed by Innoscience fails to disclose or suggest a device with a p-type gate structure and ohmic contacts that are made according to limitations 1[f] to [1i] and limitations [1n] to [1q] of claim 1 of the '508 patent. SIB at 52; SRB at 13.

The primary reference in Innoscience's obviousness argument is Hikita, which discloses an enhancement mode GaN transistor as shown below:

[redacted]

FIG. 1



Hikita at Fig. 1. In Figure 1, a sapphire substrate 101 has an AlN buffer layer 102 formed thereon. Hikita ¶ [0033]. An undoped GaN layer 103 is formed on buffer layer 102, an undoped AlGaN layer 104 is formed on layer 103, and a p-type GaN layer 105 is formed on layer104. *Id.* A heavily doped p-type GaN layer 106 is formed on layer 105, and heavily doped p-type GaN layer 106 contains "a p-type impurity at a higher concentration than that of the p-type GaN layer 105." *Id.*

Below, I address the scope and content of each prior art reference and compare it to the limitations of claim 1. Then I address whether Innoscience has shown the invention to be obvious in view of the combination of references and the objective indicia of non-obviousness.

[1pre]: "A method of forming an enhancement mode GaN transistor, the method comprising:"

No party argues that the preamble of claim 1 is limiting. Nevertheless, Innoscience argues Hikita discloses "a method of forming an enhancement mode GaN transistor" as claimed in the

[redacted]

'508 patent. RIB at 72. For completeness, I find Hikita discloses a method of forming an enhancement mode GaN transistor. Hikita describes "[a] method for fabricating a field-effect transistor forming a transistor" having "a hetero interface between the p-type GaN layer 105 and the undoped AlGaN layer 104 in the gate region." Hikita ¶¶ [0013], [0035], [0055]-[0061], Figs. 8A-8F. Hikita does not expressly use the term enhancement-mode but discloses a "field-effect transistor of the present invention can be made to be a normally OFF type." Hikita ¶¶ [0011], [0038]. There is no dispute that a person of skill in the art understands a normally-off transistor is an enhancement mode transistor. Tr. at 615: 13-15, 998:22-999:1 (Schubert); *id*. at 903:2-4, 934:17-19 (Lebby).

EPC and Staff do not dispute that Hikita discloses a column III nitride transistor.

I find Hikita discloses a method of forming an enhancement mode GaN transistor as recited in the preamble of claim 1.

[1a]: "nucleating and growing transition layers on a substrate;"

Innoscience acknowledges that Hikita "does not explicitly disclose growing multiple transition layers on a substrate," and instead points to Sheppard for that teaching. RIB at 74.

I find Sheppard discloses:

> Optional buffer, nucleation and/or transition layers (not shown) may be provided on the substrate 10. For example, an AlN buffer layer may be provided to provide an appropriate crystal structure transition between the silicon carbide substrate and the remainder of the device. Additionally, strain balancing transition layer(s) may also be provided . . . .

Sheppard at 6:58-65, 7:25-32.

EPC and Staff do not dispute that the combination of references proposed by Innoscience would render obvious an invention having this method step.

[redacted]

[1b]: "growing an III Nitride EPI layer over the transistor layers;" [14]

Innoscience argues Hikita discloses "growing an III Nitride EPI layer" as required by limitation [1b]. RIB at 74-75. EPC and Staff do not dispute that the combination of references proposed by Innoscience would render obvious an invention having this method step.

I find Hikita discloses "epitaxially growing a first nitride semiconductor layer." Hikita ¶ [0013]. Hikita teaches that this layer can be "an undoped GaN layer 103 formed on the AlN buffer layer 102." *Id.* ¶ [0033]. It is undisputed that gallium nitride (GaN) is a III Nitride material. *See* Markman Tr. at 94:5-24 (Schubert); Tr. at 425:7-11 (Schubert); Tr. at 903:14-20 (Lebby).

I find Hikita discloses growing an III Nitride EPI layer, but Hikita does not disclose growing such a layer over transition layers.

[1c]: "growing an III Nitride barrier layer over the EPI layer;"

Innoscience argues Hikita discloses "growing an III Nitride barrier layer over the EPI layer." RIB at 75-76. As noted above, Innoscience contends "the EPI layer" in Hikita is undoped GaN layer 103. Innoscience points to Hikita's undoped AlGaN layer 104 as the claimed III Nitride barrier layer grown over EPI layer 103. *Id.* EPC and Staff do not dispute that Hikita discloses growing an III Nitride barrier layer over the EPI layer.

I find Hikita discloses "epitaxially growing . . . a second nitride semiconductor layer." Hikita ¶ [0013]. Hikita teaches that this layer can be "an undoped AlGaN layer 104 formed on the undoped GaN layer 103" where a "two dimensional electron gas [is] generated at the interface between the undoped AlGaN layer 104 and the undoped GaN layer 103." *Id.* ¶¶ [0033], [0038]. It is undisputed that AlGaN layer 104 is a barrier layer. Innoscience's expert Dr. Lebby opined

[14] As noted in footnote 6 above, the phrase "transistor layers" in claim element [1b] appears to be a typographical error that should instead read "transition layers."

that a person of ordinary skill in the art would interpret layer 104 as the claimed III Nitride barrier layer. Tr. at 903:22-904:2 (Lebby). Similarly, EPC's expert Dr. Schubert stated that prior art devices "have a buffer layer and a barrier layer, and so this bi-layer configuration creates a two-dimension electron gas and sheet of electrons at the interface at the boundary between these two layers." *See* Tr. at 433:23-434:16 (Schubert). By describing the 2DEG phenomenon at the interface between layer 104 and layer 103, Hikita confirms that a person of ordinary skill in the art would understand layer 104 is a barrier layer.

I find Hikita discloses growing an III Nitride barrier layer over an EPI layer.

[1d]: "growing a GaN layer with acceptor type dopants over the barrier layer;"

Innoscience argues Hikita discloses "growing a GaN layer with acceptor type dopants over the barrier layer." RIB at 76-77. As noted above, Innoscience contends "the barrier layer" in Hikita is undoped AlGaN layer 104. Innoscience contends that Hikita teaches sequentially forming a p-type GaN layer 105 and a heavily doped p-type GaN layer 106 over barrier layer 104. *Id.* Innoscience also quotes Hikita's teaching that "it is not necessary that the heavily doped p-type GaN layer 106 is provided." *Id.* at 77 (quoting Hikita ¶ [0040]). Innoscience says Dr. Lebby opined that the p-type dopants in GaN layers 105 and 106 are acceptor-type dopants. Tr. at 904:4-14 (Lebby).

EPC and Staff do not dispute that Hikita discloses growing a GaN layer with acceptor type dopants over the barrier layer.

I find Hikita discloses growing "a p-type GaN layer 105" and "a heavily doped p-type GaN layer 106" over barrier layer 104. Hikita ¶¶ [0013], [0033], [0056]. It is undisputed that the p-type dopants in layers 105 and 106 of Hikita are acceptor-type dopants. Tr. at 904:4-14, 918:13-15 (Lebby).

[redacted]

I find Hikita discloses growing a GaN layer with acceptor type dopants over the barrier layer.

[1e]: "depositing a gate contact layer on the doped GaN layer;"

[1f]: "applying a gate photo resistant pattern;"

[1g]: "etching away the gate contact layer outside the gate region;"

[1h]: "etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact;"

[1i]: "removing the gate photo resistant pattern;"

Innoscience addresses limitations [1e]-[1i] together and asserts that Hikita in view of Beach624 renders an invention having these limitations obvious "because the combination discloses performing the steps in order as a self-aligned process." RIB at 78-81.

I find Hikita discloses:

> part of the SiN film 408 provided on the heavily doped p-type GaN layer 406 is removed, for example, by ICP dry etching or the like. Subsequently, a gate electrode 411 of Pd is formed in an associated one of the openings in the SiN film 408.

Hikita ¶ [0061]. This process is illustrated in Figures 8E and 8F of Hikita:

FIG. 8E

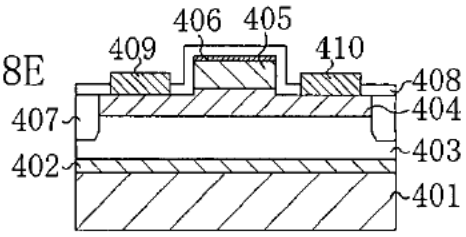
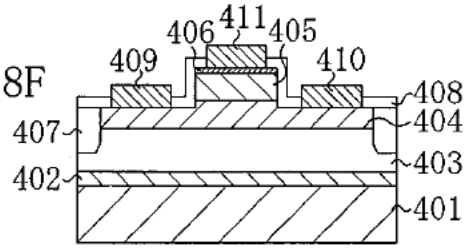


FIG. 8F



Hikita at Figs. 8E, 8F.

I find Beach624 discloses steps for making a depletion-mode transistor. Beach624 ¶ [0039]; Tr. at 934:5-19 (Lebby). In the relevant portion of Beach624, it explains:

> prior to the deposition of the ohmic contact material, a non-volatile, non-diffusive material 16 is formed over device 14. Material 16 overlays layer

[redacted]

12 in regions outside of the ohmic contact window 11, and overlays layer 10 at the bottom of ohmic contact window 11. Material 16 can be AlN, HfN, AlGaN, highly doped GaN, highly doped poly GaN, LPCVD SiN or other appropriate material that protects the semiconductor surface 12 from outdiffusing and damage during an anneal step.

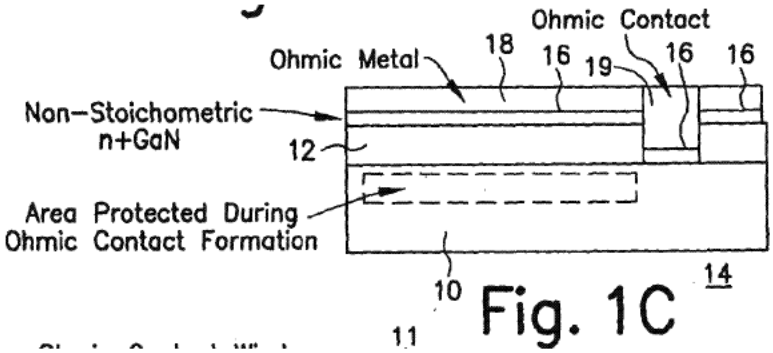


Fig. 1C

Beach624 ¶ [0043], Fig. 1C. After application of material 16, "resist material 13 is deposited in a pattern to permit the formation of a gate 15 and ohmic contact 17." *Id.* ¶ [0047]. Then, "material 18 is removed, as by etching, except where protected by photoresist 13. The removal, or etching process, also eliminates protective layer 16 under patterned photoresist 13." *Id.* This process is illustrated in figures 1D and 1E.

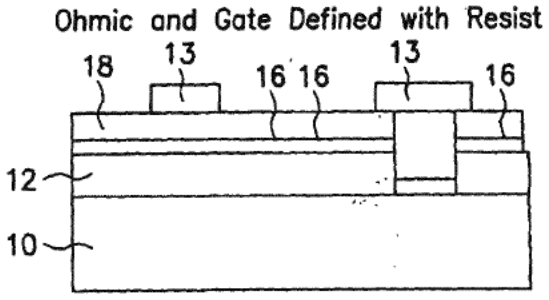


Fig. 1D

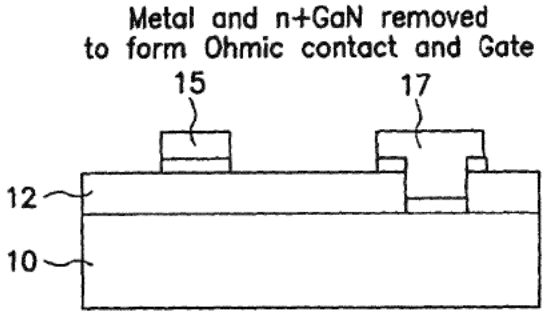


Fig. 1E

Id. at Figs., 1D, 1E. "After material 18 has been removed from device 14 in regions not covered by photoresist 13, photoresist 13 is stripped off." *Id.* ¶ [0049].

[redacted]

The parties dispute whether a person of skill in the art would find it obvious to combine the teachings of Hikita and Beach24 to arrive at an invention that includes steps [1e] through [1i]. I address that dispute below.

[1j]: "depositing a dielectric layer;"

[1k]: "applying a contact photo resistant pattern;"

[1l]: "etching the dielectric layer to open the drain and source contact area;"

[1m]: "removing the contact photo resistant pattern;"

Innoscience argues Hikita discloses limitations [1j]-[1m]. RIB at 81-82. EPC and Staff do not dispute that Hikita discloses these steps.

I find Hikita discloses that a "SiN film 108 having openings is provided over the undoped AlGaN layer 104 as well as side surfaces of the p-type GaN layer 105 and side and upper surfaces of the heavily doped p-type GaN layer 106." Hikita ¶¶ [0034], [0037], [0059]. It is undisputed that silicon nitride (SiN) is a known dielectric material. *See* Tr. at 911:4-16 (Lebby); '508 patent at 3:57-58 ("[A] dielectric material 18, such as silicon nitride (Si_3N_4), is deposited.").

