UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of	
CERTAIN PHOTOVOLTAIC CONNECTORS AND COMPONENTS THEREOF	**Inv. No. 337-TA-1365**

FINAL INITIAL DETERMINATION ON VIOLATION OF SECTION 337

Administrative Law Judge Monica Bhattacharyya

(August 30, 2024)

Appearances:

For Complainant Shoals Technologies Group, LLC:

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For Respondents Voltage, LLC and Ningbo Voltage Smart Production Co.:

Yar Chaikovsky, Philip Ou, Bruce Yen, Yolanda Xu, and Sojung Yun of White & Case LLP in Palo Alto, CA; and Jordan Coyle of White & Case LLP in Washington, DC.

For the Office of Unfair Import Investigations:

John Shin and David Lloyd of the U.S. International Trade Commission in Washington, DC.

Shoals Technologies Group, LLC
EXHIBIT 2014
Voltage, LLC v.
Shoals Technologies Group, LLC
IPR2024-00877
Part 1 of 2

Pursuant to the Notice of Investigation, (EDIS Doc. ID 798165), 88 Fed. Reg. 37905-06 (June 9, 2023), and Commission Rule 210.42, this is the administrative law judge's final initial determination on violation in the matter of *Certain Photovoltaic Connectors and Components Thereof,* Commission Investigation No. 337-TA-1365. 19 C.F.R. § 210.42(a)(1)(i).

For the reasons discussed herein, it is the undersigned's final initial determination that there has been a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain photovoltaic connectors and components thereof by reason of infringement of claims 1, 11-14, and 18 of U.S. Patent No. 11,689,153 ("the '153 patent").

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3. Claim Limitation [1.b]: "a feeder cable electrically coupled to the drop line at a nexus;" 129

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3. Claim Limitation [21.b]: "a lead assembly comprising:" 139

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5. Claim Limitation [21.b.ii]: "a second drop line electrically connected to a central trunk of a second wire harness and configured to receive power from a plurality of solar panels in a second solar array;" 140

6. Claim Limitation [21.b.iii]: "a feeder cable, the feeder cable electrically connected to the drop line and the second drop line at a nexus; and" 140

7. Claim Limitation [21.b.iv]: "a primary mold that fully encases the nexus so as to substantially seal the nexus from external environmental conditions, the primary mold further comprising:" 140

8. The "Aperture" Limitations: Claim Limitation [21.b.iv.a]: "a first aperture extending completely through the primary mold and having a first diameter, wherein the feeder cable extends through the first aperture"; Claim Limitation [21.b.iv.b]: "a second aperture extending partially through the primary mold and having a second diameter smaller than the first diameter, wherein the drop line extends into the second aperture and"; Claim Limitation [21.b.iv.c]: "a third aperture extending partially through

the primary mold and having a third diameter smaller than the first diameter, wherein the second drop line extends into the third aperture."141

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The following abbreviations may be used in this Initial Determination:

Tr.	Hearing Transcript
Dep. Tr.	Deposition Transcript
JX	Joint Exhibit
CX	Complainant's exhibit
CPX	Complainant's physical exhibit
CDX	Complainant's demonstrative exhibit
RX	Respondents' exhibit
RPX	Respondents' physical exhibit
RDX	Respondents' demonstrative exhibit
SDX	Staff's demonstrative exhibit
CPHB	Complainant's pre-hearing brief (EDIS Doc. ID 814389)
CIB	Complainant's initial post-hearing brief (EDIS Doc. ID 818482)
CRB	Complainant's post-hearing reply brief (EDIS Doc. ID 819866)
CISB	Complainant's initial supplemental post-hearing brief (EDIS Doc. ID 823323)
CRSB	Complainant's reply supplemental post-hearing brief (EDIS Doc. ID 823785)
RPHB	Respondents' pre-hearing brief (EDIS Doc. ID 814384)
RIB	Respondents' initial post-hearing brief (EDIS Doc. ID 818489)
RRB	Respondents' post-hearing reply brief (EDIS Doc. ID 819868)
RISB	Respondents' initial supplemental post-hearing brief (EDIS Doc. ID 823299)
RRSB	Respondents' reply supplemental post-hearing brief (EDIS Doc. ID 823782)
SPHB	Staff's pre-hearing brief (EDIS Doc. ID 814989)
SIB	Staff's initial post-hearing brief (EDIS Doc. ID 818456)
SRB	Staff's post-hearing reply brief (EDIS Doc. ID 819825)
SISB	Staff's initial supplemental post-hearing brief (EDIS Doc. ID 823320)
SRSB	Staff's reply supplemental post-hearing brief (EDIS Doc. ID 823756)
***Markman* Tr.**	*Markman* Hearing Transcript
CIMB	Complainant's initial claim construction brief (EDIS Doc. ID 807736)
CRMB	Complainant's rebuttal claim construction brief (EDIS Doc. ID 808813)
RIMB	Respondents' initial claim construction brief (EDIS Doc. ID 807735)
RRMB	Respondents' rebuttal claim construction brief (EDIS Doc. ID 808806)
SMB	Staff's claim construction brief (EDIS Doc. ID 808222)

I. BACKGROUND

A. Procedural History

The Commission instituted this investigation in response to a complaint filed by Complainant Shoals Technologies Group, LLC ("Shoals" or "Complainant") on May 4, 2023 (the "Complaint," EDIS Doc. ID 795598). 88 Fed. Reg. 37905-06 (June 9, 2023) ("Notice of Investigation"; EDIS Doc. ID 798165). A supplement to the Complaint was filed on May 12, 2023. *Id.* The Complaint alleged violations of section 337 of the Tariff Act of 1930, as amended, by reason of infringement of certain claims of U.S. Patent No. 10,553,739 ("the '739 patent") and U.S. Patent No. 10,992,254 ("the '254 patent"). Notice of Investigation at 1. The Commission ordered institution of this investigation to determine "whether 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 . . . by reason of infringement of one or more of claims 1-13 and 15-18 of the '739 patent and claims 1-15 of the '254 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337." *Id.* The investigation was instituted upon publication of the Notice of Investigation in the *Federal Register* on June 9, 2023. The Notice of Investigation named the following entities as Respondents: Hikam America, Inc., Hikam Electrónica de México, S.A. de C.V., Hikam Tecnologia de Sinaloa, Hewtech Philippines Corp., Hewtech Philippines Electronics Corp., Hewtech (Shenzhen) Electronics Co., Ltd. (collectively, "Hikam"), Voltage, LLC, and Ningbo Voltage Smart Production Co. (collectively, "Voltage"). Notice of Investigation at 1-2. The Office of Unfair Import Investigations is also a party to the investigation. *Id.*

Pursuant to Order No. 6, the target date of this investigation was set to be November 12, 2024. Order No. 6, EDIS Doc. ID 800475 (July 18, 2023), *unreviewed by* Comm'n Notice, EDIS Doc. ID 802468 (Aug. 16, 2023).

On July 18, 2023, the undersigned granted Shoals' motion to amend the Complaint and Notice of Investigation to assert claims 1, 2-3, 6, 8, 11-18, 21, 23, and 24 of U.S. Patent No. 11,689,153 ("the '153 patent"). Order No. 5, EDIS Doc. ID 800474 (July 18, 2023). Shoals filed its Amended Complaint on July 19, 2023. EDIS Doc. ID 800563. On August 8, 2023, Hikam and Voltage both filed responses to the Amended Complaint and Notice of Investigation disputing Shoals' allegations with respect to infringement and domestic industry and asserting certain affirmative defenses. EDIS Doc. ID 801925 (Hikam Response); EDIS Doc. ID 801958 (Voltage Response).

A *Markman* hearing was held on December 13, 2023. *See Markman* Tr., EDIS Doc. ID 810420 (Dec. 14, 2023). On February 20, 2024, the undersigned issued an order addressing claim construction for the '739 patent, the '254 patent, and the '153 patent. *See* Order No. 16, EDIS Doc. ID 814515 (Feb. 20, 2024).

On February 9, 2024, the undersigned granted Shoals' motion for partial termination of the investigation based on withdrawal of claims 2, 3, 6, 8, 9, 11, 12, and 15-18 of the '739 patent, claims 2-4, 8-12, 14, and 15 of the '254 patent, and claims 2, 3, 6, and 15-17 of the '153 patent. Order No. 15, EDIS Doc. ID 813762 (Feb. 9, 2024), *unreviewed by* Comm'n Notice, EDIS Doc. ID 815923 (Mar. 11, 2024). On February 28, 2024, the undersigned granted Shoals' motion to partially terminate the investigation based on withdrawal of the '254 patent. Order No. 19, EDIS Doc. ID 815078 (Feb. 28, 2024), *unreviewed by* Comm'n Notice, EDIS Doc. ID 816799 (Mar. 26, 2024). On April 2, 2024, the undersigned granted Shoals' motion to partially terminate the

investigation based on withdrawal of claim 8 of the '153 patent. Order No. 29, EDIS Doc. ID 817397 (Apr. 2, 2024), *unreviewed by* Comm'n Notice, EDIS Doc. ID 819810 (Apr. 26, 2024).

On February 21, 2024, the undersigned issued an order denying Shoals' motion for summary determination that the economic prong of the domestic industry requirement was satisfied. Order No. 18, EDIS Doc. ID 814602 (Feb. 21, 2024).

On March 6, 2024, the undersigned issued an order granting Respondents' motion for summary determination that Complainant has not satisfied the technical prong of the domestic industry requirement for the '739 patent. Order No. 20, EDIS Doc. ID 815576 (Mar. 6, 2024). On April 19, 2024, the Commission determined not to review Order No. 20. Comm'n Notice, EDIS Doc. ID 819109 (Apr. 19, 2024). The Commission stated that "[b]ecause Shoals has not satisfied the technical prong of the domestic industry requirement for the '739 patent, the investigation is terminated as to the '739 patent with a finding of no violation." *Id.* at 2.

On March 6, 2024, the undersigned issued an order denying Voltage's motion for summary determination of non-infringement and no violation of the '254 and '153 patents against Voltages' Alternative Design Products and denying Voltage's motion for leave to file an additional motion for summary determination. *See* Order No. 21, EDIS Doc. ID 815585 (Mar. 6, 2024).

An evidentiary hearing was held on March 18-22, 2024. The parties filed initial post-hearing briefs on April 12, 2024, and filed reply post-hearing briefs on April 26, 2024.

On May 30, 2024, the undersigned issued an order requesting supplemental briefing on certain issues related to direct and indirect infringement. *See* Order No. 31 (May 30, 2024). On June 7, 2024, Shoals, Voltage, and Staff filed their initial supplemental post-hearing briefs in response to Order No. 31. *See* EDIS Doc. IDs 823323, 823299, 823320 (June 7, 2024). On June

14, 2024, Shoals, Voltage, and Staff filed their reply supplemental post-hearing briefs in response to Order No. 31. *See* EDIS Doc. IDs 823785, 823782, 823756 (June 14, 2024)).

On July 8, 2024, the undersigned issued an initial determination extending the target date to December 16, 2024, making the final initial determination due by August 16, 2024. Order No. 32, EDIS Doc. ID 825297 (July 8, 2024), *unreviewed by* Comm'n Notice, EDIS Doc. ID 827784 (July 31, 2024). On August 13, 2024, the undersigned issued an initial determination extending the target date to December 30, 2024, making the final initial determination due by August 30, 2024. Order No. 33, EDIS Doc. ID 829425 (Aug. 13, 2024).

The '153 patent (the "Asserted Patent") is the only remaining patent in the investigation.

B. The Parties

1. Complainant

The Complainant is Shoals Technologies Group, LLC ("Shoals"). Notice of Investigation at 1. Shoals is a limited liability company organized and existing under the laws of the state of Tennessee with its principal place of business at 1400 Shoals Way, Portland, Tennessee 37148. *See id.*; Am. Compl. at cover, ¶ 11. The '153 patent is assigned to Shoals. *See* Am. Compl. at ¶ 48, Ex. 22; CIB at 3.

2. Respondents

a. Voltage

i. Voltage LLC

Respondent Voltage LLC is a limited liability company incorporated under the laws of North Carolina, specializing in the business of electrical balance of system ("EBOS") solutions and services in the renewable energy sector. *See* Am. Compl. at ¶ 28; Voltage Response at ¶ 28. Its headquarters and principal place of business is located at 1450 Raleigh Road, Chapel Hill, NC 27517. *Id.*

ii. Ningbo Voltage Smart Production Co.

Respondent Ningbo Voltage Smart Production Co. ("Ningbo Voltage") is a manufacturing company located at Rooms 102, 201, 202, Bldg. 5 (01), 8 Miaofengshan Rd., Beilun District, 57020 Ningbo, China. *See* Am. Compl. at ¶ 30; Voltage Response at ¶ 30. Ningbo Voltage manufactures the Voltage Trunk Bus. *See* Voltage Response at ¶ 30; JX-0198C at 76-77.

b. Hikam[1]

i. Hikam America Inc.

Respondent Hikam America, Inc. is a California corporation with its headquarters and principal place of business at 3521 Main Street #501, Chula Vista, CA 91911. *See* Am. Compl. at ¶ 15; Hikam Response at ¶ 15.

ii. Hikam Electrónica de México, S.A. de C.V.

Respondent Hikam Electrónica de México, S.A. de C.V. operates a factory in Mexicali, Baja California, Mexico. *See* Am. Compl. at ¶ 17; Hikam Response at ¶ 17.

iii Hikam Tecnologia de Sinaloa

Respondent Hikam Tecnologia de Sinaloa operates a factory in Guasave, Sinaloa, Mexico. *See* Am. Compl. at ¶ 19; Hikam Response at ¶ 19.

iv. Hewtech Philippines Corp.

Respondent Hewtech Philippines Corp. was established by Hirakawa Hewtech Corporation in 2011. *See* Am. Compl. at ¶ 23; Hikam Response at ¶ 23.

v. Hewtech Philippines Electronics Corp.

[1] Only the '739 patent was asserted against Hikam. *See* Am. Compl. at ¶ 66. Therefore, because the investigation has already been terminated as to the '739 patent, *see* Comm'n Notice, EDIS Doc. ID 819109 (Apr. 19, 2024), there are currently no pending claims of violation of section 337 against Hikam.

Respondent Hewtech Philippines Electronics Corp. was established by Hirakawa Hewtech Corporation in 2019. *See* Am. Compl. at ¶ 25; Hikam Response at ¶ 25. It is located at TECO Industrial Park, Ninoy Aquino Highway, Bundagul Mabalacat, Pampanga, 2010 Philippines. *Id.*

vi. Hewtech (Shenzhen) Electronics Co., Ltd.

Respondent Hewtech (Shenzhen) Electronics Co., Ltd. was established by Hirakawa Hewtech Corporation in 2013. *See* Am. Compl. at ¶ 21; Hikam Response at ¶ 21. It is located at Block 5 and Block 6, 172 Hengpailing Estate, Wu Tong Shan, Luo Hu District, Shenzhen, 518114 China. *Id.*

C. Products at Issue

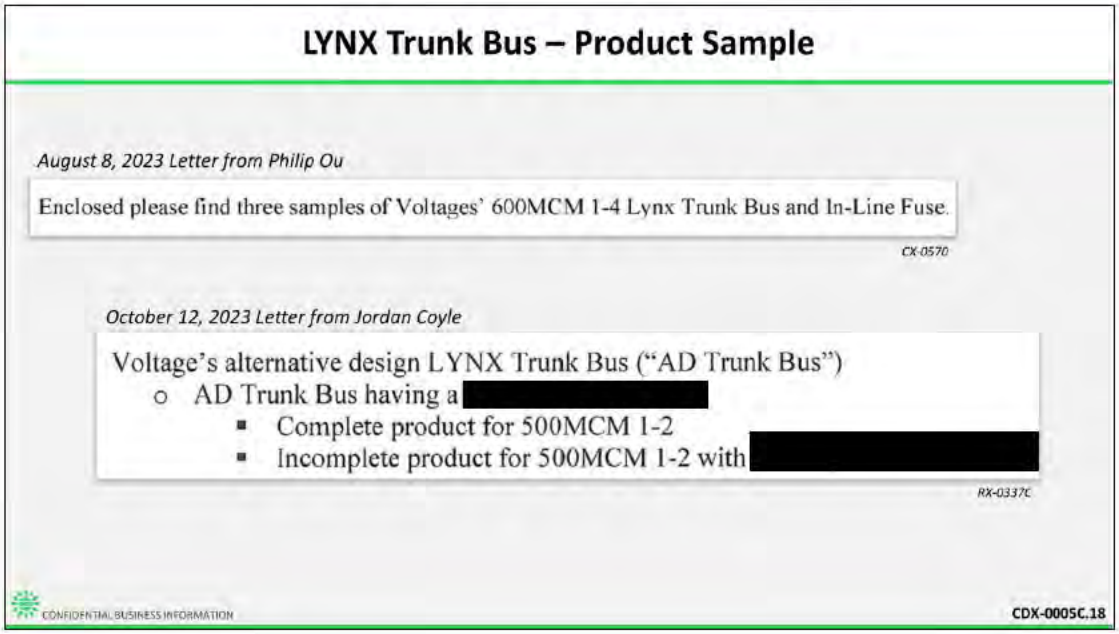
The products at issue are "photovoltaic wire harnesses or string harnesses that contain one or more inline fuses, inline fuse kits, and assemblies for connecting solar panel arrays to an inverter, which assemblies are called lead assemblies or trunk buses, and which may also include one or more in-line fuses." Notice of Investigation at 1.

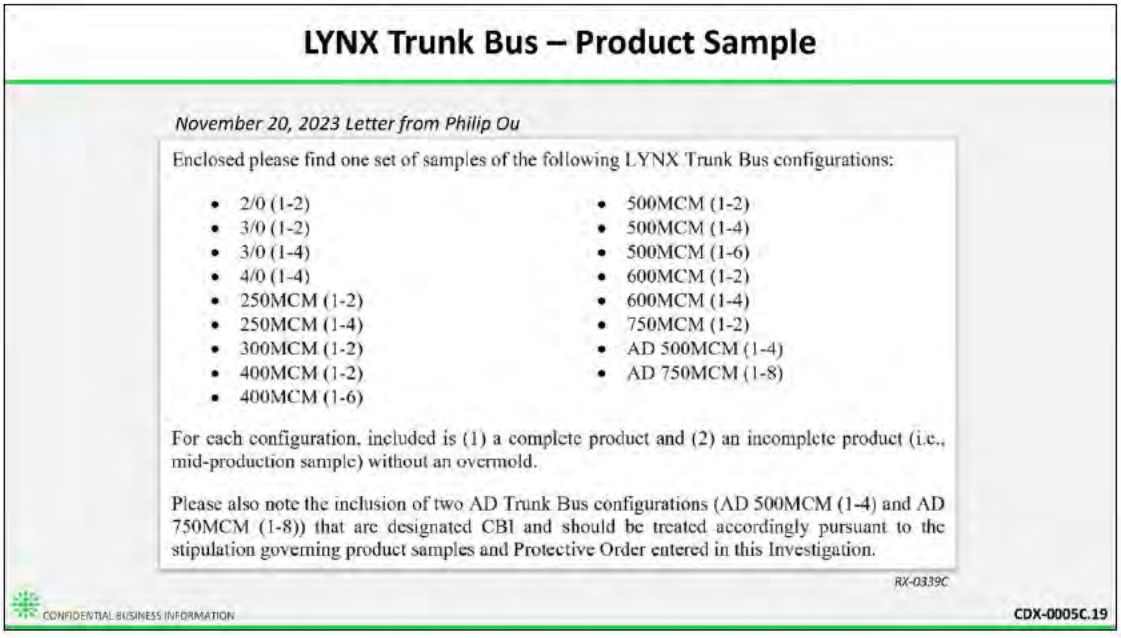
1. Accused Products and Products Proposed for Adjudication

The accused products are Voltage's LYNX Trunk Bus products ("Voltage Trunk Bus") and Voltage also seeks adjudication of Voltage's Alternative Design of LYNX Trunk Bus products ("Voltage AD Trunk Bus").[2] CIB at 7-12; RIB at 29-30; SIB at 7. Shoals' post-hearing briefs do not provide a list specifically identifying the accused products. *See generally* CIB; CRB. However, at the evidentiary hearing, Shoals' expert, Dr. William Brooks, testified that he analyzed "many samples" of the Voltage Trunk Bus and Voltage AD Trunk Bus and his

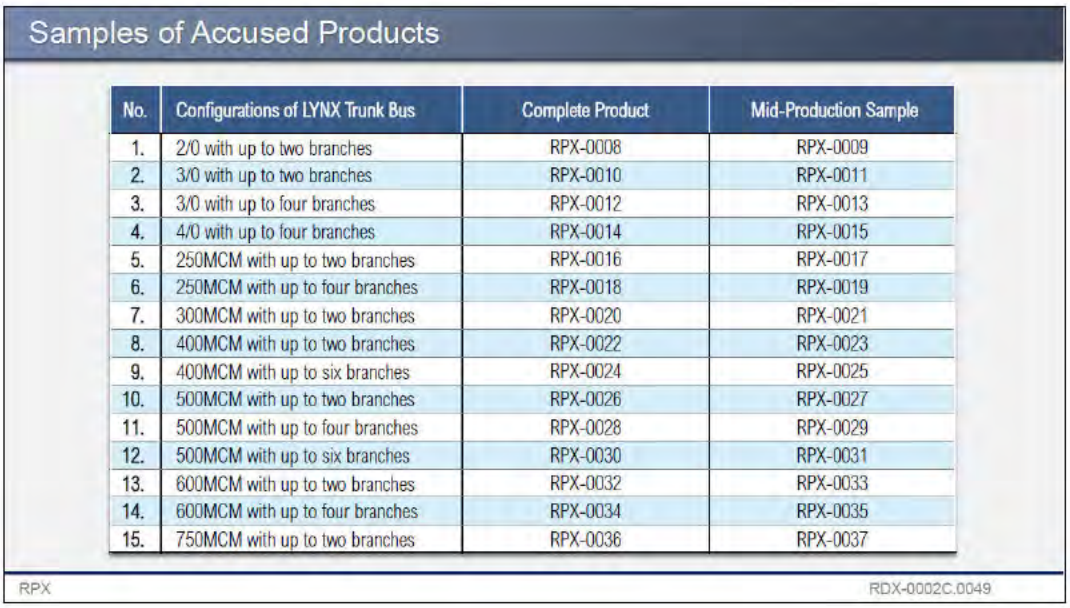
[2] The issue of adjudication of the Voltage AD Trunk Bus is addressed *infra*.

demonstratives identified the samples that he analyzed. *See* Tr. (Brooks) at 408:2-409:16; CDX-0005C at 18-19 (reproduced below).





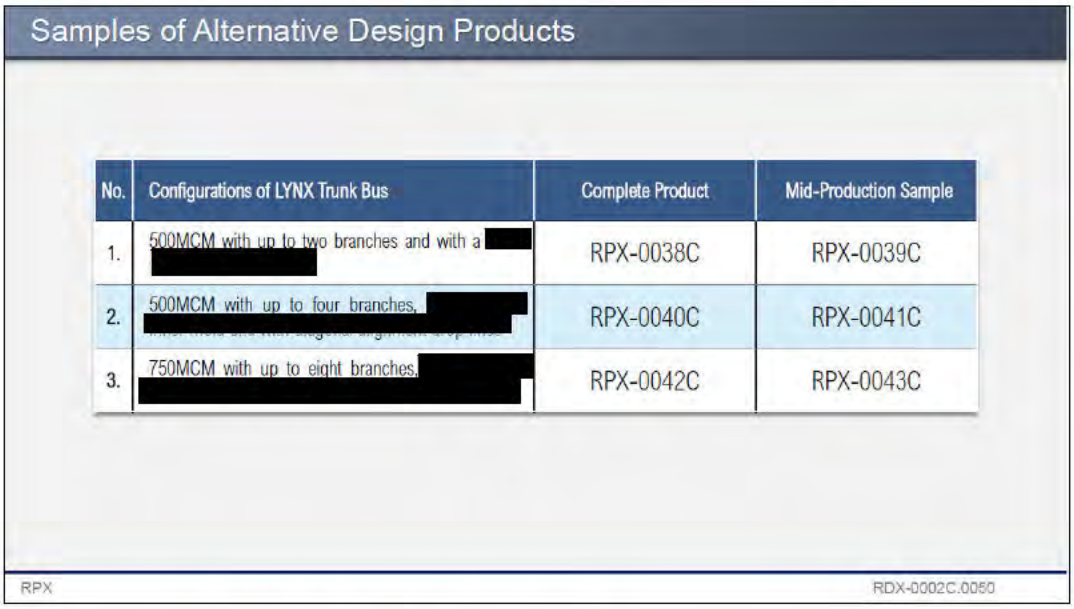
In addition, Voltage's expert, Dr. Kimberly Cameron testified about the specific Voltage products that she analyzed. *See* Tr. (Cameron) at 1100:7-20; RDX-0002C at 49-50 (reproduced below); *see also* RX-0339C; CX-0738C; RIB at 58-59 (citing RX-0339C; CX-0738C).



Samples of Accused Products

No.	Configurations of LYNX Trunk Bus	Complete Product	Mid-Production Sample
1.	2/0 with up to two branches	RPX-0008	RPX-0009
2.	3/0 with up to two branches	RPX-0010	RPX-0011
3.	3/0 with up to four branches	RPX-0012	RPX-0013
4.	4/0 with up to four branches	RPX-0014	RPX-0015
5.	250MCM with up to two branches	RPX-0016	RPX-0017
6.	250MCM with up to four branches	RPX-0018	RPX-0019
7.	300MCM with up to two branches	RPX-0020	RPX-0021
8.	400MCM with up to two branches	RPX-0022	RPX-0023
9.	400MCM with up to six branches	RPX-0024	RPX-0025
10.	500MCM with up to two branches	RPX-0026	RPX-0027
11.	500MCM with up to four branches	RPX-0028	RPX-0029
12.	500MCM with up to six branches	RPX-0030	RPX-0031
13.	600MCM with up to two branches	RPX-0032	RPX-0033
14.	600MCM with up to four branches	RPX-0034	RPX-0035
15.	750MCM with up to two branches	RPX-0036	RPX-0037

RPX RDX-0002C.0049



Samples of Alternative Design Products

No.	Configurations of LYNX Trunk Bus	Complete Product	Mid-Production Sample
1.	500MCM with up to two branches and with a [redacted]	RPX-0038C	RPX-0039C
2.	500MCM with up to four branches, [redacted]	RPX-0040C	RPX-0041C
3.	750MCM with up to eight branches, [redacted]	RPX-0042C	RPX-0043C

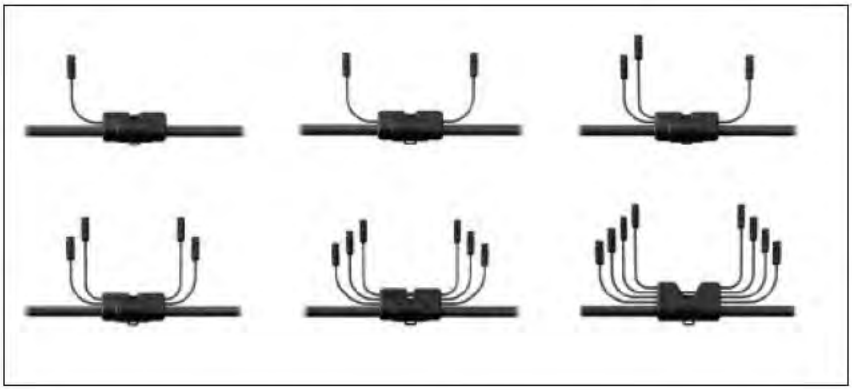
RPX RDX-0002C.0050

2. Domestic Industry Products[3]

Shoals contends that the domestic industry product is its Big Lead Assembly (BLA) products ("BLA" or "DI Product"). CIB at 7; *see also* RIB at 29; SIB at 6-7. During the evidentiary hearing, Mr. Macias described various configurations of the BLA products having

[3] The parties dispute representativeness with respect to the domestic industry products. *See* CIB at 83-94; CRB at 35-38; RIB at 96-102; RRB at 31-34; SIB at 45-51; SRB at 29-33. That issue is addressed *infra*.

mold drops with one, two, three, four, five, six, seven, and eight drop lines, some of which are shown in an excerpt from a BLA data sheet (reproduced below).



See CX-0235; Tr. (Macias) at 119:14-122:12. Further discussion of the BLA appears below with respect to the technical prong and economic prong of the domestic industry requirement. *See infra* at Parts VII and VIII.

D. Witness Testimony

The parties presented testimonial evidence in this investigation in the form of live testimony and deposition designations.

1. Party Witnesses

Shoals presented testimony from Mr. Ben Macias, Chief Revenue Officer of Shoals (Tr. at 103:14-19), Mr. Jeffrey Tolnar, President of Shoals (*id.* at 219:15-16), and Mr. Dominic Bardos, Chief Financial Officer of Shoals (*id.* at 644:14-18). Voltage presented testimony from Ms. Ruiyan Ge, one of the cofounders of Voltage (*id.* at 899:10-13).

2. Expert Witnesses

Shoals' first expert witness was Mr. William Brooks, who was admitted as an expert on photovoltaic solar energy systems, EBOS, and the electrical wiring for such systems, to provide testimony related to infringement and the technical prong of the domestic industry requirement. Tr. at 381:21-644:2 (expert qualification at 388:24-389:7). Shoals also called Mr. Clarke Nelson,

who was admitted as an expert in the areas of accounting and the analysis of economics associated with intellectual property. Tr. at 817:11-897:21, 1320:2-1325:21 (expert qualification at 818:25-819:9). Shoals' last expert witness was Mr. Joshua Weiner, who was admitted as an expert in photovoltaic solar energy systems, EBOS and the electrical wiring for solar systems. Tr. at 1257:5-1318:25 (expert qualification at 1262:19-1263:3).

Voltage's first expert witness was Mr. Andrew Clarke, who was admitted as an expert in the field of economics, including economic issues at the ITC, such as domestic industry and remedy. Tr. at 990:21-1034:1 (expert qualification at 992:9-20). Voltage also called Dr. Kimberly Cameron, who was admitted as an expert in mechanical engineering and electrical connectors. Tr. at 1043:23-1162:20 (expert qualification at 1046:2-10). Voltage's last expert witness was Dr. Thomas Kenny, who was admitted as an expert in the fields of physics and electrical and mechanical engineering and systems. Tr. at 1165:3-1256:10 (expert qualification at 1168:1-1169:7).[4]

3. Deposition Designations

Several designated deposition transcripts were received into evidence: founder of Shoals and inventor of the '254 and '153 patents Mr. Dean Solon (JX-0217C); Shoals' chief financial officer and corporate representative Mr. Dominic Bardos (JX-0205C); Shoals' former employee, former chief technology officer, former chief executive officer, and corporate representative Mr. Jason Whitaker (JX-0221C); Shoals' patent prosecution attorney for the '254 patent Ms. Carla Gannon (JX-0209C); Shoals' expert on infringement and technical prong of the domestic industry Mr. William Brooks (JX-0206C); co-founder of Voltage and corporate representative

[4] While the undersigned admitted Dr. Kenny as an expert in the fields of physics and electrical and mechanical engineering and systems, the undersigned did not rule on whether he qualified as a person of ordinary skill in the art at the hearing. *See* Tr. at 1169:2-7. That issue is addressed *infra*.

Ms. Ruiyan Ge (JX-0210C); co-founder of Voltage and corporate representative Mr. Li Wang (JX-0219C); and director of sales and business development for Voltage and corporate representative Mr. Gary Joseph (JX-0211C).[5] *See* Tr. at 321:13-20, 1338:18-1339:8 (admitting deposition designations and associated exhibits).

II. STATUTORY AUTHORITY AND IMPORTATION

A. Statutory Authority

The Commission has statutory authority over the present investigation, which includes the authority to investigate a particular respondent's accused articles that are imported into the United States or sold after importation, and the authority to investigate the importation into the United States or the sale of such articles. *See Certain Video Security Equipment and Sys., Related Software, Components Thereof, and Prods. Containing Same*, Inv. No. 337-TA-1281, Comm'n Op., EDIS Doc. ID 794569, at 9-10 (Apr. 19, 2023); *Certain Portable Battery Jump Starters and Components Thereof (III)*, Inv. No. 337-TA-1360, Comm'n Notice, EDIS Doc. ID 826741, at 3 (July 22, 2024).

B. Importation

A complainant generally need only prove importation of a single accused product to satisfy the importation element. *Certain Chem. Mech. Planarization Slurries & Components Thereof*, Inv. No. 337-TA-1204, Comm'n Op., EDIS Doc. ID 759875, at 10 (Jan. 6, 2022); *Certain DC-DC Controllers & Prods. Containing the Same*, Inv. No. 337-TA-698, Order No. 29, EDIS Doc. ID 428773, at 3 (June 18, 2010); *Certain Purple Protective Gloves*, Inv. No. 337-TA-500, Order No. 17, EDIS Doc. ID 215648, at 5 (Sept. 23, 2004).

[5] In addition, pursuant to an agreement among the parties, and within the undersigned's discretion, certain portions of the video deposition designations of Mr. Solon and Mr. Whitaker were played live during the evidentiary hearing. *See* Tr. at 377:21-378:11 (Solon), 379:4-16 (Whitaker).

Shoals submits that "it is undisputed that Voltage manufactures, imports, and sells for importation or after importation into the United States the accused LYNX products, over which the Commission has in rem jurisdiction." CIB at 13. Voltage states that "Respondents do not dispute the Commission's *in rem* jurisdiction over certain accused products by virtue of their importation into the United States." RIB at 30.

Shoals and Voltage filed a Joint Stipulation whereby "Voltage stipulates that it has imported into the United States and sold after importation into the United States at least one unit of each of the Accused Voltage Products."[6] *See* EDIS Doc. ID 814046 (Joint Stipulation of Shoals and Voltage) at ¶ 4; *see also id*. at ¶ 6; RIB at 30-31 ("Respondents have stipulated to the importation of certain Accused Products and do not dispute that the importation requirement is satisfied for these products."). Voltage, however, asserts in its post-hearing briefing that it "has not imported certain LYNX Trunk Bus products accused of infringing the '153 patent since it issued on June 27, 2023, so the Commission does not have *in rem* jurisdiction over those products." RIB at 31 (citing JX-0191C; JX-210C (Ge Dep.) at 199:20-200:10).

The undersigned finds that the importation requirement has been met for the Voltage Trunk Bus and Voltage AD Trunk Bus. The private parties' Joint Stipulation clearly states that "Voltage stipulates that it has imported into the United States and sold after importation into the United States at least one unit of each of the Accused Voltage Products," which includes LYNX Trunk Bus products and any alternative designs. *See* EDIS Doc. ID 814046 (Joint Stipulation) at ¶¶ 3-4. Furthermore, under the circumstances, Voltage's contention that certain LYNX Trunk Bus products have not been imported since June 27, 2023 is not supported by the evidence of

[6] The term "Accused Voltage Products," as used in the Joint Stipulation, includes Voltage's LYNX Trunk Bus, including any alternative designs. *See* Joint Stipulation at ¶ 3.

record. First, while Voltage cites to exhibit JX-0191C, that exhibit was not admitted into evidence. Second, with respect to Voltage's citation to Ms. Ge's deposition, while Ms. Ge appears to reference a shipment record of LYNX Trunk Bus products from June 27, 2023, her deposition testimony does not describe what LYNX Trunk Bus products are included in, or excluded from, the shipments.[7] *See* JX-0210C at 199:20-204:7.

III. LEGAL STANDARDS

A. Infringement

Section 337(a)(1)(B)(i) prohibits "[t]he importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignee, of articles that—(i) infringe a valid and enforceable United States patent or a valid and enforceable United States copyright registered under title 17[.]" 19 U.S.C. § 1337(a)(1)(B)(i). The Commission has held that the word "infringe" in Section 337(a)(1)(B)(i) "derives its legal meaning from 35 U.S.C. § 271, the section of the Patent Act that defines patent infringement." *Certain Elec. Devices with Image Processing Sys., Components Thereof, & Associated Software*, Inv. No. 337-TA-724, Comm'n Op. at 13-14, EDIS Doc. ID 467105 (Dec. 21, 2011).

[7] Moreover, even if Voltage's assertion that it "has not imported certain LYNX Trunk Bus products accused of infringing the '153 patent since it issued on June 27, 2023" were accepted, the Commission has held that the importation of a representative product within each product category is sufficient to satisfy the importation requirement for all products in each of the representative categories. *See Certain Elec. Connectors and Cages, Components Thereof, and Prods. Containing the Same*, Inv. No. 337-TA-1241, Comm'n Op., EDIS Doc. ID 781376, at 10-11 (Sept. 30, 2022) ("In other words, because the parties have treated all of the products within the QSFP 1x1 SMT and OSFP product categories, respectively, the same for purposes of infringement and the Commission has found that at least one product from each product category has been imported, the importation requirement for all products in those categories has been met.") (citing *Certain Chem. Mech. Planarization Slurries*, Comm'n Op. at 10-11). As discussed *infra*, the undersigned finds that the Voltage Trunk Bus products produced by Voltage in this investigation are representative. *See infra* at Part VI.A.

Infringement must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). The preponderance of the evidence standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharms. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

1. 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*), *aff'd*, 517 U.S. 370 (1996) (citation omitted). "[T]he construction of claims is simply a way of elaborating the normally terse claim language[] in order to understand and explain, but not to change, the scope of the claims." *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000) (alterations in original) (quoting *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991)). "[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). The words of a claim "'are generally given their ordinary and customary meaning,'" which is "the meaning that the term would have to a person of ordinary skill in art" as of the date that the patent application was filed. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

2. Direct and Indirect Infringement

A patent claim is directly infringed when a respondent "makes, uses, offers to sell, or sells any patented invention, within the United States, or imports into the United States any patented invention" without consent of the patent owner. 35 U.S.C. § 271(a).

In addition to direct infringement, a respondent may be liable for indirect infringement, including induced infringement, which is defined in section 271(b) of the Patent Act: "[w]hoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b); *see also DSU Med. Corp. v. JMS Co., Ltd.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) ("To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and *knowingly* aid[ed] and abett[ed] another's direct infringement.") (citations omitted) (alterations in original) (emphasis in original). "The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven." *Id.* (internal quotation marks and citation omitted). The Supreme Court has held that induced infringement "requires knowledge that the induced acts constitute patent infringement." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011). In *Suprema, Inc. v. Int'l Trade Comm'n*, the Federal Circuit upheld the Commission's interpretation of the section 337 language "articles that infringe" in the context of induced infringement, holding that the statute "covers goods that were used by an importer to directly infringe post-importation as a result of the seller's inducement." 796 F.3d 1338, 1352-53 (Fed. Cir. 2015) (*en banc*).

3. Literal Infringement

A complainant must prove either literal infringement or infringement under the doctrine of equivalents. Literal infringement requires the patentee to prove that the accused device meets

each and every limitation of the asserted claim(s). *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004). "If even one limitation is missing or not met as claimed, there is no literal infringement." *Elkay Mfg. Co. v. EBCO Mfg. Co.*, 192 F.3d 973, 980 (Fed. Cir. 1999) (internal quotation marks omitted). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp.*, Inc., 523 F.3d 1323, 1332 (Fed. Cir. 2008).

B. Invalidity

It is the respondents' burden to prove invalidity, and the burden of proof never shifts to the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). "Under the patent statutes, a patent enjoys a presumption of validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence[.]" *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 100-114 (2011) (upholding the "clear and convincing" standard for invalidity).

The clear and convincing evidence standard placed on the party asserting an invalidity defense requires a level of proof beyond the preponderance of the evidence. Although not susceptible to precise definition, "clear and convincing" evidence has been described as evidence that produces in the mind of the trier of fact "an abiding conviction that the truth of a factual contention is 'highly probable.'" *Price v. Symsek*, 988 F.2d 1187, 1191 (Fed. Cir. 1993) (quoting *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed. Cir. 1988)).

1. Obviousness

Section 103 of the Patent Act states, *inter alia*:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 , 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. Patentability shall not be negatived by the manner in which the invention was made.
>
> ***
>
> (c)(1) Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person.

35 U.S.C. § 103(a) (2004).

"Obviousness is a question of law based on underlying questions of fact." *Scanner Techs.*, 528 F.3d at 1379. The underlying factual determinations include: "(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness." *Id.* at 1380 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)). These factual determinations are often referred to as the "*Graham* factors."

An important inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418-21 (2007). In *KSR*, the Supreme Court rejected the Federal Circuit's rigid application of a "teaching-suggestion-motivation" test—while the Court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," it described a more flexible analysis:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion

> claimed by the patent at issue . . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

Id. at 418. Applying *KSR*, the Federal Circuit has held that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "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 . . . and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007).

2. Indefiniteness

"The Patent Act requires that a patent specification 'conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as [the] invention.'" *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014) (quoting 35 U.S.C. § 112, ¶ 2). "[T]he second paragraph of § 112 contains two requirements: first, [the claim] must set forth what the applicant regards as his invention, and second, it must do so with sufficient particularity and distinctness, *i.e.*, the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002) (citation and internal quotation marks omitted) (alteration in original). A claim does not satisfy the second requirement and is thereby indefinite "if read in light of the specification delineating the patent, and the prosecution history, [the claim] fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 534 U.S. at 901. Indefiniteness is a question of law, subject to a determination of underlying facts. *Akzo Nobel Coatings, Inc. v. Dow Chem. Co.*, 811 F.3d 1334, 1343-44 (Fed. Cir. 2016). The party challenging the validity of a

claim bears the burden of establishing indefiniteness by clear and convincing evidence. *Sonix Tech. Co., Ltd. v. Publ'ns. Int'l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017).

Under 35 U.S.C. § 112, ¶1, the specification must provide a written description of the claimed invention that "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharm., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*). Determining whether the written description requirement has been satisfied "requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art" to determine whether the specification "describe[s] an invention understandable to that skilled artisan and show[s] that the inventor actually invented the invention claimed." *Id.*

C. Domestic Industry

In patent-based proceedings under section 337, a complainant must establish that an industry "relating to the articles protected by the patent . . . exists or is in the process of being established" in the United States. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement of section 337 consists of a "technical prong" and an "economic prong." *See, e.g., Alloc, Inc. v. Intl Trade Comm'n,* 342 F.3d 1361, 1375 (Fed. Cir. 2003).

To meet the technical prong, the complainant must establish that it practices at least one claim of the asserted patent. *Certain Point of Sale Terminals & Components Thereof*, Inv. No. 337-TA-524, Order No. 40 at 17-18, EDIS Doc. ID 230409 (Apr. 11, 2005). "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*, 342 F.3d at 1375.

With respect to the "economic prong," subsection (3) of Section 337(a) provides:

> For purposes of paragraph (2), an 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).

Expenditures may be counted toward satisfaction of the domestic industry requirement "as long as those investments pertain to the complainant's industry with respect to the articles protected by the asserted IP rights." *Certain Television Sets, Television Receivers, Television Tuners, & Components Thereof*, Inv. No. 337-TA-910, Comm'n Op. at 68, 2015 WL 6755093, at *36 (Oct. 30, 2015); *accord, e.g., Certain Marine Sonar Imaging Devices, Including Downscan & Sidescan Devices, Prods. Containing the Same, & Components Thereof*, Inv. No. 337-TA-921, Comm'n Op., 2016 WL 10987364, at *40 (Jan. 6, 2016) ("Navico's allocation methodology reasonably approximates the warranty and technical customer support expenditures relating to the LSS-1 product.") (*citing Certain Ground Fault Circuit Interrupters & Prods. Containing Same,* Inv. No. 337-TA-739, Comm'n Op. at 74-75, 79-81 (June 8, 2012)). Subsections (A), (B), and (C) are listed in the disjunctive, and accordingly, the domestic industry investments in plant and equipment or labor and capital can include expenditures that relate to engineering or research and development. *Certain Solid State Storage Drives, Stacked Electronics Components, & Prods. Containing Same*, Inv. No. 337-TA-1097, Comm'n Op. at 14, EDIS Doc. ID 649139 (June 29, 2018) ("[T]he text of the statute, the legislative history, and Commission precedent do not support narrowing subsections (A) and (B) to exclude non-manufacturing activities, such as investments in engineering and research and development.").

Whether a complainant satisfies the economic prong is not analyzed according to a rigid mathematical formula. *Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 39, EDIS Doc. ID 279161 (Aug. 1, 2007). The decision is made on a case-by-case basis and requires "an examination of the facts in each investigation, the article of commerce, and the realities of the marketplace." *Id.* Although Section 337(a)(3) describes the economic activities as "significant" and "substantial," a complainant does not need to show any "minimum monetary expenditure," and a complainant does not "need to define or quantify the industry itself in absolute mathematical terms." *Certain Stringed Musical Instruments & Components Thereof*, Inv. No. 337-TA-586, Comm'n Op. at 26, EDIS Doc. ID 300615 (May 16, 2008). "A precise accounting [of the complainant's domestic investments] is not necessary, as most people do not document their daily affairs in contemplation of possible litigation." *Id.*

IV. ADJUDICATION OF THE VOLTAGE AD TRUNK BUS

Voltage seeks adjudication of the Voltage AD Trunk Bus products, which Voltage submits include two modifications to its Voltage Trunk Bus products: "(1) using [redacted] and/or (2) for certain mold configurations, [redacted]" RIB at 59; *see also id.* at 30 (citing for example, physical samples of the Voltage AD Trunk Bus: RPX-0038C, RPX-0039C, RPX-0040C, RPX-0041C, RPX-0042C, RPX-0043C). With respect to these products, the parties dispute whether they should be adjudicated in this investigation. *See id.* at 59-74; CIB at 64-72; SIB at 34-35.

A. Shoals' Motion to Strike Testimony Concerning Respondents' "[redacted] Alternative Design (Mot. Dkt. No. 1365-033)

On April 12, 2024, Shoals filed a motion (Mot. Dkt. No. 1365-033; "Mot."; EDIS Doc. ID 818472) to strike testimony presented at the evidentiary hearing concerning the Voltage AD Trunk Bus with the "[redacted]" configuration, arguing that Voltage's prehearing brief did not seek to have that version of the Voltage AD Trunk Bus adjudicated in this investigation. Mot. at 1. Specifically, Shoals seeks to strike testimony from one of Voltage's co-founders, Ms. Ruiyan Ge. *Id.* at 2 (citing Tr. (Ge) at 920:10-19, 936:14-937:24). Shoals asserts that while Voltage's prehearing brief mentioned that [redacted], Voltage's prehearing brief did not reference that modification in identifying the Voltage AD Trunk Bus that was allegedly sufficiently fixed. *Id.* at 1-2. Instead, Shoals argues that Voltage's prehearing brief cited five exhibits that all describe the [redacted] modification. *Id.* at 2. Shoals contends that at the evidentiary hearing, Voltage elicited testimony not only about the "[redacted] modification, but also about the "[redacted]" during Ms. Ge's examination. *Id.* Shoals also claims that Ms. Ge's hearing testimony that the alternative designs were finalized, at least as it relates to the [redacted]," is contradicted by her deposition testimony. *Id.* Accordingly, Shoals seeks to strike that hearing testimony.[8]

On April 24, 2024, Voltage filed an opposition to Shoal's motion to strike ("Resp. Opp."; EDIS Doc. ID 819586) arguing that Shoals seeks to remove highly relevant evidence from the record confirming that Voltage's alternative designs are sufficiently fixed. Resp. Opp. at 1. Voltage contends that the testimony Shoals seeks to strike not only concerns the "[redacted]

[8] Shoals' motion to strike was discussed at the evidentiary hearing and permitted. *See* Tr. at 919:18-936:9.

[redacted] alternative design, but is primarily directed to the fact that the Voltage AD Trunk Bus (which includes both the "[redacted]" modifications) has allegedly been fixed since the fact discovery period. *Id.* at 1-2. Voltage asserts that it disclosed the [redacted]" design during discovery in its interrogatory responses, and also produced product and mold drawings, photographs, shipping labels, and physical samples. *Id.* at 3-4. In addition, Voltage argues that its prehearing brief disclosed the "[redacted]" modification as part of its alternative design. *Id.* at 7. Moreover, of the five exhibits that Shoals claims that Voltage cited, Voltage contends that four of them show both the [redacted]" modification and the "[redacted]" modification. *Id.* at 9.

On April 24, 2024, Staff filed a response to Shoals' motion to strike ("Staff Resp."; EDIS Doc. ID 819566) also opposing the motion. Staff Resp. at 1. Staff submits that Voltage's prehearing brief preserved the request to adjudicate the "[redacted]" alternative design. *Id.* at 4. Staff asserts that Voltage disclosed the "[redacted]" alternative design during discovery in its interrogatory responses, and also produced product and mold drawings, photographs, shipping labels, and physical samples. *Id.* Staff contends that Voltage's prehearing brief explicitly discussed its physical samples showing the "[redacted]." *Id.* at 5-7. Moreover, Staff asserts that Shoals cannot reasonably claim any prejudice as its own expert, Mr. Brooks, examined the physical samples of the alternative designs, confirming that Shoals had the [redacted]" modifications. *Id.* at 7.

At issue in Shoals' motion to strike is whether Voltage's prehearing brief fairly identified the Voltage AD Trunk Bus with the "[redacted]" configuration as an alternative design for potential adjudication in this investigation. The undersigned finds that it did. First, in Voltage's prehearing brief ("RPHB"; EDIS Doc. ID 814384) under the section heading

"Accused Products," Voltage identified "Voltage's '254 / '153 Alternative Design Products," which Voltage claimed included several modifications to the Voltage AD Trunk Bus: "(i) using a [redacted]; (ii) [redacted]; and (iii) [redacted] *See* RPHB at 19-20. Voltage's prehearing brief also included photographs of samples of the alternative design products "showing the [redacted]." *Id.* at 20 (citing RPX-0038C; RPX-0039C; RPX-0040C; RPX-0041C; RPX-0042C; RPX-0043C). Moreover, in the section of Voltage's prehearing brief discussing adjudication of the alternative designs and whether the alternative designs have been sufficiently disclosed during discovery, Voltage cited to examples of exhibits relating to the alternative designs that it produced. *See id.* at 155-56 (citing JX-0156C; RX-0069C; RX-0072C; RX-0075C; RX-0078C). Of those cited exhibits, at least RX-0069C, RX-0072C, RX-0075C, and RX-0078C appear to show alternative designs that have ***both*** the "[redacted]" modifications. *See* RX-0069C; RX-0072C; RX-0075C; RX-0078C; *see also* JX-0199C (Voltage Interrogatory Responses) at 20 ("Voltage identifies the document bearing bates numbers VOLTAGE_00005150-161, which are mold drawings of AD Trunk Bus as responsive to this Interrogatory."); Tr. (Voltage's counsel) at 935:1-10 ("those are photos of drawings that show both [redacted]. The undersigned therefore finds that Voltage's prehearing brief sufficiently identifies the Voltage AD Trunk Bus with the "[redacted]" configuration as an alternative design for potential adjudication in this investigation.

Accordingly, Shoals' motion (1365-033) to strike testimony presented at the evidentiary hearing concerning the Voltage AD Trunk Bus with the "[redacted]" configuration is

hereby DENIED. Whether that alternative design should be adjudicated in this investigation, pursuant to the *Oligosaccharides* factors, is discussed *infra*.

B. *Oligosaccharides* Factors

The Commission has stated that it has a "policy in favor of adjudicating redesigns to prevent subsequent and potentially burdensome proceedings that could have been resolved in the first instance in the original Commission investigation." *Certain Human Milk Oligosaccharides and Methods of Producing the Same*, Inv. No. 337-TA-1120, Comm'n Op., EDIS Doc. ID 712205, at 18 (June 8, 2020) ("*Oligosaccharides*"). The Commission considers four factors (the "*Oligosaccharides* factors") to determine whether a redesigned or alternative product should be adjudicated: "(1) whether the product is within the scope of the investigation; (2) whether it has been imported; (3) whether it is sufficiently fixed in design; and (4) whether it has been sufficiently disclosed by respondent during discovery." *Id.* (citing *Certain Two-Way Radio Equipment and Sys., Related Software, & Components Thereof*, Inv. No. 337-TA-1053, Comm'n Op., 2018 WL 8648379 at *13-14 (Dec. 18, 2018)).