Hikita also discloses that "openings are formed in a SiN film, for example, by ICP [inductive-coupled plasma] dry etching or the like." Hikita ¶¶ [0034], [0057], [0060]. Hikata teaches that "source electrode 109 and a drain electrode 110 . . . are formed on parts of the AIGaN layer 104 corresponding to the openings of the SiN film 108." *Id.*

[redacted]

[1n]: "depositing an Ohmic contact metal;"

[1o]: "applying a metal photo resistant pattern;"

[1p]: "etching the Ohmic contact metal;"

[1q]: "removing the metal photo resistant pattern; and"

Innoscience asserts Hikita in view of Beach624 renders obvious an invention having steps [1n] through [1q] using similar arguments as for limitations [1e]-[1i]. RIB at 82-84. As with limitations [1e]-[1i], Innoscience relies on Beach624's teaching that "resist material 13 is deposited in a pattern to permit the formation of a gate 15 and ohmic contact 17" as disclosure of steps [1n] through [1q]. *See* Beach624 ¶ [0047].

The parties dispute whether a person of skill in the art would find it obvious to combine the teachings of Hikita and Beach24 to arrive at an invention that includes steps [1n] through [1q]. I address that dispute below.

[1r]: "performing rapid thermal annealing to form Ohmic drain and source contacts."

Innoscience argues Hikita alone discloses the claimed "performing rapid thermal annealing to form Ohmic drain and source contacts." RIB at 84-85. EPC and Staff do not dispute that the combination of references proposed by Innoscience would render obvious an invention having this method step.

Hikita discloses:

> Each of a source electrode 490 and a drain electrode 410 is formed of a Ti layer and an Al layer in an associated one of the openings, and then heat treatment is performed thereto in an N_2 atmosphere at 650° C.

Hikita ¶¶ [0060]. Dr. Lebby's opinion supports that a person of ordinary skill in the art would have understood this step to be a rapid thermal anneal. Tr. at 85 913:6-13 (Lebby).

[redacted]

I find Hikita discloses performing rapid thermal annealing to form Ohmic drain and source contacts.

Analysis

As noted above, Innoscience relies heavily on the teaching in Beach624 that "resist material 13 is deposited in a pattern to permit the formation of a gate 15 and ohmic contact 17" as central to its reasoning that the combined teachings of Beach624 and Hikita make the claimed invention obvious. *See* RIB at 78-84 (citing Beach624 ¶ [0047]). Innoscience claims a person of ordinary skill in the art "would have been motivated to use Beach624's etching technique to form the gate contact in Hikita" because "there were only two alternative techniques that could be used to pattern Hikita's gate contact in the designated region, which had been known and used in the semiconductor industry for decades—etching or liftoff." RIB at 66 (citing Tr. at 908:4-11 (Lebby)).

I find Innoscience's position to be unsupported in the record. First, the passage of testimony that Innoscience cites does not support its proposition that there were only two techniques known in the art that could be used to pattern a gate. Innoscience's expert Dr. Lebby merely testified that "there are two techniques for gate formation that *are popular*": " lift-off" and "etching." Tr. at 908:4-11 (Lebby) (emphasis added). And even if lift-off and etching were the only two ways to make gate patterns (a fact unsupported on this record), that would do little to show the obviousness of the combination Innoscience proposes. The claimed invention is not just a gate formed by etching; it is a particular set of steps that form a particular structure. Innoscience has not shown that the particular steps in the claimed invention are part of some restricted set obvious to the ordinary artisan.

[redacted]

Innoscience additionally argues Hikita and Beach624 both talk about etching, and that a person of skill in the art would choose to apply the etching technique of Beach624 to the invention of Hikita because etching can lead to "a high patterning precision." RIB at 66. But, without hindsight, Innoscience has not shown why the ordinary artisan would choose the etching technique and specific structures in Beach624 as opposed to a myriad of other etching techniques and structures shown in this record, which could equally have high patterning precision.

Innoscience further argues "*Beach624*'s self-alignment process effectively achieves *Hikita*'s objective that the doped GaN layer is removed except the gate region." RIB at 68 (citing Hikita ¶¶ [0035], [0057]). I find that Hikita neither shows a final product with the gate electrode 111 and p-type GaN layer 105 aligned in size and position nor discloses that such a configuration is desirable. *See* Hikita ¶¶ [0035], [0057], Figs. 1, 8A-8F. Innoscience cites testimony from Dr. Lebby as support for its conclusion, RIB at 68-69 (citing Tr. at 907:17-910:24 (Lebby)), but the cited testimony of Dr. Lebby is conclusory. Dr. Lebby describes similarities between the structure of Hikita and the structure of Beach624, but he never provides a reason to combine method steps:

> Q. Would a person of skill in the art in your opinion have been motivated to combine Hikita and Beach's self-aligned gate etching process?
>
> A. Yes, I would see this as a clear motivation to combine at least from my standpoint. If I look at Hikita what Hikita teaches is, is a nitride device with a gate contact layer. Beach also -- Beach624 also teaches a nitride device with a gate contact layer, but Beach624 also teaches us a method in making a self-aligned gate.

Tr. at 907:17-910:24 (Lebby). Dr. Lebby's testimony lacks any explanation that an ordinary artisan at the time of the invention "would have had reason to attempt" to undertake the combination of method steps necessary to arrive at the invention described in claim 1. *See PharmaStem Therapeutics*, 491 F.3d at 1360.

[redacted]

There are other problems with Innoscience's obviousness analysis. Innoscience repeatedly makes arguments that individual claim limitations in isolation would have been obvious. *See, e.g.*, RIB at 68 ("obvious to implement Beach624's self-alignment process to form self-aligned gate contact"), 70 ("obvious to form Hikita's ohmic source and drain contacts by performing the steps of depositing an ohmic contact metal, applying a metal photoresist pattern, etching the ohmic contact metal, and removing the metal photoresist pattern, as Beach624 teaches"), 74 ("obvious to nucleate and grow multiple transition layers in Hikita's device, as Sheppard teaches"). But that is not what the law requires. Instead, "[t]he claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984); *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 399 (2007) (One challenging the patent must show "the subject matter as a whole would have been obvious."). Innoscience has not presented evidence that the invention of claim 1 as a whole would have been obvious. Instead, it presents a series of quite specific selections that, on this record, only appear to have been motivated by hindsight.

Objective Indicia of Non-obviousness

EPC contends objective indicia indicate that the invention of claim 1 of the '508 patent is not obvious. EPC primarily relies on the same evidence to support both the '294 patent and '508 patent. I find this evidence is not such that it would sway the obviousness analysis in this case in either direction.

1. Commercial success and industry praise

EPC argues its GaN transistors were "quickly commercially successful" and adopted by multiple major corporations, including Velodyne, Google, Microsemi Corporation, Texas

[redacted]

Instruments, national Semiconductor, and STMicroelectronics. CIB at 119. Dr. Lidow also provided testimony indicating the GaN transistors resulting from patent '508 had early adoption across multiple industries. Tr. at 160:10-165:10 (Lidow). EPC's GaN transistors also received several industry awards. *Id*. at 188:22-190:12.

Innoscience argues that EPC has failed to show a nexus between the alleged secondary considerations and the claim elements. RIB at 91.

"[T]o accord substantial weight to secondary considerations in an obviousness analysis, . . . 'there must be a legally and factually sufficient connection between the evidence and the patented invention.'" *Fox Factory, Inc. v. SRAM, LLC*., 944 F.3d 1366, 1373 (Fed. Cir. 2019). I find EPC has not persuasively shown that its commercial success is attributable to the invention of claim 1 in the '508 patent. The news articles and awards praising EPC's innovation are general in nature and do not evidence a link to the features of the patented invention. *See* CIB at 120. I do not find EPC's evidence of commercial success and industry praise to have any material effect on the obviousness analysis.

2. Long felt but unsolved needs and failure of others

EPC argues its GaN transistors solved a long-felt need. At the hearing, Dr. Schubert testified that there was a long-felt need for an improved enhancement-mode switching transistor that would overcome the limitations of silicon MOSFETs. *See* Tr. (Schubert) at 1009:21-1010:4. He stated the invention of the '508 patent met this need, providing a method to manufacture enhancement-mode GaN transistors, resulting in improved performance, reduced gate leakage, and lower manufacturing cost. *Id.; see also* Tr. (Schubert) at 1011:18-1012:12. Staff contends that there was a long-felt need for a new method of manufacturing enhancement-mode GaN transistors. SIB at 53.

[redacted]

I find the testimony adduced by EPC fails to show an unsolved need prior the time of the invention. Dr. Schubert's testimony does not quantify the amount of time the industry spent trying to solve the problems addressed in the '508 patent, or how earlier efforts failed. I do not find EPC's evidence of commercial success and industry praise to have any material effect on the obviousness analysis.

3. Copying

EPC offers no direct evidence that Innoscience copied EPC's semiconductor designs. Instead, EPC relies upon circumstantial evidence of the substantial similarities of Respondent's products. *See* RIB 120-21. For evidence of substantial similarities, EPC employee Dr. Lidow testified that Innoscience published a paper discussing "enhancement-mode GaN on silicon HEMT" that showed devices with "electrical characteristics . . . identical to EPC's." Tr. at176:3-18, 181:6-15, 182:12-21 (Lidow). Dr. Lidow stated in a sworn declaration that two of EPC's employees with access to proprietary information joined Innoscience and "Innoscience's GaN products began to closely mimic EPC's products in design and performance." Complaint, ex. 11 ¶¶ 9-11. Finally, EPC points Innoscience's product presentations in which Innoscience's GaN power devices are described as "pin-to-pin compatible" with EPC's power devices and have "similar specifications." CX-0003-0015; *see also* JX-0036C at 0130-0132.

EPC has not shown persuasive evidence that Innoscience's processes were directly copied from EPC. Dr. Lidow's statement shows the potential opportunity for copying, but EPC cites no other evidence of direct copying that would corroborate his speculation. For example, the record does not contain evidence of step-for-step copying of EPC epitaxy recipes. I do not find EPC's evidence of copying to have any material effect on the obviousness analysis.

[redacted]

Conclusion

On the present record, after considering the prior and the objective indicia of non-obviousness, I find Innoscience has failed to demonstrate claim 1 of the '508 patent is invalid under 35 U.S.C. § 103 as obvious in view of Hikita, Sheppard, and Beach624. Innoscience has at least failed to show a person of ordinary skill in the art would be motivated to combine the teachings of those references to arrive at the claimed invention.

VII. DOMESTIC INDUSTRY

For a patent-based complaint, a violation of section 337 can be found "only if an industry in the United States, relating to the articles protected by the patent . . . exists or is in the process of being established." 19 U.S.C. § 1337(a)(2). The complainant bears the burden of establishing that the domestic industry requirement is satisfied. *John Mezzalingua Assocs., Inc. v. Int'l Trade Comm'n*, 660 F.3d 1322, 1331 (Fed. Cir. 2011). The domestic industry requirement of section 337 is often described as having an economic prong and a technical prong. *InterDigital Commc'ns, LLC v. Int'l Trade Comm'n*, 707 F.3d 1295, 1298 (Fed. Cir. 2013); *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm'n Op. at 12-14, USITC Pub. No. 4120 (Dec. 2009). "The technical prong concerns whether complainant practices at least one claim of the asserted patents. The economic prong concerns domestic activities with respect to the patent or patented article." *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm'n Op. at 25, USITC Pub. No. 4289 (Nov. 2011).

A. Representativeness of Domestic Industry Products

EPC asserts that each of its domestic industry products is "representative of all others for the purposes of this investigation." CIB at 9. EPC provides a technical prong analysis of two products to prove a domestic industry, one high-voltage product (EPC2215), and one low-voltage

[redacted]

product (EPC2016C). EPC contends these two products are representative of EPC's 360 domestic industry products. *Id.*; CX-0046C (listing EPC's domestic products); Tr. at 450:20-451:8, 454:2-9 (Schubert).

To support its assertions about representative domestic industry products, EPC identifies testimony from its expert Dr. Schubert, who reviewed "all EPC epi[taxy] recipes, travelers, TEM images, and SIMS profiles" for the EPC domestic industry products. Tr. at 450:20-25 (Schubert); CSB at 1-2. Dr. Schubert also spoke with the inventors of the patents, who "confirmed that the devices have the relevant features that are claimed in the claims and have the relevant process steps." Tr. at 451:1-8 (Schubert). Based on his analysis, Dr. Schubert concluded that "there are additional features and differences among the [domestic industry] products," but those differences "are not directly relevant to the asserted claims." *Id.*

EPC also notes that testimony from EPC employee and inventor Dr. Beach shows how those documents work together to describe the manufacture and physical structure of the EPC domestic industry devices. Tr. at 338:3-339:8 (Beach). Additionally, EPC CEO Dr. Lidow testified he was "intimately involved" with and "very familiar with each and every one of [the domestic industry products]," knowing "exactly which process goes into each one of them." Tr. at 165:18-166:3 (Lidow); CSB at 1-2. Dr. Lidow testified that all the products are made "essentially" the same way. Tr. at 168:23-25 (Lidow). The percipient witness testimony of Dr. Beach and Dr. Lidow is consistent with and supports Dr. Schubert's opinion that the two domestic industry products analyzed at trial are representative in all material ways of all EPC domestic industry products.

[redacted]

Staff agrees that EPC has shown that the two analyzed EPC products are representative of all EPC domestic industry products, noting a lack of testimonial evidence that would rebut Dr. Schubert's opinions. SIB at 45.

Innoscience argues that EPC has failed to meet its burden to show the two products analyzed are representative of all EPC's domestic industry products. RRB at 64 (citing *Certain LED Lighting Devices, LED Power Supplies, and Components Thereof,* Inv. No. 337-TA-1081, Comm'n Op. at 10 (July 23, 2019)). Innoscience asserts "Dr. Schubert did not account for any differences in the fabrication processes used to manufacture the various alleged EPC products in relation to claim 1 of the '508 patent," processes that "are continuously evolving." RRB at 100-101; Tr. at 358:1-360:17 (Dr. Beach indicating changes in processes over time); *see also* JX-0019C at 87:14-88:16 (Dr. Cao admitting there are design differences between products).

I find EPC has presented sufficient evidence to establish that the two representative products it analyzed are identical in all material respects to all EPC domestic industry products. In the testimony Innoscience cites, Dr. Beach acknowledged the epitaxial part number recently had "a small change to the AlGaN front barrier," Tr. at 359:15-20 (Beach), but there is no record evidence that the change is material to any issue in this investigation. Similarly, Dr. Cao described specific differences between products, such as different drain and source spacing and different masks designs but concluded as the one "in charge of developing these processes" that a process can be representative of the others. JX-0019C at 87:14-88:16, 89:19-14, 91:11-92:1. The structure of the domestic industry products is not "continuously evolving," Innoscience seems to suggest. As Dr. Beach and Dr. Cao demonstrated, the documentary evidence of record permits one to understand the precise differences or similarities of each of EPC's products. Dr. Schubert reviewed "all EPC epi[taxy] recipes, travelers, TEM images, and SIMS profiles" for the EPC

domestic industry products and confirmed his opinions about the relevant process steps and features with those having personal knowledge. Tr. at 450:20-451:8 (Schubert). Dr. Lidow, a percipient witness, gave testimony consistent with Dr. Schubert's conclusions. Tr. at 168:23-171:25 (Lidow).

Certain LED Lighting Devices does not require a different result. First, the party with the burden in that investigation presented only expert testimony that "failed to analyze the actual components and implemented functionality within the accused products." Comm'n Op. at 13. Here, in contrast, the record contains ample testimony from percipient witnesses Dr. Lidow and Dr. Beach that is consistent with and supports Dr. Schubert's opinions. Second, the opposing party in *Certain LED Lighting Devices* presented evidence that contradicted the conclusory testimony of the moving party's expert. Comm'n Op. at 13. Here, Innoscience cross-examined Dr. Schubert extensively at trial but never confronted him with any differences in any particular products that might undermine his opinion that the two analyzed products are representative of all others in every material respect.

I find that the two analyzed products, EPC2215 and EPC2016C, accurately represent all domestic industry products at issue in this investigation in all material respects.

B. Economic Prong of the Domestic Industry Requirement

EPC relies on investments in domestic labor and capital for research and development to show a domestic industry solely under 19 U.S.C. § 1337(a)(3)(B). CIB at 110-117. Innoscience contends that some EPC investments are not part of the domestic industry, and that EPC has failed to allocate its expenses on a per-product and per-patent basis in contravention of Commission policy. RRB at 102-03. Staff avers that EPC satisfies the economic prong of the domestic industry

[redacted]

requirement, even if some disputed expenses are excluded from the analysis. SIB at 56-58; SRB at 14. I address these arguments in further detail below.

1. EPC's Business

EPC is headquartered in El Segundo, California, and has additional California offices in Aliso Viejo and San Jose. Complaint ¶ 6 (EDIS Doc ID 797350). EPC employs 70 people involved in research and development, and 43 of those employees are in the United States. Tr. at 313:3-13 (Vander Veen). The research and development performed by the employees in the United States includes device development, process development, and device improvement. Tr. at 172:13-173:12 (Lidow). Dr. Lidow testified that the "work on the guts" of EPC's technology is performed in the United States. *Id.* The research and development personnel located outside the United States deal with tasks such as making devices work for specific customer applications, designing integrated circuits that utilize EPC technology, and working with foundries. *Id.* at 173:15-174:21. Some of the EPC foreign research groups are led by domestic engineers. *Id.* The EPC foreign research groups do not design the core technology of the transistors, which is what the asserted patents cover. *Id.* at 174:13-21.

2. EPC's Allocation Method

I find that, in the ordinary course of business, EPC organizes its labor and capital expenses by department and expenditure codes. Tr. at 295:20-296:5; 301:8-18 (Vander Veen). I further find that EPC does not specifically track its investments by product model. *Id.*

EPC's economic expert, Dr. Vander Veen, reviewed corporate records and spoke with EPC's Chief Financial Officer, Mr. Marabotti, to identify the departments and codes involved in research and development. Tr. at 295:20-296:17 (Vander Veen). To determine which domestic research and development expenses correlate with the domestic industry products practiced by the

[redacted]

patents asserted in this investigation, Dr. Vander Veen applied a sales-based allocation method. Dr. Vander Veen compared EPC's sales of domestic industry products during each period to EPC's total sales during the same time period and allocated EPC's investments proportionally. CIB at 113-114; Tr. at 306:4-309:1 (Vander Veen). The allocation percentages applied by Dr. Vander Veen are summarized as follows:

Sales Based Allocation of EPC Domestic Industry Investments

		2018	2019	2020	2021	2022	Q1 2023
Sales of Domestic Industry Products	[A]	[redacted]					
Total EPC Sales	[B]						
Sales of Domestic Industry Products as a percentage of Total EPC Revenue	[C] = [A] / [B]						

Sources:
[A] Tab 4b.
[B] EPC_ITC_00004998.

CDX-0006C at slide 26 (summarizing data from CPX-0010C; CPX-0021C; CX-0046C).

Innoscience argues that EPC failed to provide an investment analysis on a per-product and per-patent basis, in contravention of Commission policy. RRB at 102-03. Staff agrees that EPC's showing satisfies the domestic industry statute. SIB at 56-58.

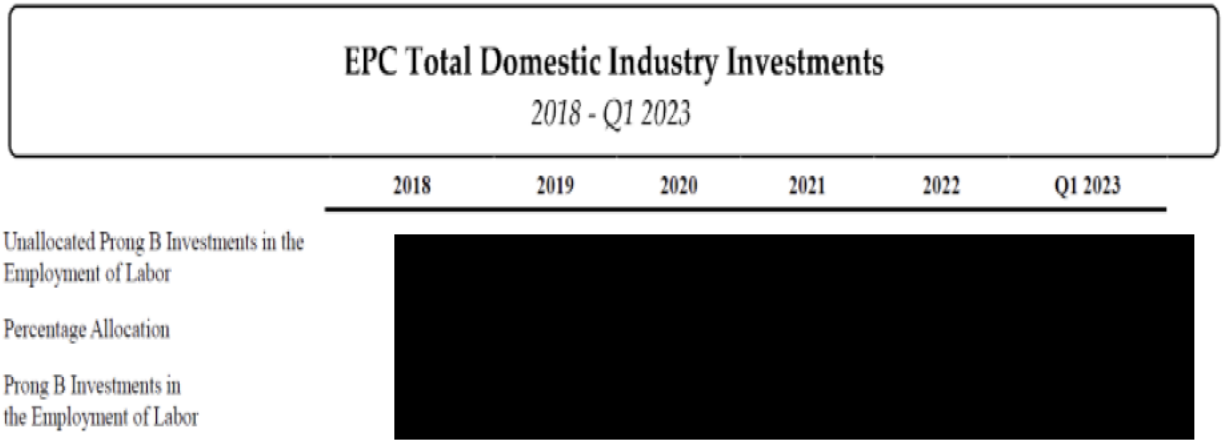
As discussed in Section VII.A, EPC has demonstrated the two analyzed products are representative of all the domestic industry products. The Federal Circuit has recently reiterated that if "all the domestic industry products practice all the asserted patents, it follows from the language of section 337 and our case law that the complainant could satisfy the economic prong as to all asserted patents based on the entire product group." *Zircon Corp. v. Int'l Trade Comm'n*, 101 F.4th 817, 824 (Fed. Cir. 2024). The facts of record here are similar. While I find below that EPC has satisfied the technical prong of the domestic industry requirement for only the '294 patent and not for the '508 patent, the record establishes that the EPC domestic industry products asserted to be covered by each patent are identical. CIB at 9. This means that relevant investments are the

[redacted]

same whether the focus is on the '294 patent, the '508 patent, or both patents. I find EPC's aggregate analysis of the domestic industry products is not erroneous, and I find EPC's sales-based allocation method is appropriate given the facts and circumstances of record here.

3. EPC's Domestic Labor Expenses

To determine which EPC labor expenses are properly allocated to the domestic industry, Dr. Vander Veen used codes corresponding to "salary and wages, medical insurance, vacation, bonuses, incentives, stock compensation, work-related travel (travel expenses, auto expenses, and conference and seminars), employer tax expenses, and workers' compensation premium." CIB at 112; Tr. at 304:15-305:12 (Vander Veen). Dr. Vander Veen calculated EPC's relevant domestic labor investments as follows:



CDX-0006C at slide 29.

No record evidence raises any doubt that EPC has made the labor investments identified by Dr. Vander Veen. In fact, Staff asserts that EPC's labor investments were slightly higher. SIB

[redacted]

at 56-57. I therefore find that, for the period 2018 through Q1 2023, EPC invested at least [redacted] million[15] in domestic labor related to the patented domestic industry products.

4. EPC's Domestic Capital Investments

For EPC's capital investments, Dr. Vander Veen included "consulting, outside services, R&D lab supplies, R&D Materials, mask sets, R&D Testing, and Materials Issue Engineering." CIB at 112; CDX-0006 at slides 7-22 (Dr. Vander Veen demonstrative). Dr. Vander Veen created summaries combining EPC's labor and capital investments:

EPC Prong B Investments in the Employment of Labor and Capital
Q2 2022 - Q1 2023

		Q2 - Q4 2022	Q1 2023
Apps Engineering Device R&D FA FAE Product Engineering IC R&D Materials R&D Support Reliability		[redacted]	
Total	**[A] = ∑[B]**		

Sources:
Tabs 10a-i.

[15] This is the sum of allocated amounts for each period in the chart above: [redacted]

[redacted]

EPC Prong B Investments in the Employment of Labor and Capital

2020 - Q1 2022

		2020	2021	Q1 2022
			[A]	
R&D			[redacted]	
IC				
R&D Support				
FAE				
Total	**[A] = ∑[B]**			

Sources:
Tabs 9a-d.

EPC Prong B Investments in the Employment of Labor and Capital

2018 - 2019

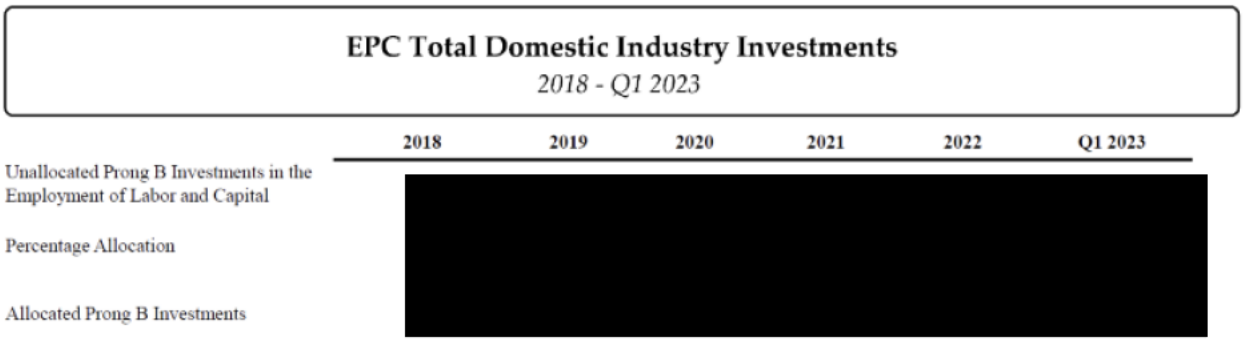
		2018	2019
			[A]
R&D			[redacted]
IC			
FAE			
Total	**[B] = ∑[A]**		

Sources:
Tabs 8a-c.