Voltage asserts that the Voltage AD Trunk Bus products should be adjudicated in this investigation because Voltage has met its burden when considering each of the *Oligosaccharides* factors. RIB at 60. While Shoals does not dispute that the Voltage AD Trunk Bus is within the scope of this investigation, Shoals argues that Voltage has not met its burden on the other three *Oligosaccharides* factors. CIB at 65; CRB at 28.

1. Scope of the Investigation

Voltage asserts that the Voltage AD Trunk Bus is within the scope of the investigation, which includes "assemblies for connecting solar panel arrays to an inverter, which assemblies are called lead assemblies or trunk buses." RIB at 60. Shoals does not dispute this.[9] CIB at 65.

The scope of the investigation is defined as "photovoltaic wire harnesses or string harnesses that contain one or more inline fuses, in-line fuse kits, and assemblies for connecting solar panel arrays to an inverter, which assemblies are called lead assemblies or trunk buses, and which may also include one or more in-line fuses." Notice of Investigation, 88 Fed. Reg. 37905-06 (June 9, 2023). The record shows, and Shoals does not dispute, that the Voltage AD Trunk Bus products are trunk buses or cable assemblies. *See* RIB at 60; CIB at 65 ("Shoals does not dispute that AD LYNX is within the scope of this investigation, and therefore subject to any exclusionary order that may issue"); CRB at 28; JX-0314C at 2-3 ("The Voltage LYNX Trunk Bus (AD) is a lead assembly for use in a solar energy installation."); *see also* RIB at 29-30 (showing that the Voltage AD Trunk Bus products are the Voltage Trunk Bus products with a few modifications). Therefore, the undersigned finds that the Voltage AD Trunk Bus products are within the scope of the investigation.

2. Importation

Voltage asserts that it imported physical samples of the Voltage AD Trunk Bus into the United States during the discovery period. RIB at 61. In addition, Voltage argues that Shoals cannot dispute that Voltage imported these samples because its expert, Mr. Brooks received those samples, cut them open, and testified about them during the evidentiary hearing. *Id.* Similarly, Voltage contends that its expert, Dr. Cameron, also received the same set of physical

[9] Staff does not address this factor. *See* SIB at 34-35; SRB at 25-26.

samples, took CT scans of the samples, analyzed them, and testified about them at the evidentiary hearing. *Id.*

Shoals does not specifically dispute that this factor is met.[10, 11] *See* CIB at 64-72; CRB at 28-33.

The evidence of record demonstrates that Voltage imported physical samples of the Voltage AD Trunk Bus. *See* RX-0066C; RX-0067; RX-0084C; RX-0337C, RX-0339C; RDX-0008C at 4; Tr. (Ge) at 918:22-919:14, 936:12-24. Shoals' expert, Mr. Brooks, also testified that he received those samples and examined them. *See* Tr. (Brooks) at 452:3-454:11; 462:24-464:15. Moreover, Shoals and Voltage filed a Joint Stipulation whereby "Voltage stipulates that it has imported into the United States and sold after importation into the United States at least one unit of each of the Accused Voltage Products." *See* EDIS Doc. ID 814046 (Joint Stipulation of Shoals and Voltage) at ¶¶ 4, 6; *see also id.* at ¶ 3 (defining "Accused Voltage Products" as "Voltage's String Harness that includes one or more in-line fuses and LYNX Trunk Bus products, *including any alternative designs*") (emphasis added). The undersigned finds that this factor is satisfied.[12]

[10] While Staff does not specifically address this factor, Staff cites to testimony from Ms. Ge where she states that the alternative designs were finalized in September 2023 and imported later the same year. *See* SIB at 35; Tr. (Ge) at 936:14-20.

[11] With respect to whether the Voltage AD Trunk Bus is sufficiently fixed, Shoals argues that "Voltage could not credibly certify (and neither Shoals nor Customs are able to verify by visual inspection) that any given shipment of AD LYNX products conformed to the design depicted on paper." CIB at 71. This argument is unpersuasive with respect to the importation factor, as that goes to whether the Voltage AD Trunk Bus products actually infringe the claims of the '153 patent (*i.e.*, the parties' dispute as to whether [redacted] rather than whether they have been imported.

[12] The undersigned also notes that "while importation may be relevant to the inquiry, actual importation of the redesign is not a mandatory requirement." *Oligosaccharides*, Comm'n Op. at 18 n.21.

3. Sufficiently Fixed in Design and Sufficiently Disclosed During Discovery

Voltage asserts that the Voltage AD Trunk Bus products are sufficiently fixed in design. RIB at 64. Voltage contends that it disclosed the details of the modifications starting in September 2023 continuing through the end of fact discovery. *Id.* at 64-65. According to Voltage, the totally of the evidence produced by Voltage clearly indicated that all of the Voltage AD Trunk Bus products [redacted]. *Id.* at 65. In addition, Voltage contends that the Voltage AD Trunk Bus products produced in November 2023 [redacted] *Id.* Voltage argues that those designs were sufficiently fixed such that Shoals could assert infringement contentions for them and its infringement expert could offer opinions on them, including at the evidentiary hearing. *Id.* Voltage asserts that "the design has been sufficiently fixed since Voltage contracted for and obtained the mold dies for its AD Trunk Bus, and has not found any need to further change the design." *Id.* at 69. Voltage disputes Shoals' argument that there is a mismatch between the physical products and the engineering drawings because Voltage contends that the [redacted] RRB at 25. According to Voltage, [redacted]. *Id.* at 25-26. In addition, Voltage claims that Shoals mistakenly relied on one single two-dimensional cross-section view of one Voltage AD Trunk Bus sample while Mr. Brooks' cross-section of the other half of the same sample showed that [redacted]. *Id.* at 26. Moreover, Voltage submits that Dr. Cameron's CT scans confirm that [redacted] of each sample of the Voltage AD Trunk Bus. *Id.*

Furthermore, Voltage claims that it sufficiently disclosed the technical features and functionality of the Voltage AD Trunk Bus during discovery. RIB at 71. Voltage submits that it produced technical documentation, contentions, and physical samples. *Id.* at 71-72. For example, Voltage contends that it first produced design documents and disclosed its alternative design in September 2023, produced product samples and more product drawings in October 2023, and produced more product samples in November 2023. *Id.* at 72-73. Voltage argues that the information it produced is sufficient to assess the features relevant to the asserted patent claims. *Id.* at 73-74. In addition, in response to Shoals' argument that the drawings allegedly differ from the product samples, Voltage contends that "[a]ll of the evidence produced by Voltage consistently shows that Voltage's AD Trunk Bus [redacted]." RRB at 28.

Shoals argues that according to the engineering drawings, [redacted] but that "Voltage did not disclose any drawings or procedures indicating how it intended to implement what would likely be a [redacted] none of the fully manufactured mold drop samples provided for examination by Shoals' expert Mr. Brooks conforms to the drawings; and no two of those samples are alike." CIB at 65-66. For example, Shoals contends that in one of the samples, [redacted]. *Id.* at 66-67. Shoals similarly claims that other samples do not conform to where the engineering drawings [redacted]. *Id.* at 67-68. Shoals further argues that mid-production samples of the undermold cannot show that the products are sufficiently fixed. *Id.* at 69. In addition, Shoals argues that one of the samples' "[redacted]

[redacted]."[13] *Id.* at 69-70. Thus, Shoals contends that "Voltage's alternative design is flawed and requires, at least, further development before it can be implemented for commercial products." *Id.* at 71. Shoals claims that "the mismatch between physical products and engineering drawings calls into question whether Voltage could ever reliably manufacture the product shown in the drawing." *Id.* at 71-72. Shoals therefore argues that Voltage fails to meet its burden on the third and fourth *Oligosaccharides* factors. *Id.* at 71.

Staff contends that during fact discovery, Voltage disclosed changes to the Voltage Trunk Bus and produced physical samples of the Voltage AD Trunk Bus as well. SIB at 34. Staff submits that Ms. Ge testified that the [redacted] design was fixed because she testified that the designs were finalized in September 2023 and imported later the same year. *Id.* at 35. In addition, Staff cites to testimony from Ms. Ge where she states that [redacted] finalized designs needed to produce the Voltage AD Trunk Bus. *Id.* According to Staff, Voltage also produced technical documentation well in advance of the close of fact discovery that is sufficient to assess the features relevant to the asserted patent claims – in particular, [redacted]. *Id.* In addition, Staff contends that Shoals had the opportunity to question Ms. Ge as Voltage's corporate designee. *Id.* Staff therefore submits that the Voltage AD Trunk Bus products should be adjudicated in this investigation. *Id.*

[13] The undersigned finds this argument unpersuasive. Shoals does not present credible evidence to support the claim that there is "evidence of manipulation of the mid-production samples." *See* CIB at 69-71. Moreover, Shoals' expert, Mr. Brooks, admitted that his theory that [redacted] was "conjecture." *See* Tr. (Brooks) at 452:18-453:2.

The evidence of record demonstrates that Voltage AD Trunk Bus is sufficiently fixed in design and has been sufficiently disclosed by Voltage during discovery. Ms. Ge, Voltage's co-founder and corporate representative, testified that the design for the Voltage AD Trunk Bus was finalized in September 2023 and the samples were produced and imported in October and November 2023. *See* Tr. (Ge) at 936:14-24. In addition, Ms. Ge testified that the design of the Voltage AD Trunk Bus was finalized in September 2023 because Voltage [redacted]" and that the mold structure has not changed since October 2023.[14] *See id.* at 937:1-12. Also, as discussed above with respect to the second *Oligosaccharides* factor, the evidence shows that Voltage imported physical samples of the Voltage AD Trunk Bus. Moreover, both of the private parties' experts had the opportunity to examine the physical samples of the Voltage AD Trunk Bus and testify regarding them at the evidentiary hearing. *See* Tr. (Brooks) at 451:22-454:11, 462:24-15; CDX-0005C at 107-113; Tr. (Cameron) at 1100:12-20, 1109:25-1112:5; RDX-0002C at 50, 65-66; CRB at 30-31 ("Shoals' expert, Mr. Brooks, and Voltage's expert, Dr. Cameron, each examined AD LYNX samples

[14] Moreover, the undersigned finds that Shoals' argument that the Voltage AD Trunk Bus is not sufficiently fixed because further development is needed before it can be implemented for commercial products is unpersuasive. *See* CIB at 71. As the undersigned previously explained in *Certain Electrical Connectors and Cages, Components Thereof, and Products Containing the Same*, "[s]imilar arguments have been rejected by other Administrative Law Judges applying the *Oligosaccharides* factors." Inv. No. 337-TA-1241, Final Initial Determination, EDIS Doc. ID 767918, at 35-36 (Mar. 11, 2022) (citing *Certain Mobile Devices with Multifunction Emulators*, Inv. No. 337-TA-1170, Final Initial Determination, EDIS Doc. ID 738549, at 10-16 (Mar. 16, 2021); *Certain Electronic Devices, Including Streaming Players, Televisions, Set Top Boxes, Remote Controllers, and Components Thereof*, Inv. 337-TA-1200, Final Initial Determination, EDIS Doc. ID 747669, at 90-91, (July 9, 2021)), *aff'd*, Comm'n Op., EDIS Doc. ID 781376, at 13 (Sept. 30, 2022); *id.* (finding redesign products disclosed during discovery sufficiently fixed in design where technical documents, drawings, and physical samples were produced during discovery); *see also Certain Unmanned Aerial Vehicles and Components Thereof*, Inv. No. 337-TA-1133, Comm'n Op., EDIS Doc. ID 719009, at 24 (Sept. 8, 2020) ("the Commission does not require that a redesign involve a commercial product in order to be adjudicated"). The record evidence shows that the Voltage AD Trunk Bus, as disclosed during discovery in technical documents and physical samples, is sufficiently fixed in design.

having a dual-drop line configuration."). Indeed, based in part on the physical samples, Shoals was able to assert infringement contentions for the Voltage AD Trunk Bus and its expert, Mr. Brooks, was able to offer opinions regarding infringement for the Voltage AD Trunk Bus.[15] *See* JX-0314C (Exhibit to Shoals' Infringement Contentions – Claim Chart for Voltage AD Trunk Bus); Tr. (Brooks) at 451:22-454:11, 462:24-465:15; CDX-0005C at 107-113. The evidence therefore shows that the Voltage AD Trunk Bus products are sufficiently fixed such that an infringement determination can be made. *See Certain Microfluidic Devices*, Inv. No. 337-TA-1068, Comm'n Op., EDIS Doc. ID 698855, at 21-22 (Jan. 10, 2020) ("Although the imported prototypes of Next GEM Chip were not final commercial products, the step emulsification design was sufficiently fixed such that an infringement determination could be made.") (internal citations omitted); *Certain Electronic Devices, Including Streaming Players, Televisions, Set Top Boxes, Remote Controllers, and Components Thereof*, Inv. 337-TA-1200, Final Initial Determination, EDIS Doc. ID 747669, at 90-91 (July 9, 2021) (finding redesign products be sufficiently fixed in design where respondents produced physical samples in discovery, although the documentation for the redesign products had not been updated and the products were not ready for mass production), *aff'd in relevant part by* Comm'n Op., EDIS Doc. ID 757848, at 14 n.7 (Dec. 3, 2021).

Relatedly, the evidence of record shows that the Voltage AD Trunk Bus was sufficiently disclosed during discovery. Voltage disclosed the modifications in the Voltage AD Trunk Bus in interrogatory responses, product and mold drawings, photographs, and physical samples starting

[15] Shoals' argument that the samples did not conform to the drawings is not persuasive as to whether the Voltage AD Trunk Bus is sufficiently fixed. *See* CIB at 66-69. The Voltage AD Trunk Bus is sufficiently fixed such that an infringement determination can be made, and the parties have been able to present their arguments regarding whether the evidence demonstrates that the Voltage AD Trunk Bus products have an [redacted]." *See* Part VI *infra*.

in September 2023 and continuing through fact discovery.[16] *See* JX-0199C (Voltage's Interrogatory Responses) at 15-21; JX-0156C; RX-0068C; RX-0069C; RX-0070C; RX-0071C; RX-0072C; RX-0073C; RX-0074C; RX-0075C; RX-0076C; RX-0077C; RX-0078C; RX-0079C; RPX-0038C; RPX-0039C; RX-0337C; RPX-0040C; RPX-0041C; RPX-0042C; RPX-0043C; RX-0339C. As noted above, Ms. Ge testified at the evidentiary hearing about the design of the Voltage AD Trunk Bus. *See* Tr. (Ge) at 918:22-919:17, 920:10-19, 936:14-937:24, 970:9-971:10. Shoals had the opportunity to question Ms. Ge at her deposition regarding the Voltage AD Trunk Bus. *See* JX-0210C (Ge Dep.) at 156:19-172:19. Also, as noted above, given the information produced, Shoals was able to assert infringement contentions against the Voltage AD Trunk Bus products and its expert was able to provide his opinions regarding infringement *See* JX-0314C (Exhibit to Shoals' Infringement Contentions – Claim Chart for Voltage AD Trunk Bus); Tr. (Brooks) at 451:22-454:11, 462:24-465:15; CDX-0005C at 107-113. The evidence thus demonstrates that the Voltage AD Trunk Bus was sufficiently disclosed during discovery. *See Certain Microfluidic Devices*, Comm'n Op. at 21 ("Moreover, it appears, based on Complainants' infringement allegations, that no additional discovery was needed."). Indeed, "the test for adjudicating redesigns does not require extensive discovery"; rather, "the test requires discovery that is sufficient for the complainant to assess the features relevant to the asserted patent claims." *Oligosaccharides*, Comm'n Op. at 20 n.22. Moreover, given that the Voltage AD Trunk Bus was disclosed during fact discovery, Shoals could have sought additional discovery, if needed. *See id.* at 23 ("If Glycosyn and its expert deemed such evidence to be

[16] Shoals concedes that Voltage disclosed "some engineering drawings of the AD LYNX mold, three production samples of the mold drop, and three mid-production samples (i.e., partially completed samples) of the mold drop." *See* CIB at 65; *see also* CRB at 28 ("Voltage relies on design drawings, documentation, and physical samples to show that the AD LYNX was 'sufficiently disclosed' and is 'sufficiently fixed.'").

insufficient, Glycosyn could and should have taken available procedural steps, such as a motion to reopen discovery or to compel further discovery, because the burden of establishing infringement remains with Glycosyn.").

* * *

Accordingly, the undersigned finds that the *Oligosaccharides* factors weigh in favor of adjudicating the Voltage AD Trunk Bus products in this investigation.

V. THE ASSERTED PATENT AND PRELIMINARY ISSUES

U.S. Patent No. 11,689,153 ("the '153 patent," JX-0089) is titled "Lead Assembly For Connecting Solar Panel Arrays to Inverter" and names Dean Solon as the inventor. '153 patent, cover. The patent issued from an application filed on April 8, 2021, is a continuation of U.S. Application No. 14/849,458 filed on September 9, 2015 (now U.S. Patent No. 10,992,254 ("the '254 patent," JX-0087)), and claims priority to provisional application No. 62/047,773 filed on September 9, 2014. *Id.*

A. Ownership

The '153 patent is assigned to Shoals. *See* Am. Compl. at ¶ 48, Ex. 22; JX-0089. Voltage does not dispute that Shoals has sufficient rights to assert the '153 patent as the owner and assignee of all rights of the '153 patent. *See generally* RIB; RRB; *see also* SIB at 4 ("Shoals is the sole owner by assignment of all rights, title, and interest in the Asserted Patent.").

B. Specification

The '153 patent discloses "assemblies for connecting solar panel arrays to an inverter, without the need of a combiner box." '153 patent at 1:21-24. The patent states that conventional solar power configurations, as shown for example in Figure 1 (reproduced below), include a plurality of solar panels 30, each connected to a central combiner box 36, with a plurality of

combiner boxes (not shown) connected to an inverter, which converts the direct current (DC) generated by the solar panels into alternative current (AC).

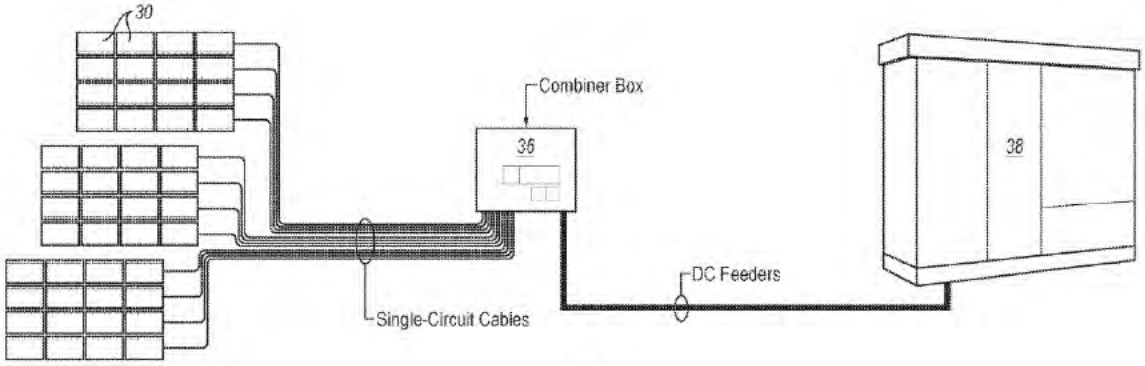


FIG. 1
Prior Art

Id. at 1:25-30, Fig. 1. The patent further states that wire harnesses can connect multiple solar panels in an array so that each array has a single input via wire harness into the combiner box. *Id.* at 1:37-39; *see also id.* at Fig. 2. However, the patent states that a combiner box is still a necessary component because the energy coming from solar arrays must be combined prior to going into the inverter and thus, "there is a need for a device that renders a combiner box unnecessary." *Id.* at 1:44-47, 1:55-56.

The '153 patent states that a system of the present invention, as shown for example in Figure 3 (reproduced below), may include a plurality of solar panels 30 that are preferably coupled using wire harnesses 34, which each include a plurality of branches each connecting to one solar panel and a central truck that terminates in wire harness connector 35.

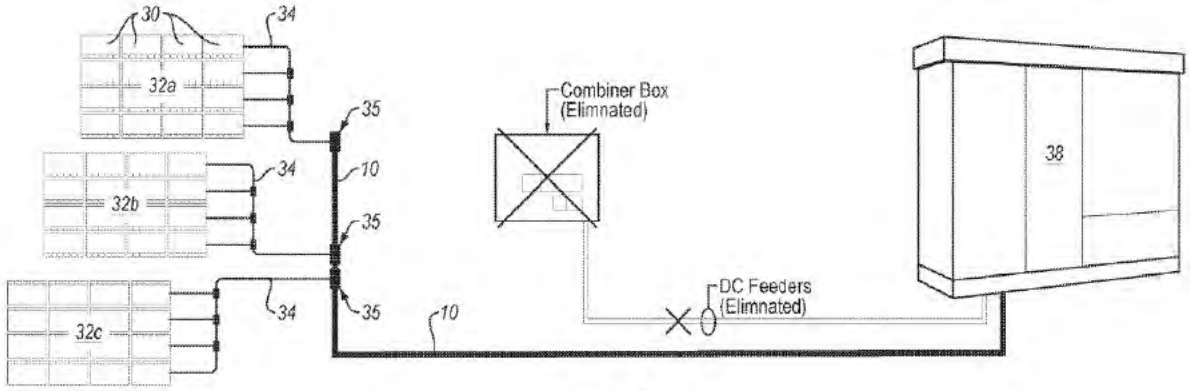


FIG. 3

Id. at 4:38-45, Fig. 3. The patent further discloses that each wire harness may be connected at wire harness connector 35 to drop line connector 13 (not shown) of lead assembly 10. *Id.* at 4:46-47. As shown, for example, in Figure 5 (reproduced below), the patent states that lead assembly 10 generally may include drop line 12 joined to feeder cable 14 at joint 17.

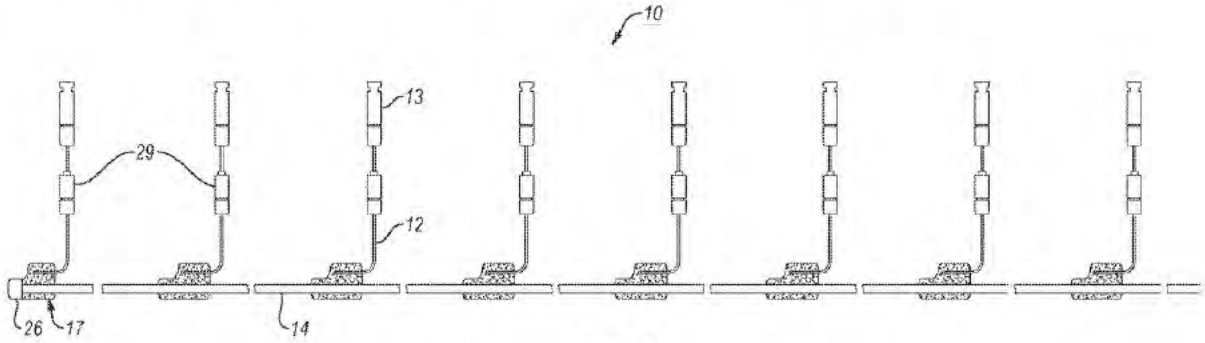


FIG. 5

Id. at 4:56-57, Fig. 5. As shown for example in Figure 29 (reproduced below), the patent discloses that each drop line 12 and feeder cable 14 may be held together by compression lug 20, which is surrounded by undermold 22, which is surrounded by overmold 24.

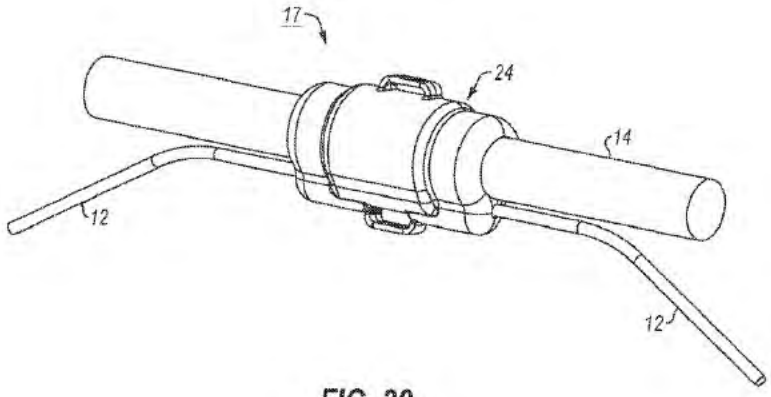


FIG. 29

Id. at 4:58-5:8, Fig. 29. Furthermore, the patent discloses that drop line 12 and feeder cable 14 may electrically couple at nexus 19 of joint 17, as shown for example in Figure 37 (reproduced below).

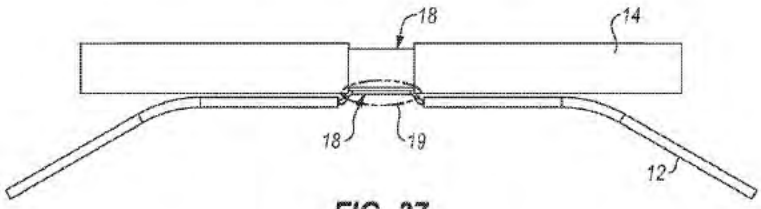


FIG. 37

Id. at 5:61-62, Fig. 37.