CDX-0006C at slide 4 (summarizing data from CPX-0019C); *id*. at slide 5 (summarizing data from CPX-0017C and CPX-0043C); *id*. at slide 6 (summarizing data from (CPX-0116C and CPX-0017C).

Applying the allocation percentages described above, EPC's claimed investments for labor and capital in connection to the domestic industry products is summarized in the following table:

[redacted]



CDX-0006C at slide 28. These calculations assert that for the period 2018 through Q1 2023, EPC invested at least [redacted] in a combination of domestic labor and capital related to the patented domestic industry products. Backing out the [redacted] that Dr. Vander Veen identified as domestic labor expenses, it follows that Dr. Vander Veen's calculations assert EPC invested [redacted] of capital in the domestic industry products.

At the evidentiary hearing, Innoscience elicited testimony from Dr. Vander Veen that at least some of the capital investments he credited for categories like "R&D Lab Supplies," "Mask Sets," and "R&D Testing" represent payments made to foreign entities. RRB at 103; Tr. at 319:5-323:1 (Vander Veen). Dr. Vander Veen opined that these investments are part of the relevant domestic industry because any foreign-bought products and services included in the totals were used by EPC's research and development personnel in the United States and were necessary for that personnel to do their work in the United States. *Id.*

I find EPC has shown the capital investments identified by Dr. Vander Veen are part of "an industry in the United States, relating to the articles protected by the patent[s]" asserted in this investigation. *See* 19 U.S.C. § 1337(a)(2). To hold otherwise would be to ignore "the realities of the marketplace," in contravention of the Commission's well-established policy. *See TianRui Grp. Co. v. Int'l Trade Comm'n*, 661 F.3d 1322, 1336 (Fed. Cir. 2011) (finding the Commission has consistently applied a flexible "realities of the marketplace" test for decades). For example, the

[redacted]

record here indicates that EPC engineers in California use software to lay out masks for making integrated circuits according to the patent claims asserted in this investigation. *See, e.g.*, Tr. at 249:8-251:4 (Lidow). Under Innoscience's theory, EPC's investment in the software used by engineers in the United States could not be credited as part of the domestic industry if that software was written by engineers in a foreign country or, even worse, if it were unknown where the software was written. Innoscience's theory would ignore the fact that the software is a necessary—and often very expensive—tool used by the industry in the United States to exploit the patented technology. The Commission has never adopted so strict a requirement for proving a domestic industry.

Purchasing foreign-manufactured lab supplies for use in labs in the United States is not the activity of a mere importer. *Cf.* Tr. at 320:22-321:8 (Vander Veen). Purchasing mask sets from outside the United States for use by research and development employees inside the United States is not the activity of a mere importer. *Cf. id*. at 321:9-19 (Vander Veen). A mere importer does not employ engineers in the United States to direct testing and analyze test results, even if some of that testing is performed outside the United States. 321:20-322:15 (Vander Veen). EPC's domestic research and development operations are plainly not those of a mere importer. It is therefore of little moment that some unknown portion of the capital that EPC expends on services and materials necessary for its domestic research ends up in foreign coffers. The capital investments of at least [redacted] identified by Dr. Vander Veen show that EPC has an industry in the United States.

5. Qualitative significance

EPC asserts that its investments in the employment of labor and capital for research and development are both quantitatively and qualitatively significant. CIB at 115-117. The majority

[redacted]

of EPC's research and development employees are in the United States, [redacted] total research and development employees. Tr. at 313:3-13 (Vander Veen). Furthermore, as Dr. Lidow explained, the "guts of the technology" research and development of EPC's products is performed by those domestic employees. EPC invests approximately [redacted] of its revenues into research and development. Tr. at 175:12-176:1 (Lidow). Dr. Vander Veen explained "when you have large investments in [research and development], that would reflect a belief in the value of the technology going forward." Tr. at 332:9-334:18 (Vander Veen). EPC designs all of the domestic industry products in the United States and the final quality control and testing are also performed in the United States. Tr. at 249:11-25; 252:5-14 (Lidow). Dr. Lidow characterized the El Segundo, CA office where this design work occurs as EPC's "brain" and "control center." Tr. at 259:23-260:18 (Lidow).

EPC has demonstrated the importance of EPC's domestic research and development activities to the patented technology. The record evidence showing the qualitative significance of EPC's investments is equally relevant to EPC'S labor investments and to EPC's capital investments. For the avoidance of any doubt, I specifically find the record evidence shows EPC's investment in research and development labor in the United States is qualitatively significant on its own. Separately and independently, I specifically find the record evidence shows EPC's capital investment directed to research and development in the United States is qualitatively significant on its own.

6. Quantitative significance

Dr. Vander Veen opined on the quantitative significance of EPC's investments in domestic labor to conduct research and development in the United States. Tr. at 328:8-329:20 (Vander Veen). As noted above, EPC's relevant domestic industry labor investment is at least [redacted]

[redacted]. Dr. Vander Veen testified that these labor investments are quantitatively significant because they represent [redacted] of EPC's total investments in research and development, and [redacted] of EPC's total operating expenditures. *Id.* I find Dr. Vander Veen's opinion to be unrebutted and credible. Accordingly, I find that EPC's investment of at least [redacted] in domestic labor is quantitatively significant.

In Section VII.B.4 above, I determined EPC's capital investment directed to research and development in the United States is at least [redacted], which is slightly larger than EPC's investment of [redacted] in domestic labor. Accordingly, the ratio of EPC's capital investments to EPC's total investments, both when compared to all research and development and to total operating expenses, is about the same as—if not slightly larger than—the labor percentage. Thus, for the same reasons noted in connection with the quantitative significance of EPC's labor investments, I independently find quantitively significant EPC's capital investment of at least [redacted] directed to research and development in the United States.

Dr. Vander Veen further opined that EPC's combined investments in capital and labor directed to its domestic research and development industry represent [redacted] of EPC's worldwide investments in research and development, and [redacted] of EPC's total operating expenditures worldwide. Tr. 314:5-315:15 (Vander Veen); CDX-0006C at slide 33 (summarizing data from CPX-0017C; CPX-0019C; CPX-0043C; CPX-0116C; CX-0051C; CX-0052C; CPX-0182C; CPX-0010C; CPX-0021C; and CX-0046C), slide 30 (showing calculations for General & Administrative investments). I find Dr. Vander Veen's opinion to be well supported by the record. Accordingly, I find that EPC's total investment of at least [redacted] in both domestic labor and capital is quantitatively significant.

7. Conclusion

I find the record evidence shows EPC has satisfied the economic prong of the domestic industry requirement in three independent ways, all based on research and development investments relating to the patented articles. First, EPC's domestic labor investment of at least [redacted] is quantitatively and qualitatively significant. Second, EPC's capital investment of at least [redacted] directed to research and development in the United States is quantitatively and qualitatively significant. Third, EPC's total investment of at least [redacted] in in both domestic labor and capital is quantitatively and qualitatively significant.

C. Technical Prong of the Domestic Industry Requirement

EPC adduced evidence and arguments that its domestic industry products practice claims 1-3 of the '294 patent and claim 1 of the '508 patent. CIB at 75. As discussed in Section VII.A, EPC analyzes one high-voltage product, EPC2215, and one low-voltage product, EPC2016C, as representative of all the domestic industry products. I have found that contention to be supported by the record. Accordingly, the findings below apply to all EPC domestic industry products.

1. The '294 Patent

a) Claim 1

[1pre]: "A column III Nitride transistor comprising:"

No party argues that the preamble of claim 1 is limiting. In any event, the parties do not dispute that the domestic industry products are column III Nitride transistors. The data sheets demonstrate the domestic industry products are column III Nitride transistors because the data sheets describe the products as "Enhancement Mode Power Transistor" containing "Gallium Nitride." Tr. at 460:17-461:19 (Schubert); CX-0005 at 1; CX-0006 at 1. Gallium (Ga) is a column

[redacted]

III element on the periodic table. I find the domestic industry products are column III Nitride transistors.

[1a]: "a substrate,"

[1b]: "a set of III-N transition layers above the substrate,"

EPC argues the domestic industry products contain a substrate and a set of III-N transition layers above the substrate. CIB at 77-78. Dr. Schubert opined that SIMS profiles of the domestic industry products show a silicon substrate and the varying patterns of transition layers, while the epitaxy recipes for those products confirm steps for forming the set of transition layers. Tr. at 465:17-467:8 (Schubert). Dr. Schubert's annotated versions of the SIMS profiles are shown below:



CDX-0002C at slide 27 (citing CPX-0113C at Chart_2619B1332); CDX-0002C at slide 26 (citing CX-0966C-0008; CPX-0004C, Cols. N-U (AlN, AlGaN)).

[redacted]



CDX-0002C at slide 29 (citing CPX-0112C at Chart_2621B1339); CDX-0002C at slide 28 (citing CX-0967C at 29; CPX-0006C at cols. N-U (AlN, AlGaN)).

Innoscience and Staff do not dispute that the domestic industry products meet these two limitations.

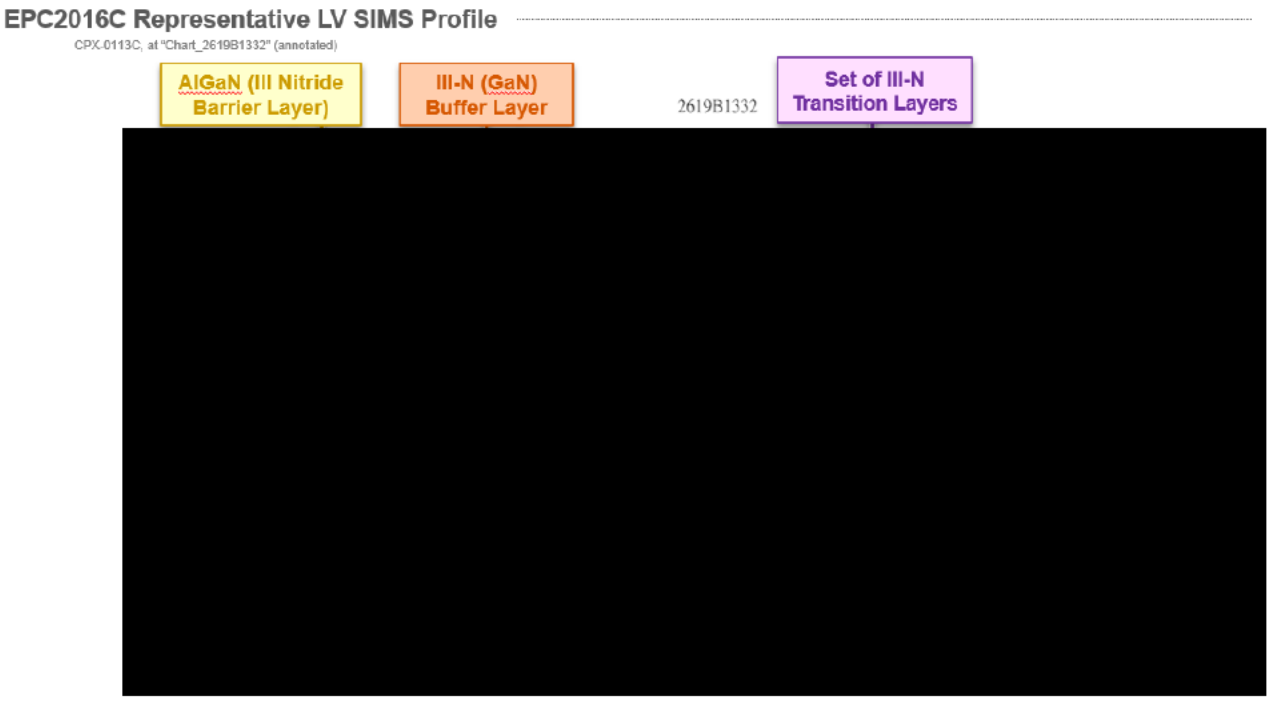
I find that the domestic industry products satisfy limitations [1a] and [1b].

[1c]: "a III-N buffer layer above the set of transition layers,"

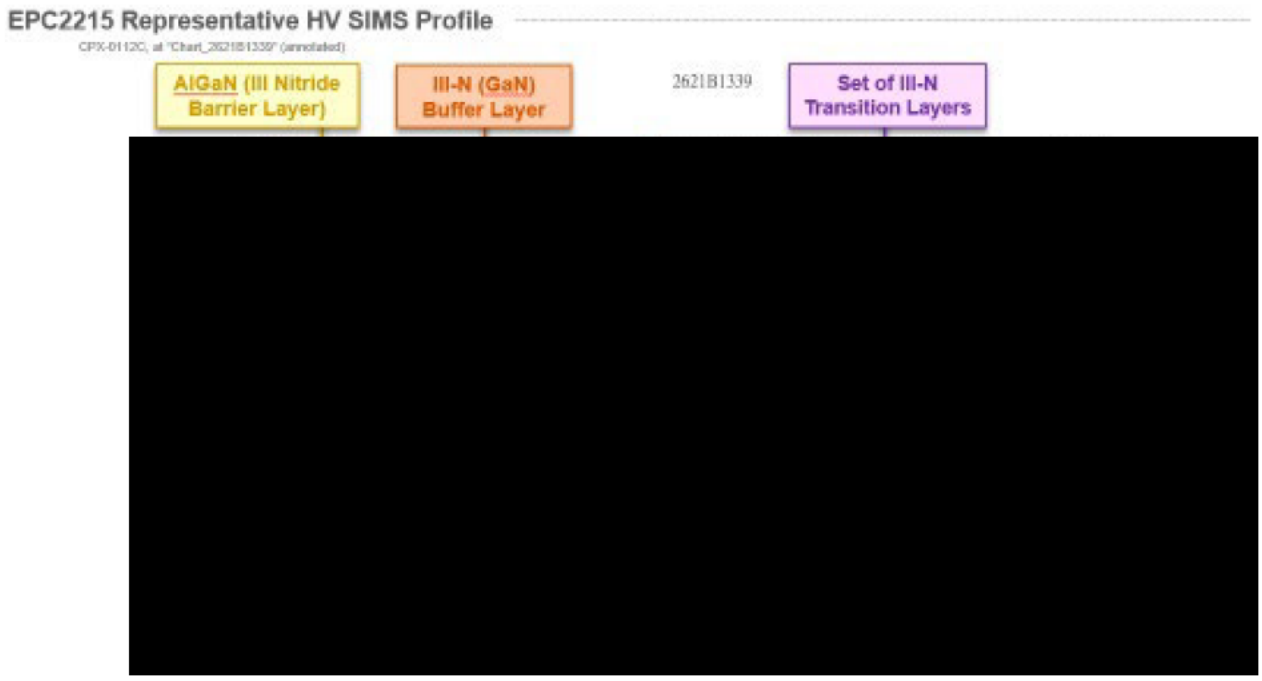
[1d]: "a III-N barrier layer above the buffer layer,"

Dr. Schubert opined that the domestic industry products have a III-N buffer layer formed of GaN above the set of transition layers, and an III-N barrier layer formed of AlGaN above the buffer layer. CIB at 78-79; Tr. at 465:17-467:8 (Schubert). Dr. Schubert illustrated this in further annotations to the SIMS profiles.

[redacted]



CDX-0002C at slide 35 (citing CPX-0113C at Chart_2619B1332); CDX-0002C at slide 34 (citing CX-0966C at 9, 21; CPX-0004C at cols. AA ([redacted]), AE ([redacted]), AH (AlGaN-Barrier)).



CDX-0002C at slide 37 (citing CPX-0112C at Chart_2621B1339); CDX-0002C at slide 36 (citing CX-0967C at 29; CPX-0006C at cols. X ([redacted]), AB (GaN-22), AE (AlGaN-Barrier)).

[redacted]

Innoscience and Staff do not dispute that the domestic industry products meet these two limitations.

I find that the domestic industry products satisfy limitations [1c] and [1d].

[1e]: "a compensated GaN layer above the barrier layer, and"

EPC argues that the domestic industry products have a compensated GaN layer above the barrier layer. CIB at 80-90. Staff concurs. SIB at 23-25. Innoscience concedes that EPC's products have a pGaN layer, but Innoscience contends that EPC's pGaN layer is actually conductive, so it is not compensated. RRB at 57-64. I review the arguments and evidence adduced by the parties below.

EPC relies on the same type of five-factor analysis that Dr. Schubert performed when evaluating the Innoscience Accused Products for infringement of the '294 patent, introduced above in Section V.A.1.[1e]. Tr. at 473:8-23 (Schubert); CDX-0002C at slide 40. Dr. Schubert opined that all five factors are in favor of finding that the domestic industry products have a compensated GaN.

First, relying on EPC's epitaxy recipes, Dr. Schubert noted EPC grows a magnesium-doped pGaN layer in a [redacted] environment, which passivates the magnesium to create the claimed compensated GaN layer. Tr. at 476:9-477:14 (Schubert); CDX-0002C at slides 44 and 45 (citing CPX-0004C, Cols. AH, AN and CPX-0006C, Cols. AE, AK); *see also* Tr. at 386:17-387:18 (Beach) (explaining the hydrogen passivation process in [redacted]).

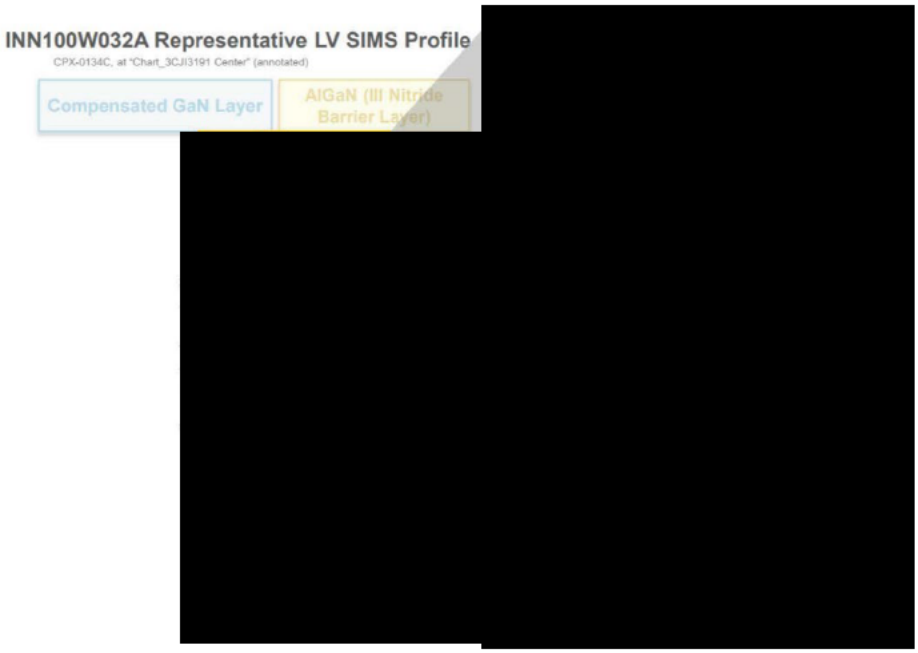
Second, EPC observes [redacted] Such a step would reduce the hydrogen passivation of the layer and would be an indication that the GaN layer is not compensated. CIB at 82-83. Dr. Schubert explained that the epitaxy recipes demonstrate that products are cooled in a [redacted] environment of [redacted]

[redacted] and/or [redacted] during the various [redacted] phases. Tr. at 478:23-479:10 (Schubert); CDX-0002C at slide 48 (citing CPX-0004C, Cols. AR-AT (Steps 43-45)). Dr. Schubert further explained that the subsequent [redacted]. Tr. at 478:24-479:17 (Schubert). Dr. Beach's testimony about the [redacted] is consistent with Dr. Schubert's opinions. Tr. at 386:17-387:18 (Beach) ("[redacted].").

Third, EPC notes that there is [redacted] CIB at 83-85. EPC deposits a protective oxide on the devices and then performs a [redacted]. CPX-0003C (EPC2016C traveler), Row 63 ([redacted]), Row 104 ([redacted]); CPX-0005C (EPC2215 traveler), No. 45 ([redacted], No. 127 ([redacted]). Dr. Schubert explained that the [redacted] First, the [redacted] covering the wafer has "[redacted]" and the pGaN is covered by [redacted]." Tr. At 483:24-484:6, 494:21-22 (Schubert); CDX-0002C at slide 53 (citing CX-0966 at 15; CX-0967C at 29). Second, Dr. Schubert further opined that the [redacted]." Tr. at 482:21-483:4 (Schubert).

Fourth, EPC argues that the SIMS profiles for the domestic industry products show a strong correlation between magnesium and hydrogen, which is one of the factors Dr. Schubert opined supports a finding of compensated GaN formation. CIB at 85-88; Tr. at 484:22-491:16 (Schubert). SIMS profiles of the domestic industry products show a correlation between the hydrogen and magnesium concentration as Dr. Schubert's annotated images show:

[redacted]





CDX-0002C at slides 56 and 64; CPX-0113C at Chart_2619B1332; CPX-0112C at Chart_2621B1339. Dr. Schubert opined that strong correlation of the magnesium and hydrogen "shows that the hydrogen is passivating the magnesium." Tr. at 486:7-19 (Schubert). Dr. Schubert explained that a similar correlation appears in SIMS profiles of test wafers (ICX3) that underwent the same epitaxial and fabrication processes used in the domestic industry products. Tr. at 490:18-491:16; JX-0024C at 194:13-22 (Lidow Dep. Tr.); JX-0018C at 133:21-134:9 (Beach Dep. Tr.);

[redacted]

CIB at 87. According to EPC, the ICX3 test wafers show the [redacted] EPC uses had no impact on the hydrogen because the pre- and post-processing SIMS profiles had similar characteristics. CIB at 88; Tr. 490:20-491:16 (Schubert).

Fifth, EPC adduces evidence that the domestic industry products have the electrical characteristics of an enhancement-mode transistor with a compensated GaN layer that reduces leakage current. CIB at 88-90. Dr. Schubert explained testing data showing that, in the domestic industry products, the gate does not begin to conduct current at until about 5 V and there is no significant gate leakage current until the domestic industry products are driven to the 5 V threshold. Tr. 493:20-494:6 (Schubert); CDX-0002 at slide 70.

On the other side, Innoscience argues that EPC's post-growth cooldown process occurs in a [redacted], and EPC's expert Dr. Doolittle testified that cooling in a [redacted] is "a very common practice when you're trying to drive hydrogen out." RRB at 54-57 (quoting Tr. at 1132:12-18 (Doolittle)). Innoscience also points to [redacted] in the EPC process, which Innoscience contends would drive out hydrogen and would be inconsistent with the formation of a compensated GaN layer. *See* RRB at 58-59. Innoscience further contends that the EPC SIMS profiles of the EPC devices do not show correlation between magnesium amounts and hydrogen amounts as would be expected in a compensated GaN layer. RRB at 60-62. Finally, Innoscience argues that the electrical characteristics of the gates in the domestic industry products do not conclusively establish that a compensated GaN layer is formed as required by limitation [1e]. *See id*. at 63-63.

I find that the weight of the record evidence as a whole shows that the EPC domestic industry products have a compensated GaN layer. Dr. Schubert's opinion on this point does not rely on any one single piece of evidence. *See* Tr. at 476:9-477:15 (Schubert); CIB at 80-82.

[redacted]

Instead, his opinion is based on review of the EPC fabrication recipes and process steps used to make the domestic industry products, measurements and test results from analysis of the domestic industry products, and his conversations with knowledgeable EPC employees who are involved in designing and manufacturing those products. *See id*. That constellation of evidence corroborates his opinions.

I find Innoscience has failed to adduce credible evidence that rebuts Dr. Schubert's opinion. Innoscience does not dispute that EPC forms a GaN layer above a buffer layer; it only disputes whether that layer is compensated. As to Innoscience's claim that EPC [redacted] that Innoscience focuses on. *See* Tr. at 478:22-479:17 (Schubert). Dr. Schubert credibly testified that processes to control activation and passivation occur at the temperatures of the [redacted]. *See* Tr. at 476:9-477:15 (Schubert). When Innoscience's counsel tried to get Dr. Schubert to admit on cross-examination that [redacted], Dr. Schubert attempted to direct counsel to the earlier, relevant [redacted], but Innoscience's counsel did not allow the explanation. *See id.* at 672:17-673:20. The exchange tends to indicate that evidence of [redacted] undermines Innoscience's position.

Additionally, Innoscience cites no evidence that its expert Dr. Doolittle consulted with persons actually involved in the EPC process when formulating his opinion about the relevant cooling step. *See generally* RRB at 54-57; Tr. at 1129:18-1133:2 (Doolittle). In contrast, Dr. Schubert's opinion about a [redacted] is corroborated by a percipient witness, Dr.

[redacted]

Beach, who is actually involved in the design and manufacture of EPC's products. *See* Tr. at 386:17-387:18 (Beach) ("In our process flow, [redacted].").

As for Innoscience's annealing argument, Innoscience does not address evidence that the [redacted] from the pGaN because (1) the wafer is [redacted] and the pGaN is covered by [redacted]; and (2) the annealing is not performed for a long enough period of time to [redacted]. *See* CIB at 84 (citing Tr. at 4482:21-483:4, 483:24-484:6, 494:21-22 (Schubert).

With respect to SIMS profiles and electrical characteristics of the domestic industry products, even if that evidence does not conclusively establish the presence of a compensated GaN layer, the evidence is consistent with the weight of the record evidence as a whole and supports Dr. Schubert's analysis. *See* CIB at 85-88; Tr. (Schubert) 489:10-491:16; CPX-0112C.