C. Asserted Claims

Shoals asserts claims 1, 11-14, 18, 21, 23, and 24 of the '153 patent against the Voltage Trunk Bus and asserts claims 21 and 24 of the '153 patent against the Voltage AD Trunk Bus. CIB at 33-52, 72-74. Shoals also relies on claims 1 and 21 of the '153 patent for purposes of the domestic industry requirement. *Id.* at 75-83. Claims 1, 11-14, 18, 21, 23, and 24 are reproduced below (with claim limitation identifiers added[17]):

1. [1.p] A lead assembly for use in a solar energy installation including:

[17] Voltage and Staff use the same identifiers to refer to the claim limitations, which the undersigned adopts herein. *See, e.g.*, RIB at xi-xii; SIB at 17-19.

[1.a] a drop line terminating at a drop line connector, the drop line connector configured to connect with a central trunk of a wire harness, the central trunk of the wire harness having a plurality of branches that each are configured to electrically connect to a separate solar panel contained in an array of a plurality solar panels;

[1.b] a feeder cable electrically coupled to the drop line at a nexus;

[1.c] an undermold that fully encases the nexus, the undermold further comprising:

[1.c.i] a first aperture extending completely through the undermold and having a first diameter, wherein the feeder cable extends through the first aperture along a first longitudinal axis; and

[1.c.ii] a second aperture extending partially through the undermold and having a second diameter different than the first diameter, wherein the drop line extends from the second aperture along a second longitudinal axis;

[1.c.iii] a third aperture extending partially through the undermold and having a third diameter different than the first diameter, wherein a second drop line extends from the third aperture along a third longitudinal axis; and

[1.d] an overmold surrounding the undermold and forming an undermold-overmold interface at an outer surface of the undermold.

11. The lead assembly of claim 1, wherein the drop line includes a fuse.

12. The lead assembly of claim 1, wherein said lead assembly combines power received from the plurality of solar panels and conducts that power directly to an inverter electrically connected to the feeder cable.

13. The lead assembly of claim 1, wherein the second drop line terminates at a second drop line connector, the second drop line connector configured to connect with a central trunk of a second wire harness, the central trunk of the second wire harness having a plurality of branches the each are configured to electrically connect to a separate solar panel contained in a second array of a plurality of solar panels.

14. The lead assembly of claim 13, wherein the lead assembly is configured to combine electrical power received from the array of solar panels and the second array of solar panels at the nexus and to deliver the combined

electrical power to an inverter that is in electrical communication with the feeder cable.

18. The lead assembly of claim 15, wherein the electrical coupling between the feeder cable, the drop line and the second drop line at the nexus is secured with at least one of a compression lug, a solder connection, a splice, and a crimp.

21. [21.p] A solar power system comprising:

[21.a] a plurality of solar panels each electrically coupled to one of a plurality of branches of a wire harness to form a first solar array;

[21.b] a lead assembly comprising:

[21.b.i] a drop line electrically connected to a central trunk of the wire harness and configured to receive power from the plurality of solar panels;

[21.b.ii] a second drop line electrically connected to a central trunk of a second wire harness and configured to receive power from a plurality of solar panels in a second solar array;

[21.b.iii] a feeder cable, the feeder cable electrically connected to the drop line and the second drop line at a nexus; and

[21.b.iv] a primary mold that fully encases the nexus so as to substantially seal the nexus from external environmental conditions, the primary mold further comprising:

[21.b.iv.a] a first aperture extending completely through the primary mold and having a first diameter, wherein the feeder cable extends through the first aperture;

[21.b.iv.b] a second aperture extending partially through the primary mold and having a second diameter smaller than the first diameter, wherein the drop line extends into the second aperture and

[21.b.iv.c] a third aperture extending partially through the primary mold and having a third diameter smaller than the first diameter, wherein the second drop line extends into the third aperture.

23. The solar power system of claim 21, further comprising a secondary mold surrounding the primary mold and forming an undermold-overmold interface at an outer surface of the primary mold.

24. [24.p] A solar power system comprising:

> [24.a] a plurality of solar panels electrically coupled by a wire harness to form a first solar array;
>
> [24.b] a lead assembly comprising:
>
> [24.b.i] a first drop line electrically connected to the wire harness and configured to receive power from the plurality of solar panels;
>
> [24.b.ii] a feeder cable, the feeder cable electrically connected to the drop line at a nexus;
>
> [24.b.iii] a primary mold that fully encases the nexus so as to substantially seal the nexus from external environmental conditions, the primary mold further comprising:
>
> [24.b.iii.a] a first aperture extending completely through the primary mold and having a first diameter, wherein the feeder cable extends through the first aperture along a first longitudinal axis;
>
> [24.b.iii.b] a second aperture extending partially through the primary mold and having a second diameter smaller than the first diameter, wherein the drop line extends into the second aperture along a second longitudinal axis; and
>
> [24.b.iv] a second drop line electrically connected to a second wire harness that connects to a plurality of solar panels, the second drop line electrically connected to the feeder cable at the nexus fully encased by the primary mold, wherein the second drop line extends into a third aperture defined by the primary mold along a third axis.

'153 patent at cls. 1, 11-14, 18, 21, 23, and 24.

D. Level of Ordinary Skill in the Art

The *Markman* Order stated: "A person of ordinary skill in the art would have had at least a bachelor's degree in mechanical or electrical engineering or a related scientific field and at least two years experience working with photovoltaic systems and electrical wiring, with recognition that more education could substitute for experience and that experience combined with training could substitute for formal education." Order No. 16, EDIS Doc. ID 814515, at 12. The *Markman* Order also noted that "the parties have not identified any meaningful dispute

regarding the level of ordinary skill in the art." *Id.*; *see also Markman* Tr. at 239:2-12 (all parties agreeing that any differences in the parties' proposed definitions for the level of ordinary skill in the art did not make a difference in terms of claim constructions at issue).[18]

Prior to the evidentiary hearing, Shoals filed a motion *in limine* seeking to exclude or limit testimony from Voltage's invalidity expert, Dr. Kenny, arguing that he does not qualify as a person of skill in the art. *See* Mot. Dkt. No. 1365-024. That issue was deferred in Order No. 26, which found that more detailed briefing and consideration of the definition of a POSA was warranted in view of this dispute:

> Because the dispute raised by Complainant's motion focuses in part on differences among the parties' definitions for the purposes of invalidity (*see* Mem. at 5), the undersigned finds that a more detailed consideration of the definition of a POSA is warranted. *See* Resp. Opp. at 1-2. The parties should address this issue in post-hearing briefs, with citations to relevant record evidence. For purposes of the hearing, and based on the qualifications set forth in Respondents' opposition (*see* Resp. Opp. at 4-6), Dr. Kenny is not precluded by this order from offering testimony. If the evidence ultimately shows that he does not have the requisite education and/or experience, then his testimony will not be relied upon as evidence of the perspective of a skilled artisan.

Order No. 26, EDIS Doc. ID 816890, at 3-4 (Mar. 8, 2024). Thus, the parties dispute whether Voltage's invalidity expert, Dr. Kenny, qualifies as a person of ordinary skill in the art in addition to disputing the proper expertise for one of ordinary skill in the art, as summarized in the following section.

[18] The level of ordinary skill in the art set forth in the *Markman* Order closely tracked that of the parties' proposals. *See* Order No. 16 at 12.

1. The Parties' Positions[19]

Shoals does not argue that a modification to the level of ordinary skill in the art as previously set forth in the *Markman* Order is necessary and contends that Dr. Kenny admitted that "there is no dispute as to the pertinent field." *See* CIB at 13, 96; CRB at 40-41 ("the Markman Order's definition correctly requires photovoltaic training"). Shoals states that it "understands 'electrical wiring' in the phrase, 'photovoltaic systems and electrical wiring,' to refer to electrical wiring in the context of photovoltaic systems, rather than electrical wiring more generally" and that "[b]ased on this understanding, Shoals does not propose any modifications to the definition." CIB at 13.

Under this approach, Shoals argues that Dr. Kenny does not qualify as a person of ordinary skill in the art.[20] *Id.* at 96. Shoals contends that Dr. Kenny admits to not having any experience with photovoltaic systems. *Id.* at 97. In addition, Shoals argues that Dr. Kenny cannot substitute the lack of practical experience with additional education because he has no education

[19] None of the parties appear to dispute the portion of the level of ordinary skill set forth in the *Markman* Order regarding education (*i.e.*, that a person of ordinary skill in the art would have "a bachelor's degree in mechanical or electrical engineering or a related scientific field"). *See, e.g.*, CRB at 40; RIB at 21; SIB at 56.

[20] Shoals also points to the experience of Voltage's infringement expert, Dr. Cameron, and asserts that "Mr. Brooks and Shoals' other technical expert witness, Josh Weiner, were the only experts to testify at the hearing whose qualifications aligned with the Judge's determination that the level of skill in the art required 'at least two years experience [or educational equivalent] working with photovoltaic systems.'" *See* CIB at 26 (referencing "Dr. Cameron, admitted only as an 'expert in mechanical engineering and electrical connectors'"). To the extent that Shoals is arguing that Dr. Cameron does not qualify as a person of ordinary skill in the art, the undersigned finds that argument waived. Shoals did not object to Dr. Cameron's testimony in its prehearing brief, in any motions *in limine*, or at the evidentiary hearing. Moreover, the record evidence shows that she has an undergraduate degree in mechanical and aerospace engineering, with minors in engineering physics, applied and computational mathematics, and materials science and engineering, a master's in mechanical engineering, a Ph.D. in mechanical engineering with a minor in materials science, worked part-time at a solar startup company while an undergraduate student, and worked on various solar projects throughout her career. *See* Tr. (Cameron) at 1044:21-1045:4, 1045:16-20. Shoals has not shown that Dr. Cameron's testimony should be precluded and the undersigned has considered her testimony providing appropriate weight.

related to photovoltaic systems and electrical wiring of photovoltaic systems as it relates to the '153 patent. *Id.*; CRB at 43. While Shoals acknowledges that Dr. Kenny may have taken some classes related to the underlying semiconductor physics, Shoals asserts that he admitted that this experience has nothing to do with the "back-of-glass" wiring (or EBOS) aspect of photovoltaic systems, which Shoals submits is the field of the '153 patent.[21] CIB at 97. Shoals contends that Dr. Kenny's only photovoltaic experience was related to personal use of "lower-power applications for consumer-grade electronics." *Id.* Shoals further contends that Dr. Kenny did not take any classes specific to installing or building solar installations. *Id.* at 98. In addition, Shoals submits that Dr. Kenny does not have any solar-related certifications or accreditations, or any working knowledge of codes or standards that relate to solar. *Id.* Shoals contrasts that with the training and experience of its own expert, Mr. Weiner, who Shoals claims has at least the level of ordinary skill in the art as defined by the ALJ. *Id.* at 99.

Shoals also argues that Voltage eliminates "photovoltaic systems" from the definition of the level of ordinary skill in the art. CRB at 40. Moreover, Shoals disputes Voltage's claim that Dr. Kenny is qualified to opine on anything that involves physics. *Id.* Shoals asserts that the level of ordinary skill correctly requires photovoltaic training because the prior art, the problems giving rise to the invention of the '153 patent, and the invention itself explicitly feature photovoltaic installations and wiring. *Id.* at 41. In other words, Shoals submits that "the electrical wiring technology as it relates to photovoltaic systems is relevant for a POSA to understand the key aspects of the invention, the nature of the problem addressed, and the prior art here." *Id.* In

[21] EBOS (*i.e.*, electrical balance of systems) refers to the components and equipment that carry power from the solar panels to the inverter. *See, e.g.*, CIB at 1, 4, 25; RIB at 13; SIB at 5-6; Tr. (Macias) at 104:22-105:1; Tr. (Tolnar) at 225:21-25; Tr. (Brooks) at 384:13-19; Tr. (Kenny) at 1185:16-24, 1220:15-21; Tr. (Weiner) at 1262:2-13.

addition, Shoals opposes Voltage's assertion that Dr. Kenny must be a person of ordinary skill in the art because he can understand the '153 patent; rather, Shoals contends that he is unable to assist the ALJ in understanding the '153 patent from the required perspective of a person of ordinary skill in the art. *Id.*

Voltage submits that one of ordinary skill in the art would have expertise in "electrical wiring and connectors (potentially with any associated fuses, connectors and moldings, as Staff suggests)." RIB at 24. Voltage asserts that the specification of the '153 patent and the claims both indicate that the substance of the patent is focused on the electrical junctions (and molding covering those junctions), and not the operation of photovoltaic cells. *Id.* at 23-24. To the extent the claims may involve photovoltaic-specific technology, Voltage submits that it is only because the claims recite solar panels as sources of current routed via wire harnesses to the claimed lead assembly. *Id.* at 24. Voltage argues that the parties appear to generally agree that the relevant technology of the '153 patent is EBOS componentry, and in particular, electrical wiring, junctions, and connectors. *Id.* Voltage therefore contends that "although the claimed invention is used as a component in solar power installations, the claimed technology is focused on the routing of electrical current, rather than, for example, the photovoltaic phenomena that generates current from photons acting on solar panels." *Id.* Thus, Voltage asserts that one of ordinary skill in the art would have experience in "electrical wiring and connectors (potentially with any associated fuses, connectors and moldings, as Staff suggests)." *Id.*; *see also* RRB at 36 ("The sole inventor of the '153 patent explained that his invention simply combined strings 'on to one common cable.'"), 37 ("It should be undisputed that the '153 patent's problem is as unsophisticated as the technology itself: how to use electrical junctions to combine energy.").

Voltage further argues that Shoals improperly aims to impose a scope of relevant expertise that must include experience with EBOS for utility-scale solar power installations.[22, 23] RIB at 25. Voltage contends that Shoals' expert, Mr. Weiner, could not provide any reasoning or support for his claim that the '153 patent falls within the utility-scale category of solar installations. *Id.* at 25-26. Voltage asserts that Mr. Weiner agreed that the '153 patent claims do not require utility-scale solar installations and that an EBOS solution does not need to be used in a utility-scale solar installation in order for it to meet the '153 patent claims. *Id.* at 26. Voltage also argues that this is consistent with the prosecution history of the '254 patent where the examiner rejected an amendment to add a limitation that the claimed lead assembly "is suitable for utility-scale installations" for failing to comply with the written description requirement and for indefiniteness. *Id.* at 25-26. Furthermore, Voltage submits that during prosecution of the '153 patent, the examiner asserted prior art rejections based on non-solar related classifications. *Id.* at

[22] Even if the photovoltaic portion of the system were included in the required experience for a POSA, Voltage argues that "Dr. Kenny has more than sufficient experience, which includes, as part of his education in physics, related courses and use of related semiconductor devices in which electrons flow through band structures in which energy can be applied through photons or other means to excite carriers over certain barriers to make them available for extraction as a source of energy." RIB at 24 n.1; *see also* RRB at 39.

[23] Additionally, if Shoals' more narrow definition of POSA were adopted, Voltage argues that Shoals' expert, Mr. Weiner, may not qualify as a POSA because "[n]either Shoals nor Mr. Weiner presented any evidence demonstrating how Mr. Weiner's degree in astrophysics and astronomy is in [a] relevant field or otherwise how his experience and training could substitute for the requisite formal education." *Id.* at 28. To the extent that Voltage is arguing that Mr. Weiner does not qualify as a person of ordinary skill in the art based on his education, the undersigned finds that argument waived. Voltage did not object to Mr. Weiner's qualifications in its prehearing brief, in any motions *in limine*, or at the evidentiary hearing. Moreover, even if this argument were not waived, Mr. Weiner's qualifications exceed those of a person of ordinary skill in the art, as defined *infra*. As the evidence shows, he has a bachelor's degree in astrophysics and astronomy and a minor in physics, and physics is a related scientific field. Tr. (Weiner) at 1257:15-19. To the extent that does not strictly meet the educational requirements for the level of ordinary skill, experience combined with training could substitute for formal education, and the evidence shows that Mr. Weiner has nearly twenty years of experience working in the solar industry. *Id.* at 1257:20-1262:18.

27. In addition, Voltage asserts that even if the claims were limited to utility-scale photovoltaic EBOS systems, Shoals does not provide any "reason that experience with utility-scale photovoltaic EBOS would afford some understanding beyond the ken of an individual with knowledge and understanding of electrical wiring and connectors required to understand the '153 patent invention." *Id.* Voltage also argues, on reply, that Shoals failed to address the issue of level of ordinary skill in its initial post-hearing brief and thus "Shoals has . . . waived its right to argue for any particular level of skill of a POSA." RRB at 35.

Staff submits that Dr. Kenny's "admission should be under the ALJ's current defined level of ordinary skill in the art, or, if appropriate, under a broader art or modified level that would more clearly include Dr. Kenny."[24] SIB at 56. Staff states that "[b]ased on the entirety of Dr. Kenny's education and experience, the Staff supports the admission of Dr. Kenny both as an expert and as a person having the appropriate level of skill in the pertinent arts of photovoltaic systems and electrical wiring for the '153 Patent." *Id.* Staff contends that the technology at issue in this investigation falls within Dr. Kenny's education and formal experience. *Id.* According to Staff, "[t]he '153 Patent specification and claims both focus on the electrical junctions (and molding covering those junctions) and not the operation of photovoltaic cells, as the claims do not involve photovoltaic-specific technology." *Id.* at 57. Staff therefore submits that Dr. Kenny's background is "well-suited" to providing expert opinions in this investigation because he has a Ph.D. in physics, has been a professor for over 30 years in mechanical engineering, which includes teaching a mechatronics course that requires designing wiring systems to power and build robots from scratch. *Id.* Furthermore, Staff asserts that Dr. Kenny has experience with

[24] None of the parties appear to dispute the portion of the level of ordinary skill set forth in the *Markman* Order regarding education (*i.e.*, that a person of ordinary skill in the art would have "a bachelor's degree in mechanical or electrical engineering or a related scientific field").

photovoltaic technology from his advanced technical experience designing semiconductor devices for use in solar energy installations. *Id.* Staff disputes Shoals' argument that Dr. Kenny lacks specific experience with utility-scale solar installation and extensive photovoltaic expertise because the '153 patent does not involve photovoltaic phenomena and does not require specific work experience within the photovoltaic industry to understand. *Id.* Moreover, Staff submits that the key claim terms at issue (*i.e.*, "aperture" and "drop line") have no specific or special meaning within the solar industry. *Id.* at 58.

2. The Level of Ordinary Skill in the Art

"Factors that may be considered in determining level of ordinary skill in the art include: (1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696 (Fed. Cir. 1983). "These factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art." *Daiichi Sankyo Co., Ltd. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007); *see also Hologic, Inc. v. Minerva Surgical, Inc.*, 764 Fed. Appx. 873, 879 (Fed. Cir. 2019) ("The Board was not required to analyze level of skill in the art on a factor-by-factor basis. It is enough that it applied the principle of *Daiichi* and assessed level of skill in the art on a holistic basis."). In addition, "[t]he patent's purpose can also be informative." *Best Med. Int'l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022).

The primary dispute among the parties is the extent to which one of ordinary skill in the art requires experience and knowledge of electrical wiring in solar installations. In light of the record evidence, the undersigned finds that one of ordinary skill in the art should have significant experience with photovoltaic/solar installations. As explained in the Background section, the

patent is specifically directed to the context of solar installations and, in particular, to "assemblies for connecting solar panel arrays to an inverter, without the need of a combiner box." '153 patent at 1:20-25; *see also id.* at 1:25-30 (explaining that "conventional solar power configuration" include "a plurality of solar panels . . . each connected to a central combiner box . . . and a plurality of combiner boxes . . . connected to an inverter"); *id.* at 1:32-43 (noting recent use of "wire harness" in solar array that has "reduced the number of connections going into a combiner box"). The patent explains the disadvantages of such a combiner box and concludes that there is a need for a device that avoids its use. *See id.* at 1:44-54 (combiner boxes "are problematic because they are clumsy, prone to damage and malfunction, must be periodically maintained, and require extensive planning and skill for installation"); *id.* at 1:55-56 ("as can be seen, there is a need for a device that renders a combiner box unnecessary"). Further, the specification repeatedly indicates that the patent is directed to solar installations. *See, e.g.*, '153 patent at 5:5-7 ("Whether a single or dual drop line is most suitable depends on the configuration of the solar arrays in a field"); *id.* at 5:19-21 ("the configuration of a particular lead assembly can be modified to accommodate different solar installations"). All claims are directed to solar installations. *See, e.g.*, claim 1 (requiring a drop line configured to connect "to a separate solar panel"), claim 21 (requiring "a plurality of solar panels each electrically coupled to one of a plurality of branches of a wire harness"), claim 24 (similar). Voltage's expert Dr. Kenney appeared to acknowledge that the patent is directed to solar installations. *See* Tr. (Kenney) at 1230:1-24; *id.* at 1169:25-1170:5 ("the patent, as supported by its claims, refers to technologies for solar energy installations"). And when applying for its own patent on a "Trunk Bus" system, Voltage's only cited prior art reference was to a related Shoals patent (a parent of the '153 patent) despite testimony from the inventor (a co-founder of Voltage), that she was aware of

cabling in other industries. *See* CX-349.0002-0004, .0006, .0014 (Voltage patent application); Tr. (Ge) at 904:19-905:5, 952:9-953:6.

The evidence of record thus indicates that the "type of problems encountered in the art" and "prior art solutions to those problems," as well as the "patent's purpose" (*see supra*) all are directed to the context of wiring in solar installations.[25] While two years of experience is not necessarily required, some significant experience is needed. *Cf. Daiichi Sankyo*, 501 F.3d at 1256-57 (finding that one of skill in the art with respect to patent seeking to "create a topical antibiotic compound to treat ear infections . . . that did not have damage to the ear as a side effect" would require experience in both treatment of ear infections as well training in pharmaceutical formulations, not simply in treatment); *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1376-78 (Fed. Cir. 2012) (vacating and remanding obviousness finding of district court because, while "the prior art, the problems giving rise to the invention, and the invention itself featured the meat encasement art," the district court "discounted the importance of familiarity or experience with meat products," instead opining that "the person of ordinary skill would have familiarity with the knitting art")[26]; *Kluhsman Mach., Inc. v. Dino Paoli SRL*, C.A. No. 5:19-CV-00020, 2020 WL 4227470, at *2 (W.D.N.C. July 23, 2020) (finding that a POSITA addressing a patent directed to lug nuts used in racing vehicles required experience in "designing and machining automotive parts"); *Parah, LLC v. Mojack Distribs., LLC*, 2018 WL 4006057, at

[25] Moreover, the context of "solar installations" is not limited to the use of solar cells to generate current. As discussed above, the "combiner box" described in the patent, which the claimed lead assembly joins to the solar panel wire harness, is a combiner box for solar installations.

[26] The Federal Circuit noted that "[w]ithout some understanding of meat and meat encasement technology in various settings, the artisan of ordinary skill would not grasp many aspects of the invention" and "omitting the meat encasement art led the validity search astray." 679 F.3d at 1376. In the proceedings at the district court, the district court had held that a person of ordinary skill in the art "is a person who has a certain level of skill in the knitting arts" and had rejected a contention that the pertinent art is "knitted meat encasements." 704 F. Supp. 2d 1004, 1007 n.2 (S.D. Cal. 2010); *see also* CRB at 40-42.

*7 (D. Kans. Aug. 22, 2018) (person of ordinary skill in the art in patent directed to a method of de-scenting clothes during hunting would be "a person with at least 2 or 3 years of experience in hunting and using scent elimination products during hunting).

Voltage's and Staff's arguments do not persuasively controvert this conclusion. Voltage argues that the '153 patent's subject matter essentially concerns electrical wiring and thus there is no need for any specialized experience in in the solar field. *See* RIB at 37 ("It should be undisputed that the '153 patent's problem is as unsophisticated as the technology itself: how to use electrical junctions to combine energy."); *see also* Tr. (Kenny) at 1176:7-8 (It's just electrons. And we know from physics that all electrons are exactly the same."). However, the fact that general principles of electrical wiring and physics may apply does not mean that the relevant art, and requirements for one of skill in the art, do not include solar experience. *See Mintz*, *supra*; *see also* CRB at 41-42. As discussed above, consistent with Voltage's own patent application, the '153 patent indicates specific practical issues relating to solar installations and seeks to solve a problem pertaining to such installations. While general physics principles may be relevant to the issues addressed by the patent, this evidence indicates that a person of skill in the art requires experience with solar installations. Such experience would be relevant, *inter alia*, to understanding reasons to combine (or not combine) prior art references, from the viewpoint of one of skill in the art, to obtain the claimed solar-based invention. *See* CRB at 43-45.

Voltage further notes, in this connection, that the Examiner during prosecution relied on references that were not specific to solar energy. *See* RIB at 27 (citing JX-0088.0075-95, 0121-29, 0246-62, 0269-77). Again, that principles of electrical connection may be relevant (and may be considered in an obviousness determination, where appropriate, at least under the reasonable-pertinence test), does not mean that a person with general knowledge about electrical

connections—but no significant experience with solar installations—qualifies as one of skill in the art.[27] Similarly, while Voltage argues that the '153 patent lists classifications that are not solar-specific, Voltage notes that it also includes a classification that is. *See* Tr. (Voltage opening statement) at 74:1-4. This intrinsic evidence is consistent with requiring significant experience with photovoltaic systems, and not simply with electrical wiring.[28]

Accordingly, based on review of the parties' submissions and the full evidentiary record, the level of ordinary skill in the art set forth in the *Markman* Order is clarified as follows. A person of ordinary skill in the art would have had at least a bachelor's degree in mechanical or electrical engineering or a related scientific field and at least two years of experience with electrical wiring and connectors, including significant experience with electrical wiring in photovoltaic systems. More education could substitute for experience and that experience combined with training could substitute for formal education.

3. Dr. Kenny's Qualifications

Pursuant to the definition above, the evidence of record does not show that Dr. Kenny qualifies as a person of ordinary skill in the art pursuant to the definition set forth above. Dr. Kenny has a bachelor's degree and Ph.D. in physics, which constitutes a "related scientific field." *See* Tr. (Kenny) at 1165:9-20; RDX-0003 at 2. He is a professor of mechanical engineering at Stanford University. *See id.*

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[27] *See* Part IX.A.2 *infra* (discussing analogous art issues); *cf. Mintz*, 679 F.3d at 1377 ("the inclusion of meat encasement art within the understanding of a person of ordinary skill in this art does not preclude the use of the knitting references as analogous to the claimed invention").

[28] Voltage's waiver arguments are not persuasive. The disputed issues were discussed at length in pre-hearing submissions and Complainant's pre-hearing brief indicated that its positions had not changed, in addition to citing testimony from Dr. Kenny. *See* CIB at 13, 96; *see also id.* at 101-102 (discussing related issues concerning "field of endeavor").

However, the evidence does not show that Dr. Kenny has significant experience with wiring in photovoltaic systems. Dr. Kenny has admitted that he has "no experience with photovoltaic systems." Tr. (Kenny) at 1231:22-24. While the evidence shows that he has education and/or experience with the "[u]nderlying physics of photovoltaic systems" and the "general architecture" of electrical connections involving inverters (*see* Tr. (Kenny) at 1233:24-1234:6), the evidence fails to show that this experience can substitute for significant experience in the field of solar installations. *See* Tr. (Kenny) at 1186:23-1187:11. As discussed above, the record fails to show that his education and experience regarding underlying principles would be sufficient to provide expertise regarding the practical aspects of the invention. Accordingly, under the Federal Circuit's recent precedent in *Kyocera* his testimony cannot be considered on issues of claim construction, validity, or infringement. *Kyocera Senco Indus. Tools Inc. v. Int'l Trade Comm'n*, 22 F.4th 1369, 1376-77 (Fed. Cir. 2022) (where definition of ordinary skill in the art required experience in "designing power nailers" which the expert did not have, "the ALJ abused his discretion by admitting [the expert's] testimony on any issue that is analyzed through the lens of an ordinarily skilled artisan"); *id.* (referring to "claim construction, validity, or infringement" as issues involving the "perspective of a skilled artisan" and finding that the ALJ abused his discretion by "admitting any of [the expert's] testimony," including on literal infringement).[29]

[29] Even if Dr. Kenny's testimony is considered, however, the evidence fails to clearly and convincingly shown indefiniteness or obviousness, as discussed in Parts V.E.1 and IX.A *infra*. The obviousness analysis includes *inter alia* a persuasive and unrebutted showing of secondary considerations of non-obviousness by Shoals.

E. Claim Construction

The *Markman* Order (Order No. 16) addressed several claim construction issues. The term "primary mold" recited in claims 21 and 24 of the '153 patent was construed to mean a "mold fully encasing the nexus and substantially sealing the nexus from external environmental conditions." Order No. 16 at 35-37. The *Markman* Order further stated that "[t]o the extent there is more than one mold with these characteristics, the 'primary mold' is the innermost of such molds."[30] *Id.* at 37.

The *Markman* Order also addressed the "aperture" terms, which are discussed below.[31]

1. "aperture" terms (claims 1, 21, 24)

a. *Markman* Phase

Each of the asserted independent claims of the '153 patent include claim limitations drawn to a "first aperture," a "second aperture," and a "third aperture." *See* '153 patent, cls. 1, 21, 24; Order No. 16 at 9-11. In each claim, the claimed "first aperture" *inter alia* extends "completely through" the undermold or primary mold; and the claimed "second aperture" extends "partially through" the undermold or primary mold. In claims 1 and 21, the claimed "third aperture" extends "partially through" the undermold or primary mold, while in claim 24 the "third aperture" is "defined by the primary mold." '153 patent, cls. 1, 21, 24.

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[30] The *Markman* Order further stated: "This Order does not address whether there could be some partial molding material, which does not fully encase the nexus so as to substantially seal it from external environmental conditions, underneath the 'primary mold.' To the extent any such dispute exists . . . , it will be addressed later in the investigation. This issue, to the extent disputed, may present fact questions depending on the type and degree of any such 'molding.' It may also depend on whether there are claim construction or factual issues surrounding the meaning of 'encase.'" Order No. 16 at 37 n.31.

[31] The *Markman* Order stated that "[t]o the extent any party believes that any holdings in this Order warrant supplemental expert disclosures or procedures before the hearing that the parties could not reasonably have provided previously, the parties should meet and confer and jointly submit any proposal(s) therefor, together with justification therefor (and identifying any disputes)." *Id.* at 49-50. No submissions were received.

During the *Markman* phase of the investigation, the parties proposed the following constructions for the term "aperture":

Shoals	Voltage	Staff
"an opening into or through something; an opening, an open space between portions of matter" "all or part of a pathway for the [drop line / feeder cable] within the [undermold / primary mold]"[32]	Invalid under § 112 for lack of written description or indefiniteness, or, in the alternative: "entire pathway of the [feeder cable/drop line wire] within the [undermold/primary mold] when viewed as if the [feeder cable/drop line wire] were removed" Or "pathway into the [undermold/primary mold" along a single axis"	"entire pathway of the [feeder cable/drop line wire] within the [undermold/primary mold] when viewed as if the [feeder cable/drop line wire] were removed" Or "a three-dimensional hole or volumetric outline thereof extending from the outer surface of the [undermold/primary mold] and which defines a pathway into the void defined by the inner surface of the [undermold/primary mold] when the underlying piece or part is removed" Alternatively, invalid under § 112 for lack of written description and/or indefiniteness

See Order No. 16 at 38. As shown by these proposed constructions, the parties agreed that the "aperture" terms related to a "pathway" within the undermold or primary mold relating to a feeder cable (for the "first aperture") or a drop line or drop line wire (for the "second aperture" and "third aperture").

In the *Markman* Order, the term "aperture" was construed to mean the "entire pathway of the [feeder cable or drop line] within the [undermold or primary mold], when viewed as if the

[32] Shoals' alternative construction was first introduced in the Updated Joint Chart on December 26, 2023.

[feeder cable or drop line] were removed." *Id.* at 38-41. The *Markman* Order also found that, at least as of the *Markman* stage of the investigation, the evidence did not clearly and convincingly show that the "aperture" terms were indefinite. *Id.* at 41. The "second aperture" and "third aperture" terms were also preliminarily found to "correspond to the pathway in the undermold/primary mold of the claimed 'first drop line' and 'second drop line,' respectively."[33] *Id.* at 48-49.

b. The Parties' Current Positions

Subsequently, at the evidentiary hearing and in post-hearing briefs, the parties updated their positions on the construction of the term "aperture" as follows:

Shoals	Voltage	Staff
"Shoals agrees with the *Markman* rulings on the aperture terms." CIB at 16.	Invalid under § 112 for lack of written description or indefiniteness, or, in the alternative: "3-D hole (i.e., the entire pathway for a cable within the [undermold or primary mold]) when viewed as if	The entire "drop line" in the ALJ's construction means the entire "drop line" wire of element 12 within the undermold in the figures of the '153 patent, such as Fig. 35 SIB at 30.[34]

[33] The *Markman* Order used the terms "first drop line" and "second drop line" as set forth in the '254 patent and claim 24 of the '153 patent. Certain other claims of the '153 patent recite "drop line" and "second drop line" in conjunction with the "second aperture" and "third aperture," respectively, instead of "first drop line" and "second drop line," although they carry a similar meaning. *See* '153 patent at cls. 1, 21, 24. The terms "first drop line" and "second drop line" will be used herein for all claims.

[34] Staff also states:

> The Staff is of the view that as long as "drop line" corresponds to "drop line wire" or "drop wire," according to the Staff's "cable test," for example, the "aperture" term is not indefinite. However, if the claimed "aperture[s]" and "drop line[s]" were to be construed such that their end points are located within the undermold, then Shoals' proposal that the "aperture" necessarily ends at the first edge of the compression lug should still be rejected as being contrary to the intrinsic evidence, which consistently describes drop line as the wire used during the manufacture of the lead assembly denoted as element number 12 and including the exposed wire as element 18. Otherwise, adopting Shoals' interpretation of the ALJ's construction of "aperture" and finding that "aperture" ends at the edge of the compression lug or nexus would appear to be unsupported by the intrinsic evidence,

	the entire cable has been removed" RIB at 49.	

In connection with the updated claim construction positions, the key disputes among the parties are: (1) whether the "second aperture" and "third aperture" terms should correspond to the pathway in the undermold for a "drop line" or, in contrast, an "entire cable" or "entire 'drop line' wire"; (2) if these terms are read in terms of the pathway in the undermold of a "drop line," whether the claims are indefinite based on uncertainty regarding whether an aperture extends "completely through" or "partially through" the undermold or primary mold.

Upon review of the parties' submissions and the evidentiary record, the undersigned reaffirms the construction in Order No. 16 that "aperture" means the "entire pathway of the [feeder cable or drop line] within the [undermold or primary mold], when viewed as if the [feeder cable or drop line] were removed." *See* Order No. 16 at 41. With respect to the "second aperture" and "third aperture" terms, the relevant pathway concerns that of a "drop line," not necessarily of the entire cable or wire used to form the "drop line." The undersigned further finds that the evidence fails to show, clearly and convincingly, that the asserted claims are indefinite based on uncertainty regarding whether an aperture extends "completely through" or "partially through" the undermold or primary mold. These issues are discussed below.

> thereby raising questions as to whether, combined with all the other potential tests and possibilities raised by Respondents, the "aperture" terms are properly enabled and reasonably certain to a POSITA.

SIB at 64.

c. Discussion

i. Drop Line Disputes

The parties dispute whether the "second aperture" and "third aperture" terms should be construed in view of the pathway for the claimed first "drop line" and second "drop line," respectively, or whether they should be construed in view of the pathway for the entire wire or cable that forms the drop line. This dispute centers on how to assess the "aperture" terms in cases where a single wire or cable is used to form more than one "drop line."

Shoals contends that the intrinsic evidence makes clear that a single wire can form two drop lines. CIB at 17. For example, Shoals asserts that the specification of the '153 patent describes Figures 37 and 53 as "a dual drop lead assembly . . . with wires exposed at nexus." *Id.* *see also* CRB at 9 (asserting that "the specification expressly describes Figure 29 as having 'dual drop lines'" and that "Figure 37 shows only one drop-line wire"). Likewise, Shoals contends that during prosecution of the '254 patent, the examiner acknowledged that Figure 37 showed "two drop lines . . . joined to a feeder cable at the nexus." CIB at 17. Moreover, Shoals asserts that the specification and prosecution history require a distinction between drop lines and wires. CRB at 5. Shoals disputes Staff's contention that a person of ordinary skill in the art would view "drop line 12," as used in the specification, the same as "wire 12" or "drop wire 12" or "drop cable 12." *Id.* Instead, Shoals argues that the specification uses reference number 12 when defining it as "12–Drop line" and using it in reference to "drop line 12 and "drop lines 12." *Id.* at 6. Shoals submits that the specification never refers to "wire 12," "drop wire 12," or "drop cable 12." *Id.* In addition, Shoals asserts that there is no embodiment in the specification that discloses two drop lines, each formed of its own wire. *Id.* at 9-10.

Voltage submits that Dr. Cameron explained that a person of ordinary skill in the art would view "drop line 12," as used in the specification of the '153 patent, as the same as "wire 12" or "drop wire 12" or "drop cable 12." RIB at 49-50. Voltage asserts that the construction "should be clarified to make clear that 'drop line', like the 'feeder cable' refers to the physical structure forming the aperture within the mold." *Id.* at 51. Voltage argues that Shoals' expert, Mr. Brooks, inconsistently and incorrectly applied the *Markman*'s construction of "aperture" because he did not apply the "entire pathway" construction. *Id.* at 35-37. In addition, Voltage submits that Dr. Cameron explained how tying "aperture" to "drop line" is confusing because of how "drop line" is inconsistently used in the specification. RRB at 16-17. Voltage also disputes Shoals' use of "drop line" to describe "inputs" or "branches" and claims that it contradicts Shoals' own documents. *Id.* at 19. Furthermore, Voltage argues that Mr. Brooks admitted that "drop line" was not a term of art in the field of photovoltaic systems, that it was not used a lot in the literature, and that he did not recall seeing it used in Shoals' own product documentation. *Id.* at 19-20.

Staff contends that Shoals' claim construction position excludes at least the part of the drop line where the insulation has been removed to expose the wire that passes through as is in contact with the nexus or compression lug. SIB at 22. In Staff's view, the intrinsic evidence supports construing aperture with reasonable certainty under the Cable test in terms of how the entire drop line wire is theoretically removed to create a void inside the undermold/primary mold defining the aperture. *Id.* at 26. According to Staff, Dr. Cameron clarified that "drop line 12" would be viewed by a person of ordinary skill in the art as the same as "wire 12" or "drop wire 12" or "drop cable 12." *Id.* at 28. Staff further relies on Figure 7 of the '153 patent and asserts

that a skilled artisan would look at the apertures relating to the voids created when separately removing the entire feeder cable and the entire drop line/wire within the joint/mold. SRB at 8.

Upon consideration of the evidence of record and the parties' submissions, the undersigned finds as follows. The language of the claims indicates that the second and third apertures should be read in terms of the pathway in the undermold or primary mold for a "drop line."[35] The claims refer to a "drop line," not a "drop line wire" or "drop line cable." *See* '153 patent, cls. 1, 21, 24; CIB at 18. They also refer to the "second aperture" and "third aperture" with reference to a particular "drop line." *See, e.g., id.* cl. 1 (requiring that "the drop line extends from the second aperture" and "a second drop line extends from the third aperture"). Thus, to the extent there is a distinction between a "drop line" and "drop line wire/cable," the claim language indicates that "drop line" is the operative context. *Phillips*, 415 F.3d at 1316 ("The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.") (internal question and citations omitted).

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[35] As described in the *Markman* Order, the parties agreed that an "aperture" corresponds to a pathway within the undermold relating to a particular structure. *See* Order No. 16, at 39-40; RIMB at 32 ("the parties do not dispute that the claimed 'apertures' may include at least the empty space within a material where, *e.g.*, the feeder cable and drop line enter, if they were to be removed"); RRMB at 18 ("The three-dimensional aperture must define a pathway for the 'feeder cable / drop line,' which begins from the outer surface of the 'undermold / primary mold' and extends into the 'undermold / primary mold.'"); CRMB at 17 ("Shoals, Staff and Voltage all describe the various apertures as 'pathways' through the undermold for certain structures. Specifically, the first aperture is the feeder cable's pathway through the undermold, while the second and third apertures are pathways (again, through in the undermold) of drop lines."); SMB at 37 ("[T]he basic concept for 'aperture' can be simplified and shortened to something like 'entire pathway of the [feeder cable/drop line] within the undermold, when viewed as if the [feeder cable/ drop line] were removed."); *Markman* Tr. (Staff) at 196:24-197:1 ("the entire pathway of the feeder cable/drop line within the undermold . . . I think that's what we've been talking about"); *id.* (Compl. counsel) at 155:8-10 ("The essential agreement on aperture is that it is a pathway. It is a pathway for wires or cables into the mold. And we see this in Respondents' brief where they talk about a pathway into the void defined by the mold, a pathway into the undermold."); *id.* at 156:7-13 ("first aperture" is "pathway . . . for this big feeder cable into the mold to the nexus" and for the "second and third apertures it's the pathway into the mold for the smaller cables, the drop lines"); *id.* (Resp. counsel) at 179:5-9 ("second aperture" could be "the hole that . . .the drop line is in"); *see also* CRB at 14; RIB at 6 ("Dr. Cameron explained that in the context of the mold structure, an aperture is a . . . pathway . . . .").

Second, there is no indication in the specification that a "drop line" corresponds to the entire cable or entire wire used to form the drop line. The specification indicates that the distinction between one or two drop lines relates to the number of wire harnesses connected to a lead assembly. *See* '153 patent at 5:2-8 ("Joint 17 of lead assembly 10 may include a single ***drop line 12***, as shown in Fig. 30, or ***dual drop lines 12***, as shown in Fig. 29, corresponding with connecting to a single wire harness or two wire harnesses, respectively. Whether a single or dual drop line is most suitable depends on the configuration of the solar arrays in a field.") (emphasis added).[36] The contrast between a "single drop line 12" (Fig. 30) and "dual drop lines 12" (Fig. 29) is shown below:

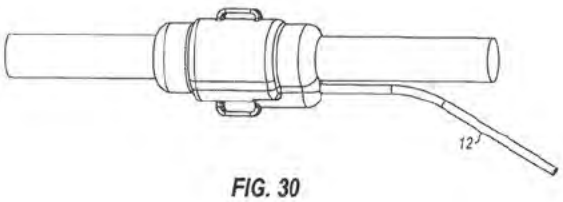


FIG. 30

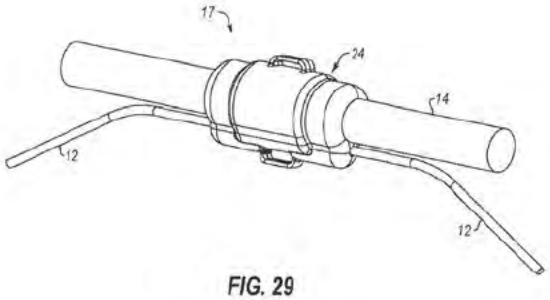


FIG. 29

[36] The evidence also shows that a"drop line" can be a type of "branch." *See* Tr. (Cameron) at 1086:6-16 (for purposes of her expert report and deposition testimony "drop line" means "branch"). The parties' disputes regarding the meaning of "drop" do not change the evidence discussed above regarding the meaning of "drop line."

Id. at Figs. 29-30; *id.* at 4:18 (structure 12 corresponds to "Drop line"); *id.* at 5:4 (referring to "dual drop lines 12, as shown in Fig. 29"). The specification at no point states that the two drop lines 12 cannot be formed from a single wire, and neither Voltage nor Staff point to any intrinsic support for such a conclusion.[37] To the contrary, in reference to Figure 35 of the '153 patent, Staff stated at the *Markman* hearing that one cable "in essence" created "two drop lines." *See* *Markman* Tr. (Staff) at 194:24-195:3 (stating, in reference to Figure 35 of the '153 patent, that "this is a drop line, but it appears to indicate that the drop line goes under the compression lug and then back out, in essence creating two drop lines, but it's one cable."). Similarly, Voltage contends that Figures 29, 31, 33, 35, and 37 "represent embodiments not claimed by the '153 patent." RRB at 11.[38] Thus, under Voltage's and Staff's interpretation, none of the Figures of the '153 patent show one aperture extending completely through the undermold, and two other apertures (with at least one extending partially through the undermold), and thus would read out all preferred embodiments from the claims. *See* CRB at 9-11 (no disclosure of two drop lines, each formed of its own wire).[39]

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[37] Voltage argues that the term "drop line" is used inconsistently in the '153 patent by referencing Dr. Cameron's testimony at 1144:4-1146:24. *See* RRB at 21 n.5. This testimony, provided in response to leading questions, is not persuasive.

[38] Shoals similarly points out that Figure 37 appears to show a single wire forming two drop lines. *See* CIB at 19. The specification shows that Figure 29 refers to the same product as Figure 35. *See* '153 patent at 4:58-61 ("As shown in FIG. 35, the drop line and feeder cable are held together by compression lug 20, which is surrounded by undermold 22 (FIG. 33), which is surrounded by overmold 24 (FIG. 29)."). The prosecution history for the '254 patent similarly shows that Fig. 37 and Fig. 35 refer to the same ultimate product. *See* CIB at 20-21; JX-0085 at 128. Moreover, the Examiner observed that Figures 29 and 31-38 show "a nexus in which ***two drop lines*** are joined to a feeder cable at the nexus." JX-0085.0087 (emphasis added); CIB at 17. In view of the intrinsic record, Dr. Cameron's testimony that it "looks like" Figure 35 refers to "the entirety of the wire" as item "12" is unpersuasive to the extent she argues that Figure 35 shows one drop line and not two drop lines. *See* Tr. (Cameron) at 1144:18-1145:15.

[39] As noted by Shoals, when attempting to describe a structure covered by the claims, Voltage's expert Dr. Cameron proposed an embodiment not shown in the patent. *See* Tr. (Cameron) at 1063:7-10; RDX-002C.18; CRB at 10-11.

That a "drop line" need not correspond to the entire wire or cable used to make the drop line is consistent with the cross-examination testimony of Voltage's expert Dr. Cameron, who testified that one of the accused products (involving two drop lines formed from a single cable) was a "two-drop line" accused product where each drop line ends in the compression lug. *See* Tr. (Cameron) at 1127:9-1128:5; RDX-002C.53; *see also id.* at 1086:6-8 (for purposes of expert report and deposition, "I just used drop line to basically be the branch"). At the *Markman* hearing, similarly, all parties agreed that one cable could form two drop lines. *See* Order No. 16 at 49; *Markman* Tr. (Resp. counsel) at 184:16-19 ("So you have two different drop lines. There is now a separate question of . . . are they formed from the same cable . . . or are they formed from different cables . . . ."); *id.* (Staff) at 197:16-18 (agreeing that "one cable" would "comprise two drop lines").

Voltage's and Staff's arguments that "drop line" should mean the entire "cable" or "drop line wire" are not persuasive. As explained above, the claim language ties the "second aperture" and the "third aperture" to the "drop line" and "second drop line," respectively. There is no reason that these claim limitations must correspond to physically separate structures. *See Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1303 (Fed. Cir. 2011) (rejecting construction requiring the claimed "retainer member" and "needle holder" limitations to be "separately molded pieces"). Nor is there any reason why the claimed "first drop line" and "second drop line" cannot have some potential overlap. *See Linear Tech. Corp. v. Int'l Trade Comm'n*, 566 F.3d 1049, 1055 (Fed. Cir. 2009) (affirming "Commission's construction of 'second circuit' and 'third circuit,' defining the terms broadly to not require entirely separate and distinct circuits . . . Rather, the 'second' and 'third' circuits must only perform their stated functions."); *Applied Med. Resources Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n.3

(Fed. Cir. 2006) ("the use of two terms in a claim requires that they connote different *meanings*, not that they necessarily refer to two different *structures*") (emphasis in original). Moreover, as discussed above, Dr. Cameron testified that each drop line in a two drop-line product ends "in the compression lug," thus indicating her ability to determine what a "drop line" is. *See* Tr. (Cameron) at 1127:9-1128:5; RDX-002C.53.[40]

Accordingly, the claimed second and third "aperture(s)" should be read in view of the pathways in the undermold/primary mold of the first "drop line" and second "drop line," where the term "drop line" does not necessarily correspond to the entire cable or wire from which a drop line may be formed.[41]

[40] Voltage also argues that, under an approach that ties an aperture to a "drop line" it would be unnecessary to indicate that the aperture extends "partially through" the undermold since a drop line would necessarily extend "partially through" the undermold. *See* Tr. (Voltage opening) at 44:1-11. To the extent this language is superfluous given the other contextual claim language, the preference for avoiding superfluous words is outweighed by the other intrinsic evidence discussed above. Read in the context of the specification and prosecution history, the use of the words "completely through" and "partially through" emphasize the contrast between the apertures formed by the claimed drop lines and feeder cable. *See Laitram, LLC v. Ashworth Bros., Inc.*, Case No. 2022-1044, -45, -84, 2023 WL 3449148, at *4 (Fed. Cir. May 15, 2023) ("[o]ur preference for avoiding superfluous language is not an inflexible rule—we must still consider all other principles of claim construction, including how a skilled artisan would have understood the term and how it is used in the specification"); *SimpleAir, Inc. v. Sony Ericsson Mobile Commc'ns AB*, 820 F.3d 419, 429 (Fed. Cir. 2016) (similar); CRB at 11-12. Moreover, Voltage's approach, as discussed above, is at odds with the other intrinsic evidence.

[41] Further, as discussed *infra*, any uncertainty about precisely where, under this approach, a "drop line" ends has not clearly and convincingly been shown to affect the scope of the claims. The evidence shows that, where a drop line meets a feeder cable at a nexus, the drop line ends somewhere in the nexus. *See* Tr. (Brooks) at 483:16-17 ("the drop line clearly ends in the nexus somewhere"); *id.* at 548:7-11; Tr. (Cameron) at 1127:9-1128:5, RDX-002C.53 (both drop lines end in the compression lug); *id.* at 1157:5-10 (drop line ends "somewhere in the nexus"); *id.* at 1158:13-1160:17, Tr. (Shoals' counsel) at 1335:20-24 (marking CDX-20), CDX-0020, CIB at 22, RRB at 16; Tr. (Kenny) at 1254:5-8 (Dr. Cameron drew boundary between first drop line and second drop line "somewhere near the middle"). Under these circumstances, any corresponding aperture within an undermold that fully surrounds the nexus extends "partially through" the undermold. *See* CRB at 17-18.

ii. "Partially Through" vs. "Completely Through"

The parties further dispute whether the asserted claims are indefinite based on uncertainty regarding whether an aperture extends "completely through" or "partially through" the undermold/primary mold. *See* RIB at 128 ("one of ordinary skill in the art would not have had reasonable certainty as to whether an aperture extends partially or completely through a molding, particularly where the mold forms apertures of more complex geometry than straight lines"). As discussed below, the evidence fails to show clearly and convincingly that the claims are indefinite on this basis.

The Parties' Arguments

Voltage argues that one of ordinary skill in the art would not have had reasonable certainty as to whether an aperture corresponding to a "drop line" extends partially or completely through a molding. RIB at 128; RRB at 43. Voltage asserts that there is little to support a written description of the claimed apertures since the only reference to an "aperture" relates to receiving zip-ties through an overmold. RIB at 128. According to Voltage, there is no textual support for the interpretation of the phrase and concept of "partially extending through," which Voltage claims was introduced by the examiner during prosecution of the '254 patent. *Id.* at 129. Voltage also argues that the prosecuting attorney testified at her deposition that she did not know what the examiner intended with the amendment. *Id.* Voltage contends that there is a "void of guidance as to what aperture may mean, beyond its plain and ordinary meaning" and that "[a]s a result," there is a problem with "attempting to understand how to determine whether an aperture partially extends through a mold." *Id.* at 131.