In sum, the evidence shows that in the domestic industry products magnesium acceptors are passivated by hydrogen during the [redacted] and form a doped GaN layer. I find that the EPC domestic industry products satisfy limitation 1[e].

[1f]: "a gate contact above the compensated GaN layer."

EPC argues that the domestic industry products include a gate contact above the compensated GaN layer. CIB at 90. Dr. Schubert opined that there is a TiN gate contact above the compensated GaN layer, relying on TEM images and the processing step "[redacted]," which Dr. Schubert is a [redacted]. Tr. at 530:14-531:21 (Schubert); CDX-0002C at slide 73 (citing CX-0966C at 9; CX-0967C at 29, 35; CPX-0003C, Row 5; CPX-00005C, No. 4).

[redacted]

Innoscience and Staff do not dispute that the domestic industry products meet this limitation.

I find that the domestic industry products satisfy limitation [1f].

Conclusion

I find EPC has shown that the domestic industry products practice every limitation of claim 1 of the '294 patent. Accordingly, for at least this reason, EPC has satisfied the technical prong of the domestic industry requirement with respect to the '294 patent by showing the EPC domestic industry products are articles protected by that patent. *See Broadcom Corp. v. Int'l Trade Comm'n*, 28 F.4th 240, 250 (Fed. Cir. 2022) ("[A] complainant must 'show that there is a domestic industry product that actually practices' at least one claim of the asserted patent." (quoting *Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d 1354, 1361 (Fed. Cir. 2013)).

b) Claim 2 "The transistor of claim 1, wherein the compensated GaN layer contains acceptor type dopant atoms passivated with hydrogen."

For claim 2, EPC relies on the same evidence cited above in connection with limitation [1e], which requires a compensated GaN layer. CIB at 91. Dr. Schubert opined that the domestic industry products meet this claim because he "showed that the compensated gallium nitride layer, indeed, contains acceptors, magnesium and also I showed that the dopant atoms are passivated with hydrogen. I showed the presence of hydrogen in SIMS profiles." Tr. at 532:4-22 (Schubert).

Staff agrees that EPC's domestic industry products satisfy claim 2. SIB at 26.

Innoscience does not separately address the additional limitations of claim 2.

Based on the evidence analyzed above in connection with limitation [1e], I find the record shows the domestic industry products practice claim 2. Accordingly, for at least this reason, EPC has satisfied the technical prong of the domestic industry requirement with respect to the '294

[redacted]

patent by showing the EPC domestic industry products are articles protected by that patent. *See Broadcom*, 28 F.4th at 250.

c) Claim 3 "The transistor of claim 2, where the acceptor type atoms are selected from the group consisting of Mg, Zn, Be and Ca."

Claim 3 adds the additional requirement of a receptor selected from among a group of elements that includes magnesium. Again, EPC relies on the same evidence cited above in connection with limitation [1e]. CIB at 91. For similar reasons discussed above in connection with limitation [1e] and claim 2, I find the domestic industry products practice claim 3 because the domestic industry products incorporate magnesium acceptor atoms in a compensated GaN layer. *See* Tr. at 533:1-533:19 (Schubert).

Staff agrees that EPC's domestic industry products satisfy this limitation. SIB at 26.

Innoscience does not separately address the additional limitations of claim 3.

Based on the evidence analyzed above in connection with limitation [1e] and claim 2, I find the record shows the domestic industry products practice claim 3. Accordingly, for at least this reason, EPC has satisfied the technical prong of the domestic industry requirement with respect to the '294 patent by showing the EPC domestic industry products are articles protected by that patent. *See Broadcom*, 28 F.4th at 250.

2. The '508 Patent

EPC asserts a domestic industry in articles protect by claim 1 of the '508 patent, which is a method claim. CIB at 97-98. Innoscience and Staff argue the domestic industry products are made by a process that does not practice limitation [1e], which requires "depositing a gate contact

layer on the doped GaN layer." RRB at 97-100;[16] SIB at 43-45. Neither Innoscience nor Staff challenge EPC's evidence that the domestic industry products are made by a process that meets all other limitations of claim 1.

As discussed in more detail below, I find that the EPC manufacturing process for the domestic industry products does not deposit a gate contact layer "on" a doped GaN layer. For completeness, I also briefly review the evidence that EPC practices the undisputed limitations.

[1pre]: "A method of forming an enhancement mode GaN transistor, the method comprising:"

No party argues that the preamble of claim 1 is limiting. In any event, the parties do not dispute that when EPC manufactures the domestic industry products, it undertakes steps that form "an enhancement mode GaN transistor." Dr. Schubert opined that the datasheets demonstrate the domestic industry products are enhancement mode GaN transistors. Tr. at 552:17-553:17 (Schubert); CDX-0002C at slide 96; CX-0005 at 1; CX-0006 at 1. I find the domestic industry products are made using a method for forming an enhancement-mode GaN transistor.

[1a]: "nucleating and growing transition layers on a substrate;"

[1b]: "growing an III Nitride EPI layer over the transistor layers;"

[1c]: "growing an III Nitride barrier layer over the EPI layer;"

[1d]: "growing a GaN layer with acceptor type dopants over the barrier layer;"

Dr. Schubert opined that SIMS profiles and epitaxial growth recipes for the EPC domestic industry products show the steps in limitations [1a]-[1d]. CIB at 100-102; Tr. at 557:3-559:11

[16] Innoscience's representativeness arguments, RRB at 100-01, are addressed above in Section VII.A.

[redacted]

(Schubert). Dr. Schubert explains that the epitaxial growth recipes form a set of transition layers, a GaN layer, an AlGaN barrier layer, and a magnesium-doped GaN layer, as required by these claim limitations. CDX-0002C at slide 103 (citing CPX-0004C, Cols. N-U, X (transition layers), AA, AE (GaN EPI layer), AH (AlGaN barrier layer), AN (Mg-doped GaN layer)); CDX-0002C at slide 105 (citing CPX-0006C, Cols. N-U (transition layers), X, AB (GaN EPI layer), AE (AlGaN barrier layer), AN (Mg-doped GaN layer)). The SIMS profiles for the devices support Dr. Schubert's opinion as his annotations show:



CDX-0002C at slide 102 (citing CPX-0113C at Chart_2619B1332).

[redacted]



CDX-0002C at slide 104 (citing CPX-0112C at Chart_2621B1339). EPC has demonstrated the methods used to produce the domestic industry products practice limitations [1a]-[1d].

[1e]: "depositing a gate contact layer on the doped GaN layer;"

EPC contends that its process for making the domestic industry products forms a gate contact on the doped GaN layer. *See* CIB at 102-103. Innoscience and Staff disagree. RRB at 97-100; SIB at 43-44. This limitation is determinative of EPC's technical prong showing for the '508 patent.

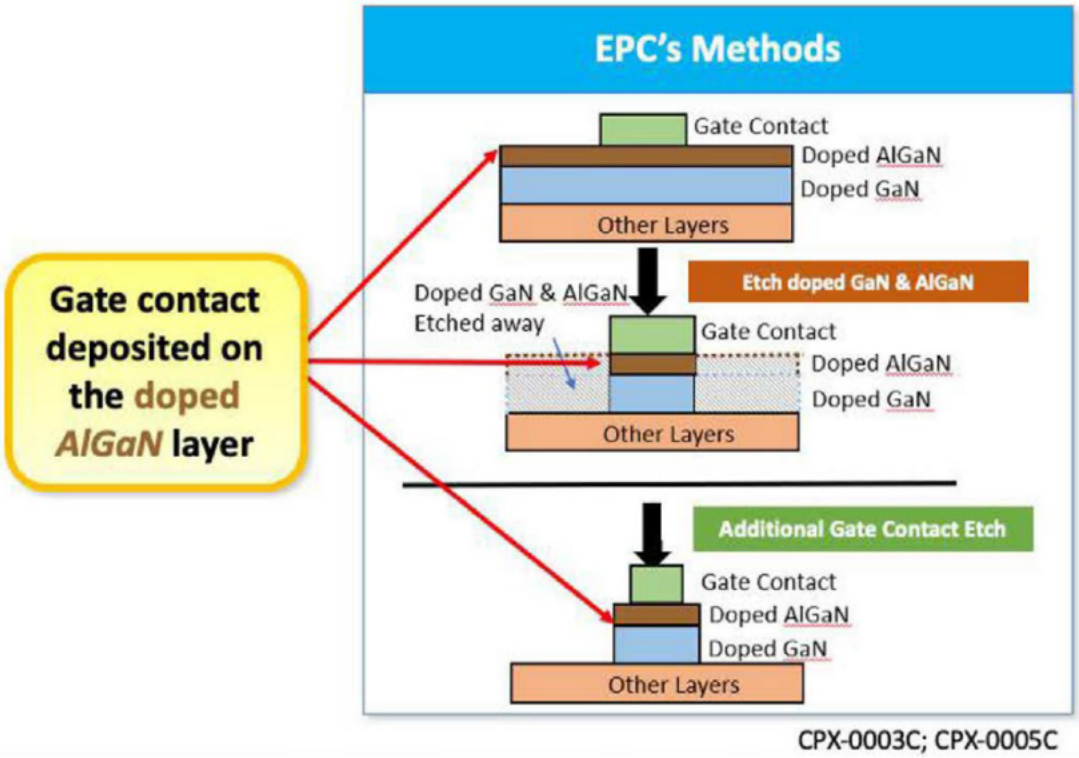
Despite the fact that no party identified this claim term as requiring construction at the claim construction phase of the investigation, the private parties seem to suggest that resolution of this issue requires construction of the word "on," while Staff appears to address the question as a purely factual issue. *Compare* CIB at 98 and RRB at 79-85 *with* SIB at 43-44.

EPC argues that the term "on" is not restricted to "directly on," while Innoscience contends the proper construction of "on" requires direct contact between layers. CIB at 98; RRB 84. I find EPC's position fails to take into account important context in the language of limitation [1e], namely, the requirement of "*depositing* a . . . layer on [a] layer." *See Phillips*, 415 F.3d at 1314

[redacted]

(the context in which a term is used in an asserted claim can be "highly instructive"). Even if there is some other context where "on" does not require "direct contact," EPC never contends that an ordinary artisan would understand that the step of "depositing" a layer on an existing layer can be accomplished without direct contact between the two layers. Thus, the dispute between the parties can be resolved simply by giving the plain meaning to every word in element [1e]. No further elaboration about the meaning of the phrase is required. *See Vivid Techs., Inc. v. Am. Science & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (claim construction is only required "to the extent necessary to resolve the controversy"); *Brown v. 3M*, 265 F.3d 1349, 1352 (Fed. Cir. 2001) (non-technical terms do not require elaborate interpretation).

There is no dispute that EPC's domestic industry products have a doped AlGaN layer between the gate contact and doped GaN layer, as Innoscience's expert Dr. Doolittle illustrated below:



CPX-0003C; CPX-0005C

RRB at 97-100 (reproducing RDX-0012C at slide 205); CIB at 102-03; SIB at 43-44.

EPC's epitaxial growth recipes for the EPC2016C and EPC2215 products confirm that the gate contact layer is deposited on a doped AlGaN layer, not a doped GaN layer, because at the time the gate contact layer is deposited, the topmost layer in the epitaxial structure is pAlGaN. Tr. (Doolittle) 1199:17-1200:2; CPX-0076C; CPX-0004C. EPC's employee Dr. Beach also confirmed at trial that the gate metal is directly deposited onto the pAlGaN layer in EPC's products. Tr. (Beach) 362:17-20.

I find that the gate contact layer in EPC's process is deposited on a doped AlGaN layer, not the doped GaN layer that EPC identifies in satisfaction of claim [1d]. Accordingly, I find EPC has not shown its products are produced by a process that comprises "depositing a gate contact layer on the doped GaN layer." The consequence of this finding is that EPC has not shown satisfaction of the technical prong of the domestic industry requirement for the '508 patent.