Voltage further asserts that its expert, Dr. Kenny, summarized four tests – (1) the see-through test, (2) the cable test, (3) the start at the nexus test, and (4) the effective physical path

test – that could determine whether an aperture extends partially through. *Id.* Voltage argues that it is not clear which test Mr. Brooks applied even though he claimed to have applied the court's construction that requires the "entire pathway" of the drop line when viewed as if the drop line has been removed. *Id.* at 133. Instead, Voltage contends that Mr. Brooks' test appears to align more closely with either the start at the nexus test or the effective physical pathway test. *Id.* (citing Tr. (Brooks) at 428:13-18, 427:22-428:12, 441:16-442:17, 547:13-25, 551:18-553:2, Tr. (Staff) at 459:4-14). In either case, Voltage asserts that Mr. Brooks did not consistently consider the entire pathway. *Id.* In addition, Voltage argues that Dr. Kenny explained that for different structures, each of the four tests may provide different results. *Id.* at 133-135. Voltage therefore argues that the various tests for determining whether an aperture extends partially through a mold provide different results depending on the mold structure considered. *Id.* at 135-136. In addition, Voltage contends that Dr. Kenny testified, in relation to Figure 35 of the '153 patent, how the aperture would terminate at different places based on the various tests. *Id.* at 136-137 (citing Tr. (Kenny) at 1237:12-1238:25, 1239:4-25, 1240:1-12, 1240:22-1241:23; SDX-0003). Furthermore, Voltage asserts that Mr. Weiner did not provide a rebuttal to Dr. Kenny's opinions. *Id.* at 137-138.

Staff asserts that "adopting Shoals' interpretation of the ALJ's construction of 'aperture' and finding that 'aperture' ends at the edge of the compression lug or nexus would appear to be unsupported by the intrinsic evidence, thereby raising questions as to whether, combined with all the other potential tests and possibilities raised by Respondents, the 'aperture' terms are properly enabled and reasonably certain to a POSITA."[42] SIB at 64-65; SRB at 37. Staff submits that Dr.

[42] Shoals argues that Staff's arguments regarding enablement are too late to be considered. *See* CRB at 14 n.10. Furthermore, Shoals disputes Voltage's contention that definiteness requires both written

Kenny explained that the limited disclosure in the '153 patent related to "aperture" supported his opinion that the claims are indefinite. SRB at 37 (citing Tr. (Kenny) at 1188:11-1191:13). Staff also contends that Dr. Kenny explained that multiple reasonable possibilities exist as to the structure of the "aperture" under the various tests. *Id.* at 37-38. Staff also asserts that Mr. Brooks' annotations to an exemplary Voltage Trunk Bus Product show the first and second drop lines to be overlapping with each other. *Id.* at 38. Moreover, Staff claims that Mr. Weiner could not describe where the second aperture begins and ends in Figure 35 of the '153 patent. *Id.* at 39. Thus, Staff asserts that "[i]f the ALJ's construction of the 'aperture' terms has a requirement to determine where the claimed 'drop line' may technically terminate or end within the compression lug, then, in the Staff's view, a skilled artisan might not be able to determine with reasonable certainty based on the intrinsic evidence where—and why—a '[first] drop line' ends and where a 'second drop line' ends among the numerous, plausible examples, where overlapping drop lines would also be a likely outcome." *Id.* at 39.

Shoals argues that Mr. Brooks testified that the drop line ends (or begins) within the nexus, explaining that there is no specific point within the nexus that is the terminus of the drop line. CIB at 22 (citing Tr. (Brooks) at 553:7-557:3; RDX-0013C; RDX-0014C). Shoals claims that Dr. Cameron agreed that the first and second drop lines each end in the middle of the compression lug. *Id.* (citing Tr. (Cameron) at 1127:14-1128:5, 1158:13-1160:17; CDX-0020C). Shoals therefore asserts that "[s]o long as each drop line ends within the nexus, the aperture associated with each drop line will likewise extend no farther than its drop line, and neither aperture will extend completely through the undermold." *Id.*

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description and enablement. *See id.* Rather, Shoals asserts that "written description and enablement are (mutually distinct) requirements imposed by 35 U.S.C. § 112." *Id.*

Shoals also asserts that the fact that the specification uses "aperture" in a different context than the claims does not make the term indefinite. CRB at 14. In addition, Shoals contends that the *Markman* Order's construction provides reasonable certainty as to whether the drop line apertures extend partially or completely through a mold. *Id.* at 16. Shoals asserts that "the aperture extends no farther than the combination of mold and drop line; once either the mold or the drop line ends, so too does the aperture." *Id.* Shoals submits that Mr. Brooks testified that the drop-line apertures of products at issue do not extend into the nexus, in part, because there is no undermolding inside the nexus. *Id.* at 16-17 (citing Tr. (Brooks) at 547:21-25). Shoals claims this is consistent with how the examiner first used the term "aperture" to refer to what is formed in a mold to "allow cables and lines access to the nexus within." *Id.* at 17 (citing JX-0085 at 163, 198, 234).

Analysis

Patents are presumed valid and a party asserting invalidity must prove this by clear and convincing evidence. *See Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1344 (Fed. Cir. 2010); 35 U.S.C. § 282. "[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). The undersigned finds that Voltage and Staff have not shown by clear and convincing evidence that the claims, read in light of the specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art regarding the scope of the invention.[43] In particular, the evidence does not clearly and convincingly show that

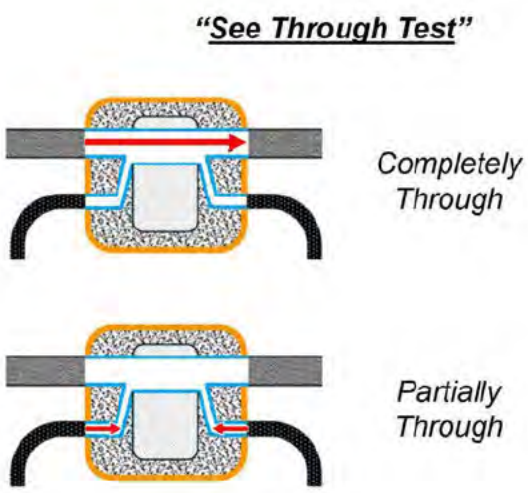
[43] Voltage's and Staff's argument regarding limited disclosures in the specification for the term "aperture" is unpersuasive. "[T]he exact terms appearing in the claim 'need not be used *in haec verba*.'" *Blue*

one of ordinary skill in the art would not have reasonable certainty as to whether an "aperture" in the undermold or primary mold extended "partially" or "completely" through the undermold or primary mold.

In support of its indefiniteness argument, Voltage primarily relies upon Dr. Kenny's testimony regarding four "tests" that could be used to assess whether an aperture extends "partially" or "completely" through the mold structure. As discussed above, Dr. Kenny's qualifications do not meet the standard for one of ordinary skill in the art and thus cannot be considered in relation to indefiniteness under *Kyocera*. Even if his testimony were considered, however, they do not show indefiniteness by clear and convincing evidence. Dr. Kenny's four tests are as follows.

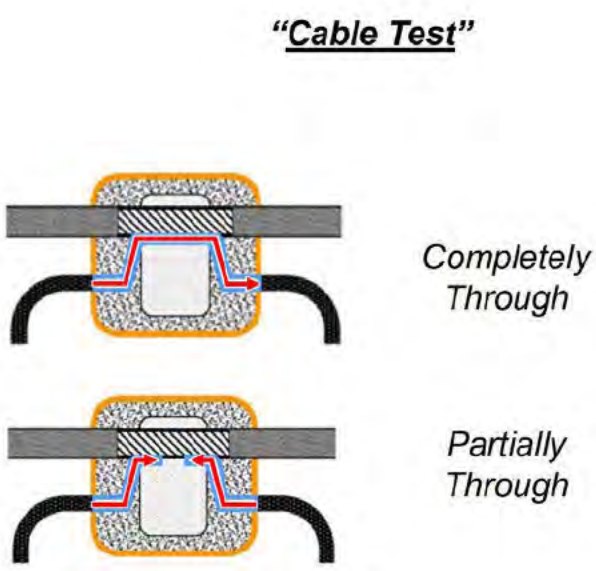
The "See-Through Test": According to Dr. Kenny, the "See Through Test" assesses an opening that you can "see through" in a straight line as an aperture running "completely through" the undermold/primary mold whereas a pathway that bends would be "partially through." *See* Tr. (Kenny) at 1192:15-1193:12. This test is illustrated by Dr. Kenny in one of his demonstratives, reproduced below:

Calypso, LLC v. Groupon, Inc., 815 F.3d 1331, 1345 (Fed. Cir. 2016) (internal citations omitted). As discussed above, the undersigned finds that one of ordinary skill in the art would understand the meaning of "aperture" in light of the patent's claims, specification (including the figures), and prosecution history.

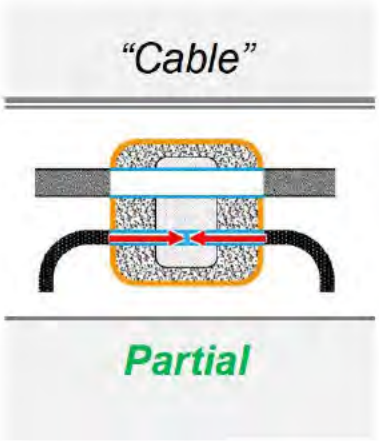


RDX-0003.0031. Dr. Kenny testified that this approach was suggested by his view that the "word aperture . . . suggested an optical kind of sensibility." *Id.* at 1192:16-22.

The "Cable Test": According to Dr. Kenny, the Cable Test is performed by removing the entire cable that makes up a feeder cable or drop line. Tr. (Kenney) at 1194:4-8. When asked how to distinguish apertures that extend "completely through" or "partially through" based on this test, Dr. Kenny stated that the distinction "arises from the original form of the cable prior to the assembly process. Was it a single cable . . . or was it two separate wires at the start of the assembly process?" *Id.* at 1194:12-20. Under the Cable Test, "the single cable version would lead to an aperture that would extend completely through; whereas any construction that began with two separate elements would lead to a situation where the aperture is only partly through." *Id.* at 1194:21-25. This test is illustrated in Dr. Kenny's demonstratives as follows:



RDX-0003.0035.

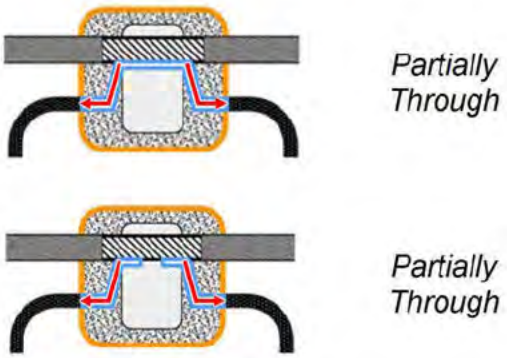


Tr. (Kenney) at 1198:6-13 and RDX-0003.0049 (explaining scenario where "you start with two separate wires and you bring them more or less together into the crimp, end-to-end, and then form the crimp" and opining that this results in "partially through" apertures under the Cable Test but "completely through" based on the See Through Test).[44]

[44] As shown by these demonstratives and by Dr. Kenny's invalidity opinions, under this test there would be two apertures for two drop lines so long as they began with separate wires, including if those wires extend to the nexus end-to-end and are crimped to form a single joint. *See* Tr. (Kenny) at 1206:13-22 (Shao meets the second aperture and third aperture limitations of the '153 patent); RX-0097.006 (Shao)

The "Start at the Nexus" Test: according to Dr. Kenny, this test assesses a pathway that starts at the nexus and extends only outwards and, in Dr. Kenny's view, "there's no possibility of a pathway passing through the compression lug." Tr. (Kenny) at 1195:1-12. Dr. Kenny based this test on his understanding "from the Markman hearing there was discussion based on a proposal by Mr. Barquist." *Id.* at 1195:2-6. Dr. Kenny testified that under his interpretation of this test, "any system where you had a cable that came in and made electrical contact at a nexus would necessarily produce an aperture that could only be partway through." *Id.* at 1199:12-22. Dr. Kenny illustrated this test as follows:

"Start at the Nexus Test"



RDX-0003.0040.

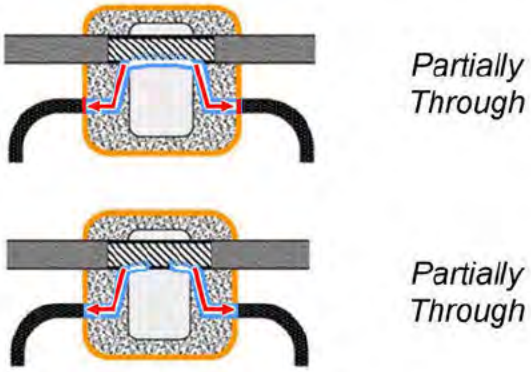
The "Effective Physical Path Test": Dr. Kenny explained that, under this test, where there is a physical pathway associated with a drop line wire, and where the wire "becomes indistinguishable from the feeder cable" then the aperture only extends partially through. Tr. (Kenny) at 1196:2-1197:10. Dr. Kenny based this test on his understanding that it "arose in the

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(the "trunk conductor and two branch-line conductors are symmetrically overlapped and crimped by means of the K-shaped branch connector 5 to form one joint"). Staff similarly ties the Cable Test to the manufacturing process. *See* SIB at 30 (explaining the Cable Test in terms of "the entire drop line/wire used during manufacturing to create one or more drops or branches").

discussion at the Markman." *Id.* at 1196:4-5. Under this test, according to Dr. Kenny, it is not possible to have a mold with an aperture that would extend "completely through." *Id.*; *see also id.* at 1199:12-16. This test is illustrated by Dr. Kenny's demonstratives as follows:

"Effective Physical Path Test"



RDX-0003.0046.

After describing the four tests and their implications for various structures, Dr. Kenny opined that, "s[m]art people have said lots of things about all of these [tests], but . . . it's not obvious to me that a person of ordinary skill in the art would automatically arrive at one particular construction. Tr. (Kenny) at 1198:25-1199:8. He concludes that "there is no reasonable certainty that a person of ordinary skill in the art would be able to tell whether a particular hypothetical structure was covered by this patent." Voltage similarly argues that "[e]ach of these tests has been considered by the parties and Staff as an appropriate test" and that there are "potentially many other reasonable tests." RIB at 136.

These arguments fail to show indefiniteness by clear and convincing evidence. Dr. Kenny's analysis describes four tests, shows that they correspond to different analyses, and concludes as a result that "there is no reasonable certainty" as to whether a "hypothetical

structure was covered by this patent." However, Dr. Kenny provides little evidence linking any of the four tests to the intrinsic record. Thus, his testimony about the possibility of four different tests providing different results does not show that the claims, read in light of the intrinsic evidence, fail to provide reasonable certainty as to their scope. *See Nautilus,* 572 U.S. at 901 ("[A] patent is invalid for indefiniteness if its claims, ***read in light of the specification delineating the patent, and the prosecution history***, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.") (emphasis added). Dr. Kenny does not, for example, show how any of the tests are supported by the specification of the patent; analyze the guidance in the specification and prosecution history; show that the intrinsic record provides contradictory indications as to the scope of the claims; or show that he considered all tests reasonably supported by the intrinsic record. To the contrary, he notes that "[p]erhaps more" tests "will be proposed and discussed." *See* Tr. (Kenney) at 1198:21-24.

Further, during the *Markman* process, Voltage proposed a construction whereby the "completely through" and "partially through" language would be assessed based on the pathway of a "feeder cable" or "drop line cable" into the "void" corresponding to the inner surface of the undermold. *See* RIMB at 40; *see generally id.* at 35-41. This approach appears generally consistent with Dr. Kenny's Cable Test. In support, Voltage cited intrinsic evidence including portions of the prosecution history, Figure 7 of the '153 patent, and the claim language at issue. Staff also supports the Cable Test and proposed it during *Markman* proceedings, also with reference to Figure 7 and the prosecution history. *See* SIB at 20; SMB at 36-39, 46-47. But neither Voltage nor Staff persuasively explain why this approach, and supporting intrinsic evidence, do not support utilizing "drop line" rather than "drop line cable" for the element that should be removed to determine the aperture (hereinafter designated the "Modified Cable

Test").[45] Voltage has not persuasively shown that the term "drop line," as described in the patent, could not be applied by one of skill in the art.[46] Moreover, this approach better reflects the language of the claims (which refer to "drop line") and the patent's figures and, unlike Dr. Kenny's Cable Test, does not import a manufacturing process limitation unsupported by any language in the specification.[47] Voltage's argument that there may be "overlapping pathways" for two different drop lines also fails to show indefiniteness. *See Linear Tech.*, 566 F.3d at 1055.[48]

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[45] Under the Modified Cable Test, the entire portion of the cable or wire constituting the "drop line" is removed, not the entire cable or wire, which may comprise other structures, including other drop lines. This approach is consistent with the "drop line" claim language (as previously discussed) as well as the *Markman* Order's construction of "aperture."

[46] Even if there may be some differing expert opinion about precisely where the drop line in different products is located, this is based on the particular electrical characteristics of the nexus. *See, e.g.*, Tr. (Brooks) at 436:23-24 (explaining that electrical connections are made at the nexus); *id.* at 554:20-555:11 (explaining that drop line path within nexus itself is "squiggly" because it "dissipates into the nexus"); *id.* at 608:11-22 (nexus is "electrically conductive material . . . therefore, the drop line becomes one with the nexus"). Voltage has not shown that any such discrepancies result in a different conclusion about whether the "aperture" resulting from removing the drop line is "partially through" or "completely through" through the undermold/primary mold when (as held above) the "second aperture" and "third aperture" are determined by reference to the pathways of the first and second drop lines and not necessarily the entire cable or wire used to manufacture them. It is ultimately claims that are held indefinite (not specific claim terms), and the evidence fails to show that any uncertainty regarding the precise endpoint of a "drop line" creates uncertainty regarding the scope of "completely through" and "partially through." *Cox Comm'ns, Inc. v. Sprint Comm'n Co. LP*, 838 F.3d 1224, 1231 (Fed. Cir. 2016) ("As *Nautilus* instructs, the dispositive question in an indefiniteness inquiry is ***whether the claims, not particular claim terms . . . fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention***.") (internal quotations omitted) (emphasis added).

[47] As explained by Dr. Kenny, the Cable Test would distinguish between two drop lines formed by one wire (which Dr. Kenny states would form one aperture running "completely through" the undermold) versus two drop lines formed by two wires that are overlapped and crimped at the nexus (which he states would create two apertures, each running "partially through" the undermold). *See* n.44 *supra*. Dr. Kenny, Voltage, and Staff cite no persuasive support for distinguishing between "completely through" and "partially through," as used in the '153 patent, on this type of process-of-manufacture basis. *See also* Tr. (Brooks) at 429:15-17 ("what it's made out of is not important").

[48] As set forth in the *Markman* Order, the "second aperture" is determined by assessing the mold structure if the first drop line were removed, while the "third aperture" is determined by assessing the mold structure if the second drop line were removed. One would not, for example, remove both the first drop line and second drop line in assessing the "second" aperture. One would also not remove the feeder cable when assessing the "second" or "third" apertures.

The undersigned further notes that the approach applied by Mr. Brooks can be understood as similar to the Modified Cable Test. Like the Modified Cable Test, Mr. Brooks assesses the structure of the undermold with the feeder cable or drop line removed. The only difference is that he disregards the pathway and associated aperture of the drop line within the nexus itself in view of the absence of undermold within the nexus. *See* Tr. (Brooks) at 547:16-20, 557:7-12.[49] Under either approach, Figure 7 provides guidance as to the meaning of "completely through." If the nexus area is included (as with the Modified Cable Test), then an aperture extends "completely through the undermold" if, were the feeder cable to be removed, an aperture extends through the undermold, from one side to the other, including through the nexus. If the nexus area is not included (as in Mr. Brooks' approach), and in view of Figure 7 of the

[49] This difference reflects a dispute among the parties regarding the meaning of "within the undermold." The patent requires a first aperture "extending completely through the undermold." During the *Markman* phase of the investigation, all parties agreed that the "aperture" terms, to the extent not indefinite, referred to pathways "***within the undermold***." *See* Order No. 16 at 39-40; RIMB at 32; RRMB at 18; CRMB at 17; SMB at 37; *Markman* Tr. (Staff) at 196:24-197:1; *id.* (Compl. counsel) at 155:8-10, 156:7-13; *id.* (Resp. counsel) at 179:5-9; *see also* CRB at 14; RIB at 6. The parties now dispute whether an aperture through the nexus is part of an aperture "within the undermold." On the one hand, within the nexus area, any aperture corresponding to the feeder cable is directly within the nexus and not directly within the undermold. *See* CRB at 16-17. On the other hand, any such aperture is ultimately within the undermold because the undermold surrounds the nexus. *See* RRB at 24. The prosecution history suggests that the nexus area should not necessarily be assessed as part of the claimed "apertures." The prosecution history indicates that the claimed "aperture" allows "access to the nexus" (suggesting the aperture is not itself part of the nexus). *See* JX-0085 ('254 File History), at SHOALS 1080. The prosecution history also indicates that apertures "displace" molding material and creates molding material having the "shape" of a cable or wire. *See* JX-0088.0078 at SHOALS 1429 ('153 patent File History) (Examiner rejection stating that prior art reference included "a first aperture extending completely through the undermold (the gel fills the volume except for where a cable/line/nexus exists; the gel would therefore have an aperture having the shape of cable 26 that through the mold as seen in Fig. 1)"); *id.* at SHOALS 1439 (Examiner rejection stating that feeder cable in prior art "would displace the material of the undermold in the form of a first aperture"); *id.* at SHOALS 1604 (similar). As shown in Figure 7 of the '153 patent, however, the portions of the feeder cable and drop lines within the nexus do not generally displace molding material; rather, the nexus/compression lug does. *See* '153 patent, Fig. 7 (indicating, in the nexus area, mold material formed in the shape of the compression lug, not the internal cables or wires). As discussed above, however, it is not necessary to resolve this issue as it is not material to the ultimate issues in this investigation.

patent and the prosecution history,[50] an aperture extends "completely through the undermold if, were the relevant feeder cable or drop line removed, there is an aperture between one outside surface of the undermold and the nexus that continues between the nexus and the other side of the undermold's outside surface.[51] It is, however, unnecessary to resolve whether the Modified Cable Test or Mr. Brooks' approach is more appropriate. Given the holding above that the claimed second and third apertures should be determined by a drop line (and not necessarily by the entire wire or cable that forms the drop line), the evidence does not show a scenario where this choice makes a difference as to whether an aperture extends "partially through" or "completely through" the undermold/primary mold for purposes of infringement, technical prong, or invalidity. *See* CRB at 17-18. Accordingly, going forward the analysis is based on the Modified Cable Test; however, the same conclusions would result using Mr. Brooks' approach in the manner discussed above.[52]

Accordingly, for the reasons discussed above, the undersigned finds that Voltage and Staff have not shown by clear and convincing evidence that the claims are indefinite based on the

[50] Both Voltage and Staff relied on Figure 7 as providing guidance during *Markman* proceedings. *See* SMB at 37, 42.

[51] In other words, under this approach the nexus is a void within the undermold that allows for continuity of an aperture, but is not itself a part of the aperture. Similarly, if one created a pencil-sized tunnel through a doughnut from one side to the other, one could say that the tunnel runs "completely through" the doughnut despite the doughnut hole interrupting the tunnel. Dr. Cameron's and Dr. Kenny's testimony that any aperture disregarding the nexus could not extend "completely through" the undermold fails to take into account the guidance of Figure 7 and the patent's other preferred embodiments, the prosecution history (*see* n.49 *supra*), and the particular geometry of the undermold, As previously stated, however, it is unnecessary to resolve this issue for purposes of the investigation. Under either this approach or the Modified Cable Test, the ultimate result is the same with respect to the issues in this investigation.

[52] Voltage argues that certain arguments by Shoals regarding how to assess an aperture were waived. *See* RRB at 15. This argument is rejected. Shoals' arguments were well within the scope of the claim construction arguments presented through the *Markman* process and at the hearing.

uncertainty in distinguishing between apertures extending "partially through" or "completely through" the undermold/primary mold.

VI. INFRINGEMENT

Shoals alleges direct infringement of claims 1, 11-14, and 18 of the '153 patent by the Voltage Trunk Bus and indirect infringement of claims 21, 23, and 24 of the '153 patent by the Voltage Trunk Bus.[53] *See* CIB at 33-52, 72-74; CISB at 1. For the reasons discussed below, the evidence shows that claims 1, 11-14, and 18 of the '153 patent are directly infringed by the Voltage Trunk Bus. The evidence fails to show indirect infringement of claims 21, 23, and 24 of the '153 patent for the Voltage Trunk Bus. In addition, with respect to Voltage's AD Trunk Bus (which is not accused but is being adjudicated), the evidence fails to show infringement of any asserted claim.

A. Representativeness

Shoals asserts that Mr. Brooks' analysis of the Voltage Trunk Bus having two drop lines and a 400 MCM feeder cable (*i.e.*, CPX-0024.1C) is representative of all Voltage Trunk Bus molds having at least two drop lines, regardless of feeder size, and establishes infringement by any Voltage Trunk Bus lead assembly having at least one such mold on it. CIB at 52. Shoals submits that Mr. Brooks examined all the Voltage Trunk Bus samples provided to him and found no differences among them in terms of structure and structural relationships at issue in the claims. *Id.* at 53. Shoals also argues that the deposition testimony of Voltage's co-founder, Mr. Wang, confirms Mr. Brooks' representativeness opinion. *Id.* at 55. In addition, Shoals and Mr.

[53] Shoals is not alleging direct infringement of claims 21, 23, or 24 by the Voltage Trunk Bus. In response to Order No. 31 directing Shoals to identify for each asserted claim of the '153 patent whether it is asserting direct and/or indirect infringement, Shoals stated that it "argues . . . indirect infringement of the asserted solar power system claims—21, 23, and 24." *See* CISB at 1; Order No. 31 (May 30, 2024).