[1f]: "applying a gate photo resistant pattern;"

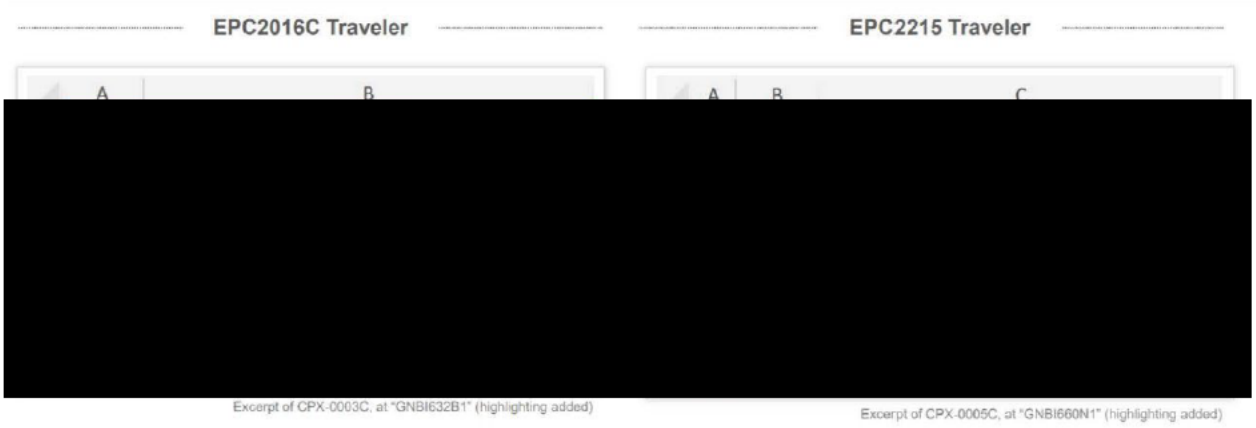
[1g]: "etching away the gate contact layer outside the gate region;"

[1h]: "etching away the doped GaN layer, except a portion of the doped GaN layer beneath the gate contact;"

[1i]: "removing the gate photo resistant pattern;"

Dr. Schubert explained that the EPC traveler documents describe how limitations [1f]-[1i] are met by the domestic industry products. CIB at 103-06. Consistent with limitation [1f], the EPC traveler documents show steps to apply a gate photo resistant pattern, shown as "[redacted]." Tr. at 567:5-21 (Schubert).

[redacted]

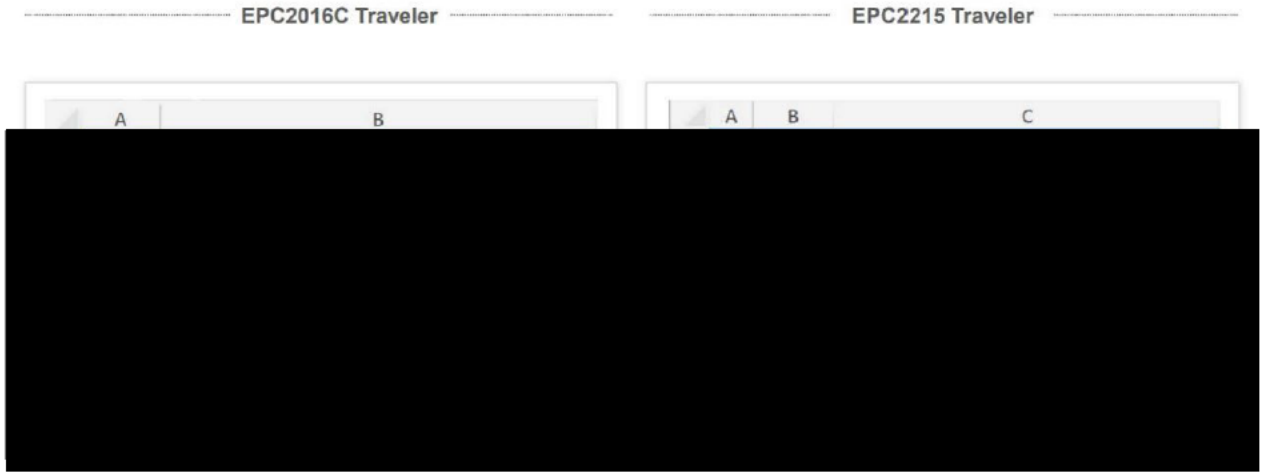


CDX-0002C at slide 114 (citing CPX-0003C, Rows 24-27; CPX-0005C, Rows 19-22). Continuing with the process documented in the traveler documents, Dr. Schubert described "[o]ne step of these traveler documents is [redacted]. So this refers to an etching process in which the [redacted] is etched away outside the gate region." Tr. at 569:14-570:5 (Schubert).



CDX-0002C at slide 119 (citing CPX-0003C, Row 34; CPX-0005C, No. 29; CX-0966C-0015; CX-0967C-0029). Dr. Schubert further opined that the process meets limitation [1i] "removing the gate photo resistant pattern" as described in the step labelled "[redacted] Tr. at 574:21-575:11(Schubert).

[redacted]



CDX-0002C at slide 127 (citing CPX-0003C, Row 45; CPX-0005C, No. 33). Dr. Schubert opined that the transmission electron microscopy images of the devices was consistent with the process described in the traveler documents. Tr. at 569:11-22 (Schubert); CDX-0002C at slide 119; CX-0966C at 15; CX0967C at 29.

I find EPC has demonstrated the methods used to produce the domestic industry products meet limitations [1f]-[1i] of the '508 patent.

[1j]: "depositing a dielectric layer;"

Dr. Schubert explained that the traveler documents show depositing a dielectric layer through "[redacted]" in the form of [redacted], a dielectric material. Tr. at 577:7-18 (Schubert).



[redacted]

CDX-0002C at slide 131 (citing CPX-0003C, Row 63; CPX-0005C at "GNBI660N1," No. 45). I find EPC has demonstrated the methods used to produce the domestic industry products meet limitation [1j].

[1k]: "applying a contact photo resistant pattern;"

[1l]: "etching the dielectric layer to open the drain and source contact area;"

[1m]: "removing the contact photo resistant pattern;"

EPC argues the record shows the domestic industry products include [1k] applying contact photo resistant pattern; [1l] etching the dielectric layer to open the drain and source contact area; and [1m] removing the contact photo resistant pattern. CIB at 106-07. Dr. Schubert described the steps meeting each limitation in the EPC traveler documents:

> Additional evidence is found from travelers, and the low voltage device is on the left. We see three steps, 70 to 72, [redacted]. Then we see step 78, etching the [redacted] dielectric layer. In step 80, [redacted], that is the removal of the photoresist, and we find the same steps or similar steps on the right-hand side for the EPC high voltage device.

Tr. at 580:12-581:9 (Schubert). These steps are shown below as annotated by Dr. Schubert:

EPC2016C Traveler

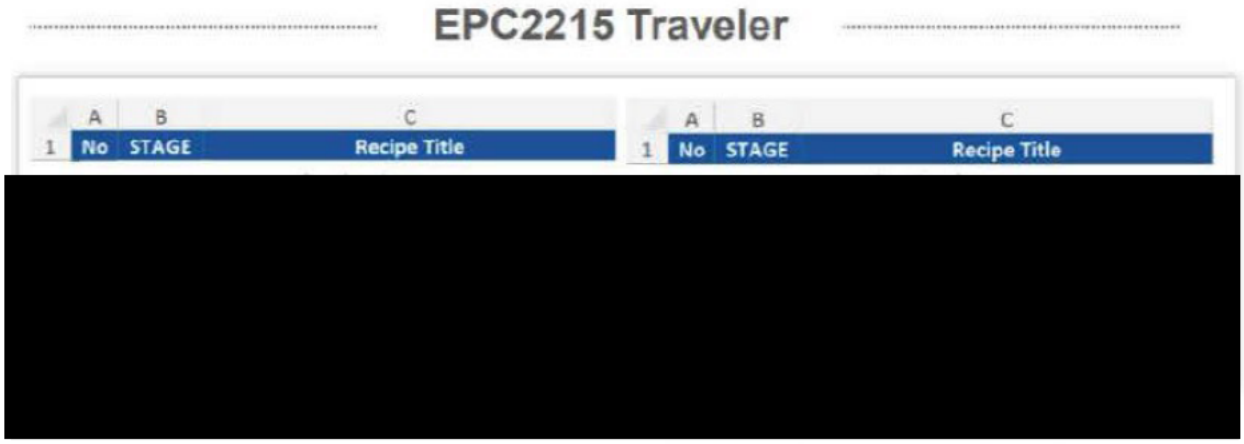
	A	B
1	STAGE	Recipe Title

	A	B
1	STAGE	Recipe Title

[redacted]

[redacted]

CDX-0002C at slide 135 (citing CPX-0003C, Rows 70-72 (applying the photoresist), 78 (etching the dielectric layer), 80 (removing the photoresist)).



CDX-0002C.135 (CPX-0005C, Nos. 98-100, 104, 106). Dr. Schubert opined that the transmission electron microscopy images were consistent with his analysis of the traveler documents. Tr. at 580:12-17 (Schubert); CX-0966C at 6; CX-0966C at 15.

I find EPC has demonstrated the methods used to produce the domestic industry products meet limitations [1k]-[1m] of the '508 patent.

[1n]: "depositing an Ohmic contact metal;"

[1o]: "applying a metal photo resistant pattern;"

[1p]: "etching the Ohmic contact metal;"

[1q]: "removing the metal photo resistant pattern; and"

EPC argues the domestic industry products satisfy limitations [1n]-[1q]. CIB at 108-09. Dr. Schubert explained how the EPC traveler documents show these steps:

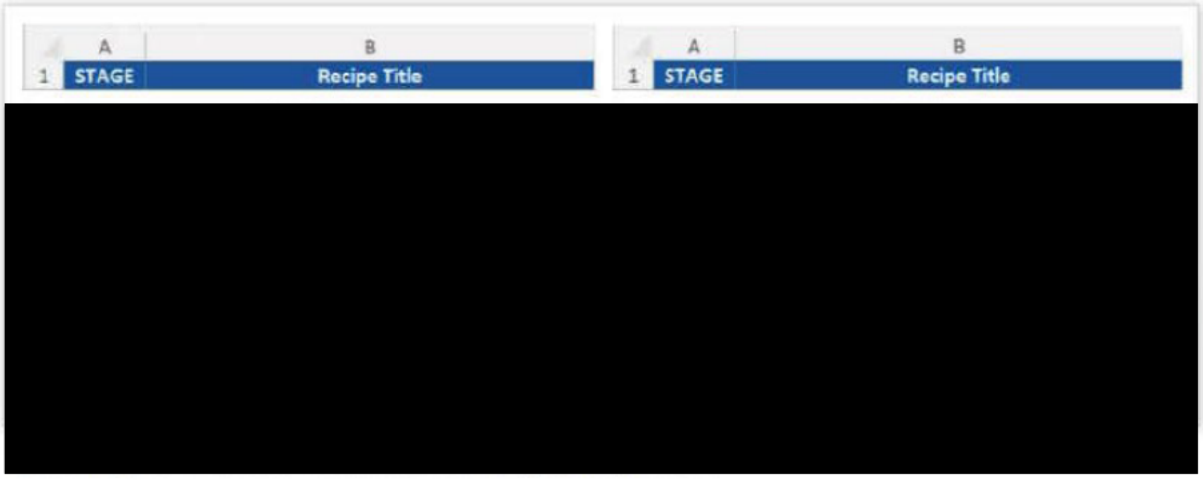
> Additional evidence is found from travelers. EPC low voltage travelers on the left-hand side, high voltage travelers on the right-hand side. If we look at the left-hand side, we can see step 86, which is [redacted] of [redacted]. Then steps 89 to 92 relates to the application of a photo-resistant pattern. Step 98 relates to the etching of the contact metal, and step 100 relates to the removal of the photoresist by stripping, and we find

[redacted]

corresponding steps on the right-hand side that are consistent with the claim steps.

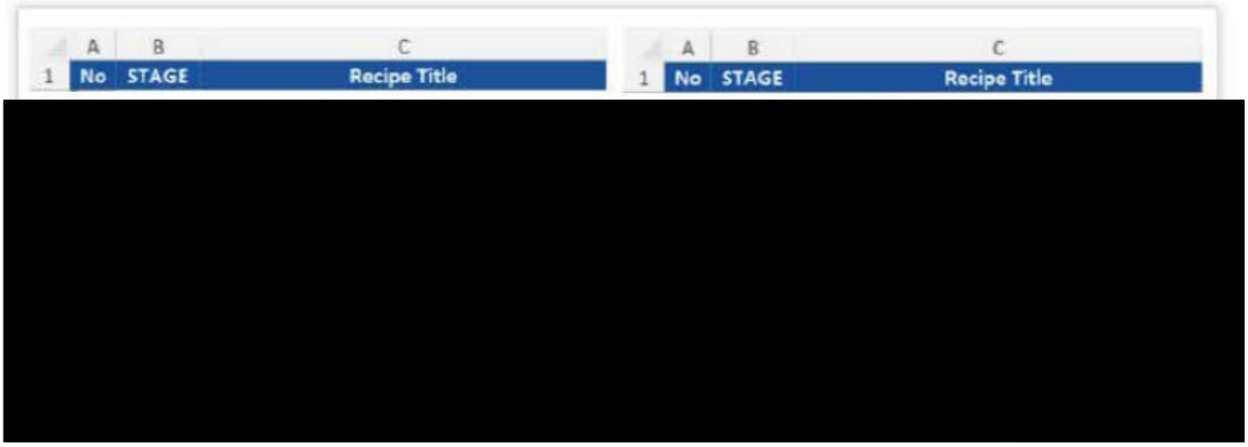
Tr. at 584:1-10 (Schubert).

EPC2016C Traveler



CDX-0002C at slide 139 (citing CPX-0003C, Rows 86 (depositing Ohmic contact metal), 89-92 (applying metal photo resistant pattern), 98 (etching Ohmic contact metal), 100 (removing metal photo resistant pattern).