Brooks rely on the Intertek report used to certify the Voltage Trunk Bus products.[54] *Id.* at 55-56. Shoals contends that the Voltage Intertek report, which includes illustrations of the same product configuration that Mr. Brooks selected for his infringement analysis, confirms that the product is representative of all Voltage Trunk Bus mold configurations. *Id.* at 56-59. Moreover, Shoals asserts that Mr. Brooks testified to having cut open and examined every Voltage Trunk Bus sample he received, and stated his opinion that they are all alike in terms of the requirements of the claims at issue. *Id.* at 59. Shoals also contends that in Voltage's interrogatory responses and correspondence accompanying the production of samples "Voltage characterizes 4-drop-line samples as '1-4' or 'up to 4' and 6-drop-line samples as '1-6' or 'up to 6.'" CRB at 19-20; *see also* CIB at 32, 60-64. Thus, Shoals argues that Voltage's characterization of the product samples makes clear that the 4-drop line and 6-drop line samples are representative of the 3- and 5-drop line configurations. CRB at 19-20.

Voltage argues that Shoals failed to demonstrate that the products its expert analyzed are representative for infringement. RIB at 97. Voltage states that it "produced 15 different LYNX Trunk Bus configurations, including a mid-production sample (with no outer mold) and a completed product, and identified the inner mold structure as representative of the dimensions of the mold structure for the undermold or innermold that would exist for the different LYNX Trunk Bus configurations made using the same mold die or mold tool." *Id.* at 58-59. Voltage further states that "[t]hrough these disclosures, Voltage provided product samples covering all of

[54] The evidence shows that Intertek is a testing laboratory and the purpose of an Intertek report is generally to obtain certification per standards that are required for photovoltaic products. *See* Tr. (Macias) at 215:22-25, 227:1-228:5; Tr. (Brooks) at 411:17-412:7. Whether a sample is representative for purpose of Intertek testing is distinct from whether it is representative for purpose of infringement. *See id.*; Tr. (Brooks) at 603:12-604:16; Tr. (Bardos) at 791:24-794:18; Tr. (Ge) at 979:22-980:24.

its Trunk Bus configurations' mold structures for the alleged undermold."[55] *Id.* at 59; *see also id.* at 97 ("Voltage – in response to Shoals' discovery demands – provided fifteen product samples covering every inner mold structure configuration for the LYNX Trunk Bus products."). However, Voltage maintains that "Shoals failed to analyze each configuration or account for differences between them, including, for example, LYNX Trunk Bus products having an odd number of branches." *Id.* at 97. Similarly, with respect to remedy, Voltage states: "Any LEO should be tailored to the type of product found to infringe. For example, if a violation is found only as to trunk bus products with even-numbered drop lines and these products are not representative of trunk bus products with odd-numbered drop lines, then the LEO should be specific to Voltage LYNX trunk bus products with an even number of drop lines." RIB at 164.

Staff submits that Mr. Brooks did not conduct an appropriate representative product analysis for the Voltage Trunk Bus products.[56] SIB at 32. However, Staff asserts that because Voltage produced physical samples of its accused products having an even number of drops that were similar to other models having an even number of drops, "Staff is of the view that each of Voltage's physical samples having an even number of drops can be found to be representative of other product models also having an even number of drops." *Id.* With respect to accused products having an odd number of drops or branches in which the wire related to the odd numbered drop may have a different pathway length within the undermold, Staff contends that "Shoals may still not be able to meet its burden to prove that all of the accused Voltage Trunk

[55] Moreover, Voltage did not respond to any of Shoals' arguments regarding representativeness for the Voltage Trunk Bus products in its reply post-hearing brief. *See generally* RRB.

[56] Staff did not respond to any of Shoals' arguments regarding representativeness for the Voltage Trunk Bus products in its reply post-hearing brief. *See generally* SRB.

Bus Products are covered by Mr. Brooks' infringement analysis" because they were not separately analyzed and charted by Mr. Brooks. *Id.* at 33.

When a patentee relies upon analysis of a representative product to prove infringement for each accused product, the patentee "must show by a preponderance of the evidence that the products its expert[] analyzed are indeed representative of unanalyzed products." *Certain LED Lighting Devices, LED Power Supplies, and Components Thereof*, Inv. No. 337-TA-1081, Comm'n Op, EDIS Doc. ID 682650, at 10 (July 23, 2019) (quoting *Certain Semiconductor Devices, Semiconductor Device Packages, and Prods. Containing Same*, Inv. No. 337-TA-1010, Order No. 77, EDIS Doc. ID 609297, at 9 (Mar. 15, 2017), *aff'd*, Comm'n Notice, EDIS Doc. ID 608676 (Apr. 14, 2017)).

When producing the Voltage Trunk Bus and Voltage AD Trunk Bus samples during discovery, Voltage presented a table and stated that: "Each product sample is representative of the undermold dimensions for the identified configurations. The samples and representations cover every Trunk Bus configuration Voltage has imported into the United States." *See* CX-0738C at 2. Voltage further stated "[b]y way of example" that "[t]he first entry (2/0 (1-2)) product sample is representative of (and will have the same undermold dimensions as) the following configurations: 1/0 1 branch; 1/0 2 branches; 2/0 1 branch; 2/0 2 branches." *See id.* (excerpt reproduced below). As can be seen in the excerpt below, Voltage provides further examples indicating that certain product samples are "representative of" other product configurations. *See id.*

The below table identifies the product sample description based on feeder cable wire gauge and number of drop lines. Each product sample is representative of the undermold dimensions for the identified configurations. The samples and representations cover every Trunk Bus configuration Voltage has imported into the United States. By way of example:

- The first entry (2/0 (1-2)) product sample is representative of (and will have the same undermold dimensions as) the following configurations: 1/0 1 branch; 1/0 2 branches; 2/0 1 branch; 2/0 2 branches.
- The 4/0 (1-4) product sample is representative of (and will have the same undermold dimensions as) the following configurations: 4/0 1 branch; 4/0 2 branches; 4/0 3 branches; 4/0 4 branches.
- The 500MCM (1-4) product sample is representative of (and will have the same undermold dimensions as) the following configurations: 500MCM 1 branch; 500MCM 2 branches; 500MCM 3 branches; 500MCM 4 branches.
- There is another mold configuration used for 500MCM and up to 8 branches. The sample provided is 500MCM (1-6), but the product sample is representative of (and will have the same undermold dimensions as) the following configurations: 500MCM 5 branches; 500MCM 6 branches; 500MCM 7 branches; 500MCM 8 branches, as well as 1, 2 or 3 or 4 branches if the same mold is used (though the mold for the above 500MCM (1-4) is more likely to be used).

Product Sample Description	**Configurations Representative of for Undermold Dimensions**
2/0 (1-2)	1/0: up to 2 branches 2/0: up to 2 branches
3/0 (1-2)	3/0: up to 2 branches
3/0 (1-4)	3/0: 3 or 4 branches
4/0 (1-4)	4/0: up to 4 branches
250MCM (1-2)	250MCM: up to 2 branches
250MCM (1-4)	250MCM: up to 4 branches
300MCM (1-2)	300MCM: up to 2 branches
400MCM (1-2)	350MCM: up to 2 branches 400MCM: up to 2 branches
400MCM (1-6)	350 MCM: up to 6 branches 400MCM: up to 6 branches
500MCM (1-2)	500MCM up to 2 branches
500MCM (1-4)	500MCM up to 4 branches
500MCM (1-6)	500MCM up to 8 branches
600MCM (1-2)	600MCM up to 2 branches
600MCM (1-4)	600MCM up to 4 branches
750MCM (1-2)	750MCM up to 4 branches
AD 500MCM (1-4)	Either are representative of all AD trunk bus configurations for purposes of determining

Id. Thus, Voltage characterizes its product samples as being representative of "up to" a certain number of branches, meaning that it includes even and odd branches up to a certain number. *See id.* This is also consistent with how Voltage characterized different configurations of the Voltage Trunk Bus in interrogatory responses. For example, Voltage described certain configurations as

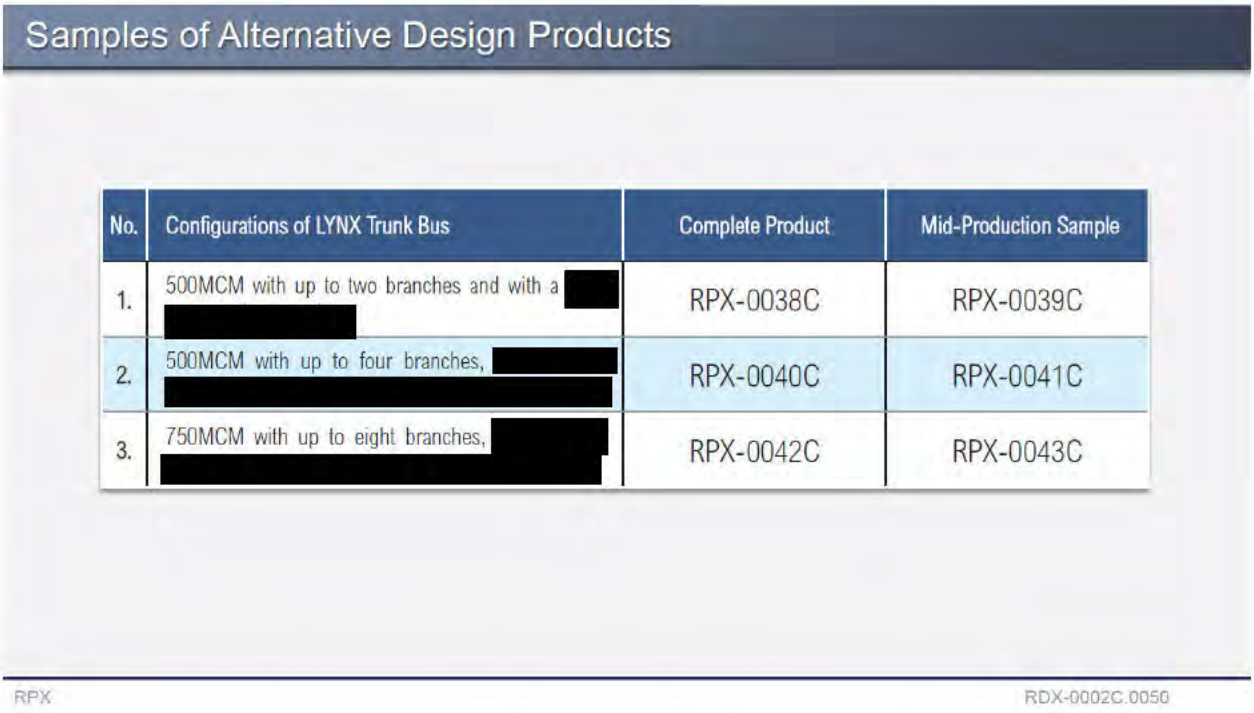
"1/0 with up to two branches" or "4/0 with up to four branches." *See* JX-0198C (Voltage Interrogatory Responses) at 14-15, 19-20. This is also consistent with how Voltage's expert, Dr. Cameron, described the configurations of the Voltage Trunk Bus and Voltage AD Trunk Bus that she analyzed. *See* Tr. (Cameron) at 1100:5-20; RDX-0002C at 49-50 (reproduced below).[57]

Samples of Accused Products

No.	Configurations of LYNX Trunk Bus	Complete Product	Mid-Production Sample
1.	2/0 with up to two branches	RPX-0008	RPX-0009
2.	3/0 with up to two branches	RPX-0010	RPX-0011
3.	3/0 with up to four branches	RPX-0012	RPX-0013
4.	4/0 with up to four branches	RPX-0014	RPX-0015
5.	250MCM with up to two branches	RPX-0016	RPX-0017
6.	250MCM with up to four branches	RPX-0018	RPX-0019
7.	300MCM with up to two branches	RPX-0020	RPX-0021
8.	400MCM with up to two branches	RPX-0022	RPX-0023
9.	400MCM with up to six branches	RPX-0024	RPX-0025
10.	500MCM with up to two branches	RPX-0026	RPX-0027
11.	500MCM with up to four branches	RPX-0028	RPX-0029
12.	500MCM with up to six branches	RPX-0030	RPX-0031
13.	600MCM with up to two branches	RPX-0032	RPX-0033
14.	600MCM with up to four branches	RPX-0034	RPX-0035
15.	750MCM with up to two branches	RPX-0036	RPX-0037

RPX RDX-0002C.0049

[57] Similarly, this appears to be consistent with how Mr. Wang, Voltage's co-founder, described the various configurations. *See* JX-0219C at 141:7-23; Tr. (Brooks) at 419:5-420:2.



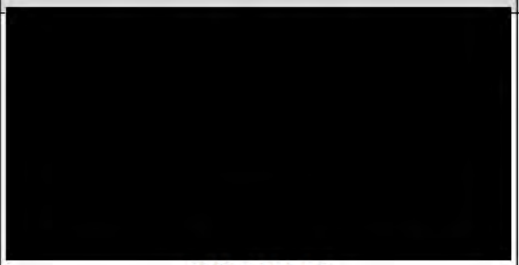
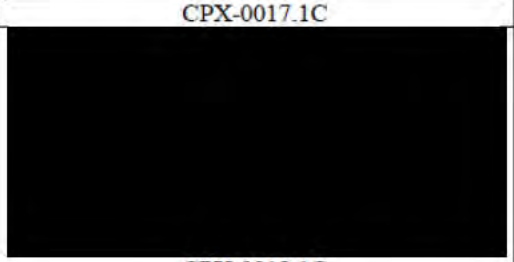
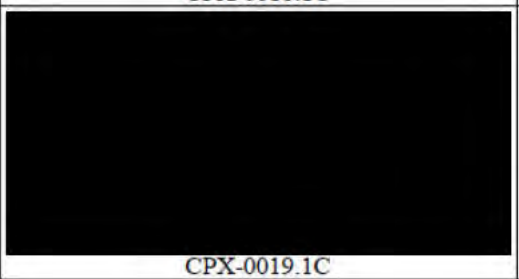
Samples of Alternative Design Products

No.	Configurations of LYNX Trunk Bus	Complete Product	Mid-Production Sample
1.	500MCM with up to two branches and with a [redacted]	RPX-0038C	RPX-0039C
2.	500MCM with up to four branches, [redacted]	RPX-0040C	RPX-0041C
3.	750MCM with up to eight branches, [redacted]	RPX-0042C	RPX-0043C

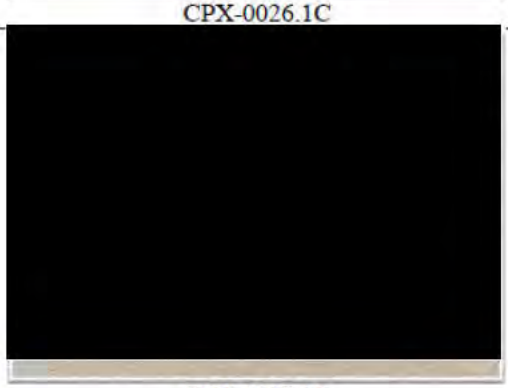
RPX

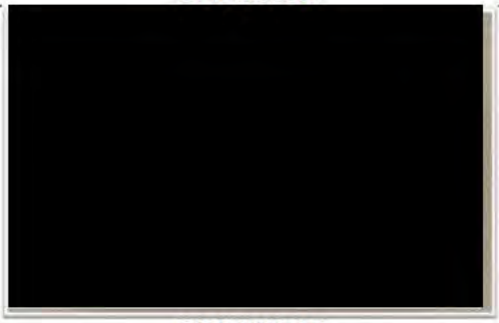
RDX-0002C.0050

In addition, Mr. Brooks testified that he analyzed all of the product samples he received (including cutting at least one sample of each open). Tr. (Brooks) at 409:2-16. Mr. Brooks further testified that the products he evaluated were representative of all the accused Voltage Trunk Bus products and that there were no differences in the products in terms of the structure and structural relationships at issue in the claims of the '153 patent. *Id.* at 409:17-410:11. He concluded the same for the Voltage AD Trunk Bus products. *Id.* at 410:12-411:1. Moreover, Shoals submits the following table showing Mr. Brooks' opinions (including the samples he cut open and analyzed) regarding infringement of the Voltage Trunk Bus products, including the representativeness of the various configurations.

Feeder Size (# of Drop Lines)	Representative of (per CX-0738C)	Brooks Sample	Other PX Nos.
2/0 (1-2)	1/0: up to 2 branches 2/0: up to 2 branches	 CPX-0017.1C	CPX-0017 RPX-0008 RPX-0009
3/0 (1-2)	3/0: up to 2 branches	 CPX-0018.1C	RPX-0010 RPX-0011
3/0 (1-4)	3/0: 3 or 4 branches	 CPX-0019.1C	RPX-0012 RPX-0013

Feeder Size (# of Drop Lines)	Representative of (per CX-0738C)	Brooks Sample	Other PX Nos.
4/0 (1-4)	4/0: up to 4 branches	[not sent to Mr. Brooks][16]	RPX-0014 RPX-0015
250 (1-2)	250 MCM: up to 2 branches	[not sent to Mr. Brooks]	RPX-0016 RPX-0017
250 (1-4)	250 MCM: up to 4 branches	 CPX-0022.1C	CPX-0022 RPX-0018 RPX-0019
300 (1-2)	300 MCM: up to 3 branches	 CPX-0023.1C	CPX-0023 RPX-0020 RPX-0021
400 (1-2)	350 MCM: up to 2 branches 400 MCM: up to 2 branches	 CPX-0024.1C	CPX-0024 RPX-0022 RPX-0023

Feeder Size (# of Drop Lines)	Representative of (per CX-0738C)	Brooks Sample	Other PX Nos.
400 (1-6)	350 MCM: up to 6 branches 400 MCM: up to 6 branches	 CPX-0025.1C	CPX-0025 RPX-0024 RPX-0025
500 (1-2)	500 MCM: up to 2 branches	 CPX-0026.1C	CPX-0026 RPX-0026 RPX-0027
500 (1-4)	500 MCM: up to 4 branches	 CPX-0027.1C	CPX-0027 RPX-0028 RPX-0029

Feeder Size (# of Drop Lines)	Representative of (per CX-0738C)	Brooks Sample	Other PX Nos.
500 (1-6)	500 MCM: up to 6 branches	 CPX-0028.1C	CPX-0028 RPX-0030 RPX-0031
600 (1-2)	600 MCM: up to 2 branches	 CPX-0029.1C	CPX-0029 RPX-0032 RPX-0033
600 (1-4)	600 MCM: up to 4 branches	 CPX-0016.1C	CPX-0034.1C CPX-0016.1C CPX-0016 RPX-0034 RPX-0035

Feeder Size (# of Drop Lines)	Representative of (per CX-0738C)	Brooks Sample	Other PX Nos.
750 (1-2)	750 MCM: up to 4 branches	 CPX-0031.1C	CPX-0031 RPX-0036 RPX-0037

Id. at 60-64; *see also id.* at 35, 37, 39-41 (showing cross-sections of various Voltage Trunk Bus samples).[58, 59] This demonstrates the similarities between the various configurations of the Voltage Trunk Bus products relevant to the claim limitations at issue.

Therefore, the evidence, including Voltage's own statements and the statements of its expert, therefore fail to support Voltage's implication that Voltage Trunk Bus and Voltage AD Trunk Bus products with even-numbered drop lines or branches may not be representative of products with odd-numbered drop lines or branches. Moreover, while Staff contends that for accused products having an odd number of drops or branches, the wire may have a different pathway length within the undermold, Staff does not sufficiently explain why that would affect the representativeness analysis with respect to infringement.[60] *See* SIB at 33.

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[58] It appears that the annotations to the images of the product samples were added in Shoals' post-hearing briefs and were not originally part of Mr. Brooks' demonstratives. *Compare* CIB at 34, 60-64, *with* CDX-0005C at 57, 97-105. However, Mr. Brooks' demonstratives do include images of all the various configurations shown in the table demonstrating that he cut open and analyzed all of those configurations. *See, e.g.*, CDX-0005C at 48, 53, 55, 57, 97-105.

[59] While the undersigned finds the table in Shoals' initial post-hearing brief useful, there appear to be some errors. For example, the fourth row on page 61 of Shoals' initial post-hearing brief, *i.e.*, "300 (1-2)," which corresponds to RPX-0020 and RPX-0021, is representative of "300MCM: up to 2 branches" per CX-0738C, not "300 MCM: up to 3 branches" as stated in Shoals' brief. *See* CIB at 61; CX-0738C at 2; *see also* RDX-0002C at 49. In addition, for the row on page 64 of Shoals' initial post-hearing brief, *i.e.*, "750 (1-2)," which corresponds to RPX-0036 and RPX-0037, CX-0738C states that it is representative of "750MCM up to 4 branches," but the photograph appears to show up to two branches and Dr. Cameron's demonstrative states that it is representative of "750MCM with up to two branches." *See* CIB at 64; CX-0738C at 2; RDX-0002C at 49. However, despite these errors, the undersigned finds that the table demonstrates how Voltage's descriptions of its produced samples combined with Mr. Brooks' analysis of the samples weighs in favor of finding that the Voltage Trunk Bus Products produced by Voltage are representative products.

[60] Moreover, under the correct claim construction for the term "aperture," where "drop line" does not necessarily correspond to the entire cable or wire from which a drop line may be formed (*see supra* at Part V.E.1), the infringement analysis does not differ with respect to Voltage Trunk Bus products with molds having an even-number of drop lines or an odd-number of drop lines (for molds with two or more drop lines).

Accordingly, the undersigned finds that Shoals has shown by a preponderance of the evidence that for the purpose of infringement, the Voltage Trunk Bus products produced by Voltage, and analyzed by Mr. Brooks, are representative of Voltage Trunk Bus products having at least one mold with at least two drop lines.

B. Direct Infringement of Independent Claim 1

1. Claim Limitation [1.p]: "A lead assembly for use in a solar energy installation including:"

No party addresses whether the preamble is limiting. *See generally* CIB; RIB; SIB. To the extent the preamble is limiting, Voltage does not dispute that the Voltage Trunk Bus products meet this claim limitation and the undisputed evidence shows that the Voltage Trunk Bus products are lead assemblies for use in a solar energy installation. *See* RIB at 74-88; RRB at 21-25; Tr. (Ge) at 899:14-900:24; Tr. (Brooks) at 398:8-400:13; CX-0244; *see also* SIB at 36-43; SRB at 27-28.

2. Claim Limitation [1.a]: "a drop line terminating at a drop line connector, the drop line connector configured to connect with a central trunk of a wire harness, the central trunk of the wire harness having a plurality of branches that each are configured to electrically connect to a separate solar panel contained in an array of a plurality solar panels;"

Voltage does not dispute that this limitation is met. *See* RIB at 74-88; RRB at 21-25; *see also* SIB at 36-43; SRB at 27-28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a drop line terminating at a drop line connector, the drop line connector configured to connect with a central trunk of a wire harness, the central trunk of the wire harness having a plurality of branches that each are configured to electrically connect to a separate solar panel contained in an array of a plurality of solar panels. *See* Tr. (Brooks) at 420:3-423:22; CDX-0005C at 37-45; CX-0244 at 2; JX-0159C at 44; JX-0210C (Ge Dep.) at

117:21-25; CX-0483; JX-0154C at 12-14; JX-0345C at ¶¶ 14-26; Tr. (Ge) at 900:4-24, 956:7-957:11; CPX-0040.

Accordingly, Shoals has shown that the Voltage Trunk Bus products meet Claim Limitation [1.a].

3. Claim Limitation [1.b]: "a feeder cable electrically coupled to the drop line at a nexus;"

Voltage does not dispute that this limitation is met. *See* RIB at 74-88; RRB at 21-25; *see also* SIB at 36-43; SRB at 27-28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a feeder cable electrically coupled to the drop line at a nexus. *See* Tr. (Brooks) at 423:23-425:7; CDX-0005C at 46-48; JX-0159C at 44; CPX-0024.1C.

Accordingly, Shoals has shown that the Voltage Trunk Bus products meet Claim Limitation [1.b].

4. Claim Limitation [1.c]: "an undermold that fully encases the nexus, the undermold further comprising:"

Voltage does not dispute that this limitation is met. *See* RIB at 74-88; RRB at 21-25; *see also* SIB at 36-43; SRB at 27-28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have an undermold that fully encases the nexus. *See* Tr. (Brooks) at 425:8-21; CDX-0005C at 49; JX-0245C at 5; CPX-0024.1C.

Accordingly, Shoals has shown that the Voltage Trunk Bus products meet Claim Limitation [1.c].

5. Claim Limitation [1.c.i]: "a first aperture extending completely through the undermold and having a first diameter, wherein the feeder cable extends through the first aperture along a first longitudinal axis; and"

Voltage does not dispute that this limitation is met.[61] *See* RIB at 74-88; RRB at 21-25; *see also* SIB at 36-43; SRB at 27-28. In addition, the undisputed evidence demonstrates that under the Modified Cable Test the Voltage Trunk Bus products have a first aperture extending completely through the undermold having a first diameter, where the feeder cable extends through the first aperture along a first longitudinal axis. *See* Part V.E.1 *supra*; Tr. (Brooks) at 425:22-427:1; CDX-0005C at 50-51; JX-0245C at 5; CPX-0024.1C.

Accordingly, Shoals has shown that the Voltage Trunk Bus products meet Claim Limitation [1.c.i].

6. Claim Limitations [1.c.ii] and [1.c.iii]: "a second aperture extending partially through the undermold and having a second diameter different than the first diameter, wherein the drop line extends from the second aperture along a second longitudinal axis;"/"a third aperture extending partially through the undermold and having a third diameter different than the first diameter, wherein a second drop line extends from the third aperture along a third longitudinal axis; and:"

The parties dispute these limitations. Shoals asserts that these limitations are met and that Voltage's and Staff's arguments depend on construing the claim language incorrectly. CIB at 41-

[61] While Voltage does not specifically dispute this limitation, Voltage argues that under Shoals' claim construction theory "if the drop line or branch cable forming what Mr. Brooks contends are two different apertures that only extend partially through the mold because there is no aperture, or portion of an aperture, within the nexus, the same would apply to the feeder cable." RIB at 38-39; *see also* RRB at 22-23 ("Taking Mr. Brooks' opinion that the second and third aperture only extend partially through because they are "bounded by the nexus", the same would be true for the "first aperture."). As discussed above regarding the claim construction of "aperture," this argument does not take into account the guidance of Figure 7, the prosecution history, and the geometry of the undermold. Moreover, applying the Modified Cable Test shows that this limitation is met.

42. Shoals submits that in the Voltage Trunk Bus, [redacted]. *Id.* at 42. Shoals contends that the intrinsic record makes clear that a drop line necessarily ends at or somewhere within the nexus, and therefore, the drop line's entire pathway within the undermold cannot extend completely through the undermold – it can only extend partially through. CRB at 23. Shoals submits that "[t]his is so even if the drop line is 'viewed as if . . . removed' because the aperture revealed would be one that enters one side of the mold, either stops at the nexus or somewhere inside it, and never emerges from the other side of the mold." *Id.* Shoals argues that Mr. Brooks' opinions regarding the location of the apertures at his deposition and at the evidentiary hearing were consistent. *Id.* at 23-24. In addition, Shoals contends that "Dr. Cameron agreed with Mr. Brooks that if two drop lines meet at the nexus, they both end there, even if they are [redacted] *Id.* at 26 (citing CDX-0020 (depicting annotations made by Dr. Cameron), Tr. (Cameron) at 1158:13–1160:17).[62]

Voltage argues that Dr. Cameron examined every Voltage Trunk Bus sample produced in this investigation and concluded that none of the configurations meet these limitations. RIB at 75-76. Voltage contends that Dr. Cameron's CT scans for the configurations of the Voltage Trunk Bus with two branches show that there is no third aperture in the mold structure. *Id.* at 76-77. As to the configurations of the Voltage Trunk Bus with four or more branches, Voltage asserts that Dr. Cameron's CT scans show that while there is a third aperture, each of the second and third apertures extend completely through the undermold, not partially through the undermold. *Id.* at 77-78. According to Voltage, the Voltage Trunk Bus [redacted]

[62] To the extent that Shoals argues that "Dr. Cameron is not a POSA," *see supra* at Part V.D.

[redacted] and Voltage claims that "Dr. Cameron explained that the 'pathway' for the drop line cable is very clearly still in physical existence for all samples that she has examined and 'does not get broken' as shown in both her CT Scan videos, just as is the 'pathway' of the feeder cable that Shoals argues extends completely through the undermold / primary mold." *Id.* at 78. Voltage therefore argues that the evidence shows that the entire pathway or aperture associated with the "branch cable" extends completely through the nexus and the mold structure in the same way that the entire pathway or aperture associated with the trunk cable does. *Id.* at 79. Voltage states that "[o]nly under Shoals' incorrect application of the Court's claim construction and untenable view of the intrinsic record can Mr. Brooks offer his opinion that the aperture for an input (or branch or 'drop line') ends at the outside of the nexus, but the aperture for the feeder cable does not." *Id.* at 81. Under Dr. Cameron's analysis, however, Voltage argues that there are either two apertures, each that extend completely through the mold structure, or four apertures, each that only extend partially through the mold structure. *Id.*

Voltage contends that for the second and third apertures, Shoals argues that they extend only partially through the undermold because they are bounded at the other end by the nexus, but that for the first aperture, Shoals argues that it extends completely through the mold.[63] RRB at 21-22. Voltage asserts that "[t]aking Mr. Brooks' opinion that the second and third aperture only extend partially through because they are 'bounded by the nexus', the same would be true for the 'first aperture.'" *Id.* at 22-23. However, according to Voltage, Dr. Cameron opined that the first aperture extends completely through in the same way that the second aperture extends completely through. *Id.* at 23. Thus, Voltage argues that Shoals' infringement theory is

[63] While Voltage's citations and photographs are directed to the BLA, Voltage applies the same arguments to both infringement and the technical prong of the domestic industry requirement. *See* RRB at 21-25.

inconsistent between the first and second aperture where one ends because it is "bounded by the nexus" while the other extends through the nexus. *Id.* at 24.

Staff argues that this limitation is not met because each "second aperture" extends the entire way through the undermold as shown, for example, in Dr. Cameron's CT scans. SIB at 36. Staff submits that "Dr. Cameron explained that Voltage's drop line wire forms a 'second aperture' that extends completely through . . . the undermold/primary mold (and through the compression lug) in the same manner that the feeder cable forms a 'first aperture' that extends completely through the undermold/primary mold (and through the compression lug)." *Id.* at 37. Staff claims that Dr. Cameron testified that under Mr. Brooks' view, any drop line would have an aperture partially extending through the undermold, and that his view would render the "partially through" and "completely through" limitations meaningless. *Id.* at 38. Staff contends that Mr. Brooks' opinions regarding the second and third apertures are inconsistent with his opinions regarding the first aperture. *Id.* Staff therefore asserts that if the first aperture includes the section of the feeder cable within the compression lug, then so does the second aperture that is formed by the first drop line, including the section of the exposed wire within the compression lug. *Id.* at 39.

Additionally, Staff asserts that even if one wire can include the two claimed drop lines, Mr. Brooks incorrectly argued that the claimed second and third apertures would necessarily end at each edge of the compression lug. SRB at 27. Rather, Staff contends that because each drop line extends at least into the nexus with its exposed wire, Shoal's infringement theory is incorrect. *Id.* Staff submits that since the second aperture includes the entirety of the void within the undermold when the drop line wire is removed, the claimed third aperture must be a separate structure from the claimed second aperture. *Id.* Staff, however, argues that Shoals did not

identify a second, separate drop line wire. *Id.* In addition, Staff asserts that Mr. Brooks did not explain why the exposed wires should not necessarily be included in each drop line. *Id.* at 27-28.

Staff also argues that none of the Voltage Trunk Bus configurations have the claimed "third aperture" structure. SIB at 40. Staff contends that Mr. Brooks only identified an alleged "third aperture" as part of the same drop line wire on the other side of the compression lug and thus, because the "second aperture" includes the entirety of the void within the undermold, the claimed "third aperture" must be a separate structure from the claimed "second aperture." *Id.* at 40-41. Staff therefore contends that Shoals did not identify a second, separate drop line wire and did not show that the Voltage Trunk Bus products have a "distinctly separate (and not overlapping) 'third aperture' as claimed." *Id.* at 41.

Upon review of the parties' submissions and record evidence, the undersigned finds that Shoals has established, by a preponderance of the evidence, that the Voltage Trunk Bus products meet the "second aperture" and "third aperture" claim limitations.

The parties' dispute over these limitations primarily centers on the claim construction of the "aperture" terms.[64] As discussed above, "aperture" means the "entire pathway of the [feeder cable or drop line] within the [undermold or primary mold], when viewed as if the [feeder cable or drop line] were removed." *See supra* at Part V.E.1. Additionally, the claimed second and third "aperture(s)" should be read in view of the pathways in the undermold of the first "drop line"

[64] The record evidence shows, and Voltage and Staff do not dispute, that the drop line extends along a second longitudinal axis and the second drop line extends along a third longitudinal axis. *See* Tr. (Brooks) at 427:4-21; CDX-0005C at 52, 54. In addition, the record evidence shows, and Voltage and Staff do not dispute, that the second aperture has a second diameter different than the first diameter and that the third aperture has a third diameter different than the first diameter. *See* Tr. (Brooks) at 428:19-429:5; CDX-0005C at 52, 54.

and second "drop line," where the term "drop line" does not necessarily correspond to the entire cable or wire from which a drop line may be formed. *See id.*

The record evidence shows that in the Voltage Trunk Bus, [redacted] [65] *See* CIB at 42; Tr. (Ge) at 917:25–918:4 (testifying that Voltage uses [redacted]), 967:23-968:23. As shown in an exemplary image of a sample of the Voltage Trunk Bus (reproduced below), [redacted].

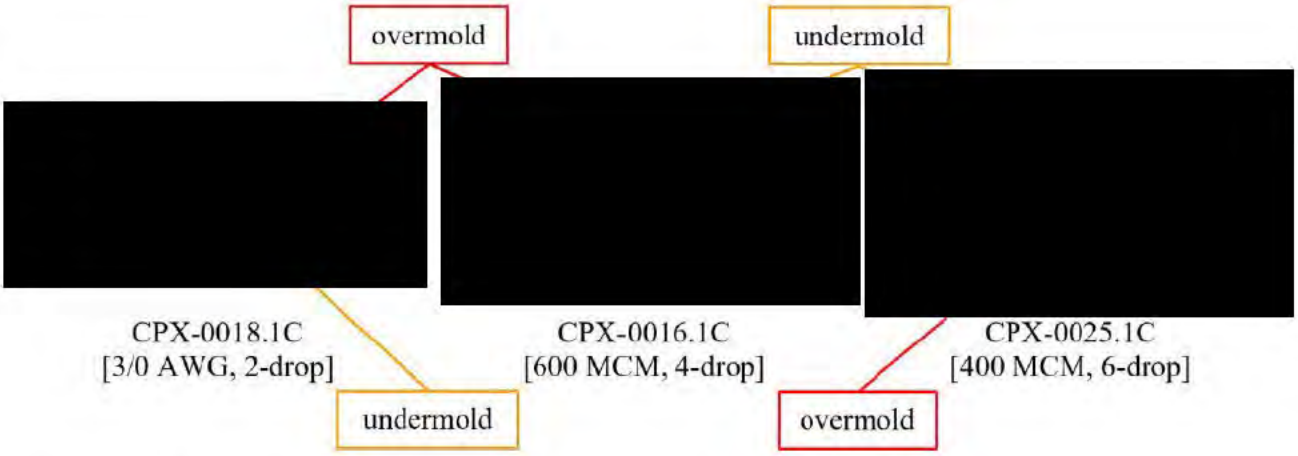


CPX-0019 [3/0 1-4], CPX-0019.1C

See CIB at 41; CPX-0019.1C. As Mr. Brooks testified, in the Voltage Trunk Bus products, a drop line ends somewhere within the nexus. *See* Tr. (Brooks) at 548:7-11, 609:10-610:3; RDX-0011C. Dr. Cameron agreed. *See* Tr. (Cameron) at 1157:5-11 (drop line ends "somewhere in the nexus"). Thus, as shown in annotated images of the Voltage Trunk Bus (reproduced below), the [first] drop line (corresponding to the drop line with the left dashed diagonal green line) and second drop line (corresponding to the drop line with the right diagonal green line) are identified

[65] As discussed in detail above, the undersigned rejected Voltage's and Staff's arguments that "drop line" should mean the entire cable or drop line wire, even if the relevant wire forms two different claimed drop lines. *See supra* at Part V.E.1. Thus, Voltage's and Staff's argument that the entire pathway or aperture associated with the drop line extends completely through the nexus and the mold structure (*see, e.g.*, RIB at 76-81) is flawed under the construction of the "aperture" terms herein.

in three different samples – a two drop line sample, a four drop line sample, and a six drop line sample.



See CIB at 34-35; CPX-0018.1C; CPX-0016.1C; CPX-0025.1C.

Using the Modified Cable Test, the entire portion of the cable or wire forming the "drop line" is removed, not the entire cable or wire. *See supra* at Part V.E.1. Thus, when viewed as if the first drop line or second drop line were removed, each of the second aperture and the third aperture is "extending partially through the undermold." This is consistent with Mr. Brooks' testimony. *See* Tr. (Brooks) at 547:13-25; *see also id.* at 609:10-610:3; RDX-0011C (showing second aperture highlighted).[66] Further, as discussed above regarding representativeness, these products were shown to be representative of the accused products generally.

Accordingly, Shoals has shown by a preponderance of the evidence that the Voltage Trunk Bus products meet Claim Limitations [1.c.ii] and [1.c.iii].

[66] The Modified Cable Test and Mr. Brooks' approach differ in that under Mr. Brooks' approach, the "second aperture" and "third aperture" do not include any portion within the nexus area, whereas under the Modified Cable Test they extend into the nexus area (but not beyond). As discussed in Part V.E.1 *supra*, it is unnecessary to distinguish between these two approaches since under either test the accused products have second and third apertures that extend "partially through" the undermold.

7. Claim Limitation [1.d]: "an overmold surrounding the undermold and forming an undermold-overmold interface at an outer surface of the undermold."

Voltage does not dispute that this limitation is met. *See* RIB at 74-88; RRB at 21-25; *see also* SIB at 36-43; SRB at 27-28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have an overmold surrounding the undermold and forming an undermold-overmold interface at an outer surface of the undermold. *See* Tr. (Brooks) at 430:23-432:14; CDX-0005C at 56-57; CPX-0034.1C; JX-0245C at 9; CPX-0034.1C; CPX-0018; CPX-0018.1C; CPX-0019; CPX-0019.1C; CPX-0025; CPX-0025.1C; CPX-0016; CPX-0016.1C.

Accordingly, Shoals has shown that the Voltage Trunk Bus products meet Claim Limitation [1.d].

* * *

Accordingly, because each limitation of claim 1 is satisfied, the Voltage Trunk Bus products infringe claim 1 of the '153 patent.

8. Voltage AD Trunk Bus

While Shoals does not assert claim 1 against the Voltage AD Trunk Bus, Voltage contends that the Voltage AD Trunk Bus does not infringe any of the asserted claims. *See* RIB at 74. As found above, the evidence shows that the Voltage AD Trunk Bus should be adjudicated. Shoals' initial and reply post-hearing briefs do not contain infringement arguments regarding the Voltage AD Trunk Bus with respect to claim 1. Accordingly, any such arguments by Shoals have been waived and Shoals has failed to meet its burden of proof. *Oligosaccharides*, Comm'n Op. at 23-25 (complainant bears burden of establishing infringement with respect to non-accused, adjudicated product); Ground Rule 13.1. Voltage is therefore entitled to a finding of non-infringement of claim 1 for the Voltage AD Trunk Bus products.

C. Direct Infringement of Dependent Claims 11-14 and 18

1. Claim 11: "The lead assembly of claim 1, wherein the drop line includes a fuse."

Aside from arguing that the Voltage Trunk Bus does not practice independent claim 1, Voltage does not dispute that dependent claim 11 is met. *See* RIB at 89; *see also* SIB at 43; SRB at 28. In addition, the undisputed evidence demonstrates that certain Voltage Trunk Bus products have fused drop lines. *See* Tr. (Brooks) at 433:3-20; CDX-0005C at 59-60; CX-0244 at 2; JX-0159C at 9; CIB at 44.

Accordingly, the Voltage Trunk Bus products infringe claim 11 of the '153 patent.

2. Claim 12: "The lead assembly of claim 1, wherein said lead assembly combines power received from the plurality of solar panels and conducts that power directly to an inverter electrically connected to the feeder cable."

Aside from arguing that the Voltage Trunk Bus does not practice independent claim 1, Voltage does not dispute that dependent claim 12 is met. *See* RIB at 89; *see also* SIB at 43; SRB at 28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a lead assembly that combines power received from solar panels and conducts that power directly to an inverter electrically connected to the feeder cable. *See* Tr. (Brooks) at 433:21-434:8; CDX-0005C at 62; JX-0345C at ¶ 22; JX-0138C at 7-9; JX-0159C; Tr. (Ge) at 956:7-19; CIB at 45.

Accordingly, the Voltage Trunk Bus products infringe claim 12 of the '153 patent.

3. **Claim 13: "The lead assembly of claim 1, wherein the second drop line terminates at a second drop line connector, the second drop line connector configured to connect with a central trunk of a second wire harness, the central trunk of the second wire harness having a plurality of branches the each are configured to electrically connect to a separate solar panel contained in a second array of a plurality of solar panels."**

Aside from arguing that the Voltage Trunk Bus does not practice independent claim 1, Voltage does not dispute that dependent claim 13 is met. *See* RIB at 89; *see also* SIB at 43; SRB at 28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a second drop line that terminates at a second drop line connector, where the second drop line connector is configured to connect with a central trunk of a second wire harness, and the central trunk of the second wire harness has a plurality of branches that are each are configured to electrically connect to a separate solar panel contained in a second array of a plurality of solar panels. *See* Tr. (Brooks) at 434:9-21; CDX-0005C at 64; JX-0345C at ¶¶ 25-26; CX-0244; Tr. (Ge) at 956:7-19; CIB at 45.

Accordingly, the Voltage Trunk Bus products infringe claim 13 of the '153 patent.

4. **Claim 14: "The lead assembly of claim 13, wherein the lead assembly is configured to combine electrical power received from the array of solar panels and the second array of solar panels at the nexus and to deliver the combined electrical power to an inverter that is in electrical communication with the feeder cable."**

Aside from arguing that the Voltage Trunk Bus does not practice independent claim 1, Voltage does not dispute that dependent claim 14 is met. *See* RIB at 89; *see also* SIB at 43; SRB at 28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a lead assembly that is configured to combine electrical power received from the array of solar panels and the second array of solar panels at the nexus and to deliver the combined

electrical power to an inverter that is in electrical communication with the feeder cable. *See* Tr. (Brooks) at 434:22-435:15; CDX-0005C at 66; JX-0345C at ¶¶ 25-26; JX-0159C; CPX-0024.1C; CIB at 45-46.

Accordingly, the Voltage Trunk Bus products infringe claim 14 of the '153 patent.

5. Claim 18: "The lead assembly of claim 15, wherein the electrical coupling between the feeder cable, the drop line and the second drop line at the nexus is secured with at least one of a compression lug, a solder connection, a splice, and a crimp."[67]

Aside from arguing that the Voltage Trunk Bus does not practice independent claim 1, Voltage does not dispute that dependent claim 18 is met. *See* RIB at 89; *see also* SIB at 43; SRB at 28. In addition, the undisputed evidence demonstrates that the Voltage Trunk Bus products have a second drop line with a section of exposed wire at the nexus so as to be electrically connected to the feeder cable. *See* Tr. (Brooks) at 435:16-436:24; CDX-0005C at 68; JX-0143C; JX-0151C; CPX-0024.1C. The undisputed evidence also demonstrates that in the Voltage Trunk Bus products, the electrical coupling between the feeder cable, the drop line and the second drop line at the nexus is secured with a compression lug. *See* Tr. (Brooks) at 436:25-438:5; CDX-0005C at 69; CX-0327C; CPX-0024.1C; CIB at 46.

Accordingly, the Voltage Trunk Bus products infringe claim 18 of the '153 patent.

6. Voltage AD Trunk Bus

While Shoals does not assert claims 11-14 and 18 against the Voltage AD Trunk Bus, Voltage contends that the Voltage AD Trunk Bus does not infringe any of the asserted claims. *See* RIB at 74. Shoals' initial and reply post-hearing briefs do not contain infringement

[67] Claim 18 depends from claim 15, which recites: "The lead assembly of claim 1, wherein the second drop line includes a section of exposed wire at the nexus so as to be electrically connected to the feeder cable." '153 patent at cl. 15.

arguments regarding the Voltage AD Trunk Bus with respect to claim 1 or any of its dependent claims. Accordingly, any such arguments have been waived and Shoals has failed to meet its burden of proof. *Oligosaccharides*, Comm'n Op. at 23-25 (complainant bears burden of establishing infringement with respect to non-accused, adjudicated product); Ground Rule 13.1. Voltage is therefore entitled to a finding of non-infringement of claims 11-14 and 18 for the Voltage AD Trunk Bus products.

D. Indirect Infringement of Claims 21, 23, and 24

1. Waiver

The undersigned issued Order No. 31 requesting supplemental briefing, *inter alia*, on the following issues:

> 1. For each asserted claim of the '153 patent, Complainant Shoals Technology Group, LLC ("Shoals") should identify whether it is asserting direct and/or indirect infringement.
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> 2. To the extent Shoals asserts indirect infringement for any asserted claim, please explain, including with citations to the post-hearing briefs and pre-hearing briefs, whether Shoals preserved this argument. Such explanation should include identifying any arguments or record evidence provided by Shoals regarding the knowledge requirements for indirect infringement. *See Commil USA, LLC v. Cisco Sys., Inc.*, 575 U.S. 632, 639 (2015) ("liability for inducing infringement attaches only if the defendant knew of the patent and that 'the induced acts constitute patent infringement'"); *id.* ("contributory infringement requires knowledge of the patent in suit and knowledge of patent infringement"); *Certain Robotic Vacuum Cleaning Devices and Components Thereof Such as Spare Parts*, Inv. No. 337-TA-1057, Comm'n Op., 2019 WL 1292948, at *12-14 (Feb. 1, 2019).

Order No. 31 at 1 (May 30, 2024). The order further stated that "[a]rguments pertaining to issues other than the questions above will be disregarded" *Id.* In response to Order No. 31, the parties

submitted supplemental briefs and supplemental reply briefs. *See* CISB; CRSB; RISB; RRSB; SISB; SRSB.

a. The Parties' Positions

In response to Order No. 31, Shoals represented that it asserts direct infringement of claims 1, 11-14, and 18 and indirect infringement of claims 21, 23, and 24. *See* CISB at 1. Shoals argues that it preserved the issue of indirect infringement by asserting claims 21, 23, and 24 in its prehearing brief (CPHB at 167-169), at the hearing (Tr. (Brooks) at 438:6-439:9, 443:5-22, 445:18-24), and in post-hearing briefs (CIB at 47-52). CISB at 1, 4-5; CRSB at 1. Shoals claims that in each instance, it cited to evidence, expert opinion, and the fact stipulation from Voltage (JX-0345C), demonstrating induced infringement liability for used of the Voltage Trunk Bus products by Voltage's customers in solar power systems. CISB at 1.

Shoals asserts that the fact stipulation is itself evidence of Voltage's knowledge. *Id.* Shoals submits that the fact stipulation identified the Voltage Trunk Bus as an accused product, detailed Voltage's instruction on using it in a matter amounting to direct infringement, and confirmed that such use had in fact occurred. *Id.* at 2-3. In addition, Shoals contends that by reason of Shoals' amended complaint, Voltage knew that its customers' use of the Voltage Trunk Bus was alleged to infringe. *Id.* at 1. Moreover, Shoals argues that Voltage has never asserted any noninfringement argument centered solely on the elements of inducement. *Id.* at 3.

Therefore, Shoals claims that Voltage's knowledge is not a contested issue. *Id.* For example, Shoals points to an interrogatory response where Voltage allegedly admits to knowledge of the patent. *Id.* In addition, Shoals argues that service of a complaint with claim charts explaining infringement can be sufficient to establish both knowledge of the patent and that the acts complained of can constituted infringement. *Id.* Shoals also asserts that Voltage has

never denied or contested having the knowledge required for imposing inducement liability. CRSB at 2.

Voltage argues that Shoals has not preserved a claim for indirect infringement for any claim at least because Shoals failed to address the knowledge requirement for indirect infringement. RISB at 1. Specifically, Voltage claims that Shoals' prehearing and post-hearing briefs did not address the knowledge requirements for any indirect infringement claim. *Id.* at 2. First, with respect to Shoals' prehearing brief, Voltage notes that Shoals' discussion of claim limitations [21.pre]-[21.c] cite back to the discussion of claim 7 of the '254 patent. *Id.* Additionally, Voltage notes that in Shoals' prehearing brief, Shoals' discussion of claim limitations [24.pre]-[24.b] cite back to the discussion of claim 21. *Id.* at 2-3. In Shoals' discussion of claim 7 of the '254 patent, however, Voltage asserts that Shoals merely cites various exhibits (without further explanation), which do not address the knowledge requirements of indirect infringement, and some of those exhibits were never admitted into evidence. *Id.* at 3.

With respect to Shoals' post-hearing brief, Voltage argues that the only reference to indirect infringement appears in the legal standards section and also fails to address the legal standard for the knowledge requirements for proving indirect infringement. *Id.* at 4. In addition, for Shoals' discussion of claims 21 and 24, Voltage contends that Shoals' post-hearing brief merely asserts that elements [21.pre]-[21.c] and [24.pre]-[24.b] are established by the Voltage Fact Stipulation, with references to Mr. Brooks' hearing testimony. *Id.* However, Voltage submits that Mr. Brooks never address the knowledge requirements; rather, he only addressed whether he believed that specific limitations were met based on the Fact Stipulation. *Id.* Voltage therefore asserts that Shoals has waived any indirect infringement claim under the reasoning in *Certain Robotic Vacuum Cleaning Devices* and Ground Rules 9.2 and 13.1. *Id.* at 5.

Voltage also argues that any new arguments and evidence that Shoals presents, for the first time in its supplemental briefing, that the knowledge requirements have been satisfied should be disregarded. RRSB at 1. For example, Voltage contends that Shoals argues for the first time in its supplemental briefing that the filing of its amended complaint suffices to demonstrate the requisite knowledge. *Id.* at 3-4. Voltage, however, claims that argument is too late consistent with the Commission's holding in *Certain Robotic Vacuum Cleaning Devices*. *Id.* Moreover, to the extent that Shoals' newly presented arguments regarding knowledge are considered, Voltage asserts that the Commission weighs the evidence of knowledge of existing patents and infringement against evidence of a good-faith belief of non-infringement and that "Voltage maintained its good-faith belief of non-infringement since first becoming aware of the '153 patent." *Id.* at 4.

Staff submits that Shoals waived any indirect infringement[68] arguments because it was unable to identify where it explicitly argued that Voltage met the knowledge requirements for indirect infringement. SRSB at 1. In addition, Staff asserts that Shoals' attempt to proffer new arguments should be disregarded. *Id.* Staff contends that reviewing the portions of Shoals' prehearing brief that Shoals claimed preserved the issue of indirect infringement showed that Shoals failed to address the knowledge requirements because none of the citations identify where Shoals preserved any argument regarding Voltage's knowledge of the patent or of patent infringement. *Id.* at 2.

Staff argues that a plain reading of the terms of the Fact Stipulation shows that it does not address, much less stipulate, that Voltage satisfied the knowledge requirements. *Id.* at 4. Rather,

[68] Staff notes that "[a]lthough Shoals' position is that it preserved indirect infringement for the solar system claims 21, 23, and 24 of the '153 Patent, Shoals appears to concede that it never put forward arguments directed to contributory infringement, only induced infringement." SRSB at 2 n.1.