EPC2215 Traveler



CDX-0002C at slide 139 (citing CPX-0005C, Rows 112, 89-92, 114-17, 122, 124).

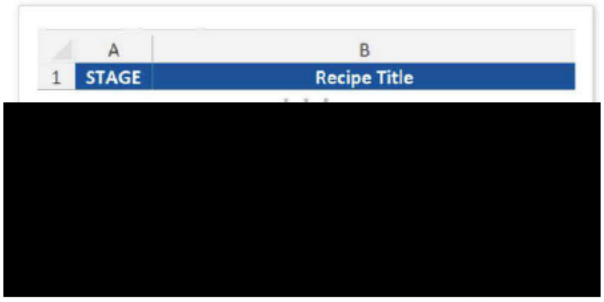
[redacted]

I find EPC has demonstrated the methods to produce the domestic industry products meet limitations [1n]-[1q] of the '508 patent.

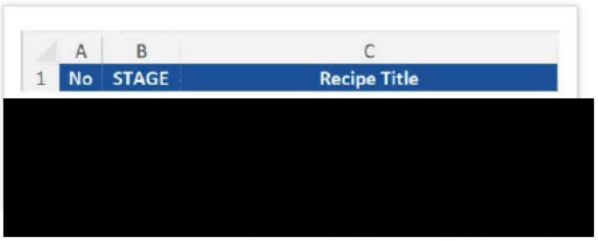
[1r]: "performing rapid thermal annealing to form Ohmic drain and source contacts."

Dr. Schubert opined that the EPC traveler documents "disclose an RTA process, the claimed rapid thermal annealing process. Tr. at 586:7-19 (Schubert).

EPC2016C Traveler



EPC2215 Traveler



CDX-0002C at slide 143 (citing CPX-0003C, Row 104 ("DF RTA"); CPX-0005C, No. 127 (same)). I find EPC has demonstrated the method to produce the domestic industry products meets limitation [1r] of the '508 patent.

Conclusion

I find EPC has not shown that the domestic industry products are made by a method that practices every limitation of claim 1 of the '508 patent because EPC's method lacks step [1e], "depositing a gate contact layer on the doped GaN layer." Accordingly, EPC has not shown satisfaction of the technical prong of the domestic industry requirement with respect to the '508 patent.

VIII. FINDINGS OF FACT AND CONCLUSIONS OF LAW

1. The Commission has personal jurisdiction over all parties and *in rem* jurisdiction over the accused products in this investigation.

[redacted]

2. EPC has standing to assert the '294 and'508 patents.

3. The importation requirement of section 337 is satisfied for the Accused Products.

4. The Accused Products infringe claims 1, 2, and 3 of the '294 patent.

5. The Accused Products do not infringe claim 1 of the '508 patent.

6. Claim 1 of the '294 patent has been shown invalid as anticipated in view of the prior art under 35 U.S.C. § 102.

7. Claims 2 and 3 of the '294 patent have not been shown invalid as anticipated in view of the prior art under 35 U.S.C. § 102.

8. Claims 2 and 3 of the '294 patent have not been shown invalid as obvious in view of the prior art under 35 U.S.C. § 103.

9. Claim 1 of the '508 patent has not been shown invalid as obvious in view of the prior art under 35 U.S.C. § 103.

10. The technical prong of the domestic industry requirement has been satisfied with respect to the '294 patent.

11. The technical prong of the domestic industry requirement has not been shown to be satisfied with respect to the '508 patent.

12. The economic prong of the domestic industry requirement has been satisfied with respect to the '294 and'508 patents.

13. A violation of 19 U.S.C. § 1337 has been shown by the importation and sale of articles that infringe claim 2 and 3 of the '294 patent.

IX. INITIAL DETERMINATION

For the reasons set forth above, it is my initial determination that a violation of section 337 of the Tariff Act of 1930, as amended, has occurred in the importation into the United States and

[redacted]

the sale within the United States after importation of certain semiconductor devices and methods of manufacturing same and products containing the same that infringe claims 2 and 3 of U.S. Patent No. 8,350,294.

I hereby certify to the Commission this initial determination and the Recommended Determination.

The Secretary shall serve the confidential version of this initial determination upon counsel who are signatories to the Protective Order (Order No. 1) issued in this investigation. A public version will be served at a later date upon all parties of record.

Pursuant to 19 C.F.R. § 210.42(h), this initial determination shall become the determination of the Commission unless the Commission has ordered review of the determination in response to a petition filed under 19 C.F.R. § 210.43(a) or the Commission reviews the determination on its own initiative pursuant to 19 C.F.R. § 210.44.

X. RECOMMENDED DETERMINATION ON REMEDY & BOND

I must issue a recommended determination concerning the appropriate remedy in the event that the Commission finds a violation of section 337, and I must recommend the amount of bond to be posted by the Respondents during Presidential review of the Commission action. *See* 19 C.F.R. § 210.42(a)(1)(ii).

A. Limited Exclusion Order

The Commission has broad discretion in selecting the form, scope, and extent of the remedy in a section 337 proceeding. *Viscofan, S.A. v. U.S. Int'l Trade Comm'n*, 787 F.2d 544, 548 (Fed. Cir. 1986). A limited exclusion order directed to a respondent's infringing products is among the remedies that the Commission may impose. *See* 19 U.S.C. § 1337(d).

[redacted]

The parties agree that a limited exclusion order is appropriate if the Commission finds a violation of section 337. CIB at 122; RRB at 104; SRB at 14-15. However, Innoscience argues the any limited exclusion order should be tailored by: (1) limiting it to specific product models found in violation in this investigation, and (2) delaying it "for sufficient time to allow Innoscience to design and implement alternatives to avoid harming U.S. consumers and the U.S. economy." RRB at 104.

With regard to Innoscience's first suggestion, the Commission's standard limited exclusion order prohibits entry of any articles presented by a respondent that would infringe a patent claim identified in the order, not merely products "that were actually adjudicated to infringe the [asserted] patent." *Certain Unmanned Aerial Vehicles and Components Thereof*, Inv. No. 337-TA-1133, Comm'n Op. at 26-27. Nothing in this record supports a deviation from that practice. For example, Innoscience cites no evidence that any particular product exists that would make the limitation relevant.

Innoscience's second proposal, to delay the effect of any limited exclusion order, is similarly unsupported. Innoscience fails to cite any evidence of particular harm to U.S. consumers or to the U.S. economy should a limited exclusion order be immediately entered. Additionally, Innoscience has provided no evidence about the time required to redesign any infringing products. Also relevant, Innoscience has not explained why the time that has elapsed since it was put on notice of EPC's infringement claims has not been sufficient to prepare mitigating measures if an exclusion order enters.

If the Commission determines that a violation of section 337 has occurred, I recommend that the Commission follow its general practice of issuing limited exclusion orders barring entry of products that infringe the Asserted Patents.

[redacted]

B. Cease and Desist Order

Under section 337(f)(1), the Commission may issue a cease and desist order in addition to, or instead of, an exclusion order. *See* 19 U.S.C. § 1337(f)(1). The Commission generally issues a cease and desist order directed to a respondent only when there is a "commercially significant" amount of infringing, imported product in the United States that could be sold, thereby undercutting the remedy provided by an exclusion order. *See Certain Magnetic Data Storage and Tapes and Cartridges Containing the Same (II)*, Inv. No. 337-TA-1076, Initial Determination at 176 (Oct. 25, 2018). Additionally, at least one Commissioner is of the opinion that the "presence of some infringing domestic inventory, regardless of the commercial significance, provides a basis to issue a cease and desist order." *Certain L-Tryptophan, L-Tryptophan Prods., and Their Methods of Prod.*, Inv. No. 337-TA-1005, Comm'n Op. at 52 n.49 (Jan. 11, 2018).

EPC requests cease and desist orders because Innoscience allegedly has "significant domestic operations and commercially significant inventory that could undercut the remedy provided by an exclusion order." CIB at 123-24. Staff supports EPC's request. SIB at 59; SRB at 16-17. Innoscience argues that EPC failed to show Innoscience maintains commercially significant levels of inventory in the United States and the Commission "has only applied a 'significant domestic operations' analysis when a respondent has refused to participate in an Investigation, thus preventing discovery into inventory." RRB at 105-06.

Although Innoscience argues that its inventory in the United States is not commercially significant because it has a value of less than [redacted], RRB at 105, I nevertheless find that a cease and desist order is appropriate. The evidence shows Innoscience has a commercial inventory of [redacted] in the United States as of August 3, 2023. CPX-0121C; JX-0036C at 83:14-84:5, 84:14-15 (Sun Dep. Tr.). Innoscience also an office in

[redacted]

Santa Clara, California, and [redacted] domestic employees to support its commercial operations in the United States. JX-0036C at 50:7-22, 51:1-22; 55:14-56:1 (Sun Dep. Tr.). If Innoscience's domestic operations are allowed to continue to offer and trade in its domestic inventory of [redacted] of infringing goods, a limited exclusion order remedy will be undermined. Accordingly, in the event the Commission determines Innoscience respondents have violated section 337, I recommend issuance of cease and desist orders directed to the Innoscience respondents.

C. Modification of Remedies Based on PTAB proceedings

Innoscience argues that the Commission should suspend enforcement of any remedial orders "[i]f the PTAB finds any of the asserted claims unpatentable in a Final Written Decision." RRB at 106-07. EPC contends the PTAB proceedings have no persuasive value to the issues in this investigation. CRB at 58-59. Staff argues Innoscience's request is premature. SRB at 16.

The present record provides no basis to suspend remedial orders. The PTAB has not issued a final written decision finding any claims asserted in this investigation to be unpatentable, and it is possible that such a decision will never issue. Should circumstances change, Innoscience may attempt to seek relief from the Commission with the benefit of a developed record.

D. Bond During Presidential Review

Pursuant to 19 U.S.C. § 1337(j)(3), the Commission must determine the amount of bond to be required of a respondent during the 60-day Presidential review period following the issuance of permanent relief, in the event that the Commission determines to issue a remedy. The purpose of the bond is to protect the complainant from any injury. *See* 19 U.S.C. § 1337(e)(1); 19 C.F.R. § 210.42(a)(1)(ii), § 210.50(a)(3).

When reliable price information is available, the Commission has often set the bond by eliminating the differential in sales prices between the domestic product and the imported,

infringing product. *Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 24, USITC Pub. No. 2949 (1995). In other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. *See Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm'n Op. at 41-43, USITC Pub. No. 2670 (1995). A 100% bond has been required when no effective alternative existed. *Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, USITC Pub. No. 3046, Comm'n Op. at 26-27 (July 1997) (a 100% bond imposed when price comparison was not practical because the parties sold products at different levels of commerce, and the proposed royalty rate appeared to be *de minimis* and without adequate support in the record).

The complainant bears the burden of establishing that a bond is required during the Presidential review period. *Certain Rubber Antidegradants, Components Thereof, and Prods. Containing Same*, Inv. No. 337-TA-533, Comm'n Op. at 40 (July 21, 2006).

EPC argues a 100% bond is appropriate because "calculation of a price differential is impractical and there is insufficient evidence in the record to determine a reasonable royalty." CIB at 124. The evidence shows Innoscience has sold the Accused Products for a wide range of prices [redacted], and EPC argues that range makes "taking a price differential impractical." CIB at 124; CX-0839C; CX-0015.

Innoscience argues no bond should issue because EPC has not shown EPC would be injured during the presidential review period, or if there is a bond, it should be guided by the [redacted] royalty rate that EPC has offered other parties to license the '294 patent. RRB at 107-08 (citing license offers RX-0652C and RX-0653C). Innoscience's economic expert, Mr. Schoettelkotte,

[redacted]

opined that license offers of [redacted] nform the reasonable royalty for a competitor to license the Asserted Patents. Tr. at 837:23-839:13 (Schoettelkotte). On that evidence, Innoscience suggests a bond rate of no higher than 5%. RRB at 107-108.

The license documents Innoscience cites are not accepted licenses, but merely offers. Presumably, any finally agreed royalty rate, reached after negotiation, would not be higher than the royalty rate EPC originally offered in those term sheets. Therefore, if a bond rate were set at 5%, it would protect EPC from any injury, as required by statute. 19 U.S.C. § 1337(e)(1).

It is my recommendation that if the Commission determines that a violation of section 337 has occurred, the Commission set a bond rate of 5%.

XI. ORDER

Within seven days of the date of this document, the parties shall jointly submit a single proposed public version of this document with any proposed redactions indicated in red. If the parties submit excessive redactions, they may be required to provide declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in 19 C.F.R. § 201.6(a). To the extent possible, the proposed redactions should be made electronically in a single PDF file with the proposed redactions submitted as "marked" but not yet "applied." The proposed redactions should be submitted via email to Cheney1362@usitc.gov and not filed on EDIS.

SO ORDERED.

Clark S. Cheney
Chief Administrative Law Judge