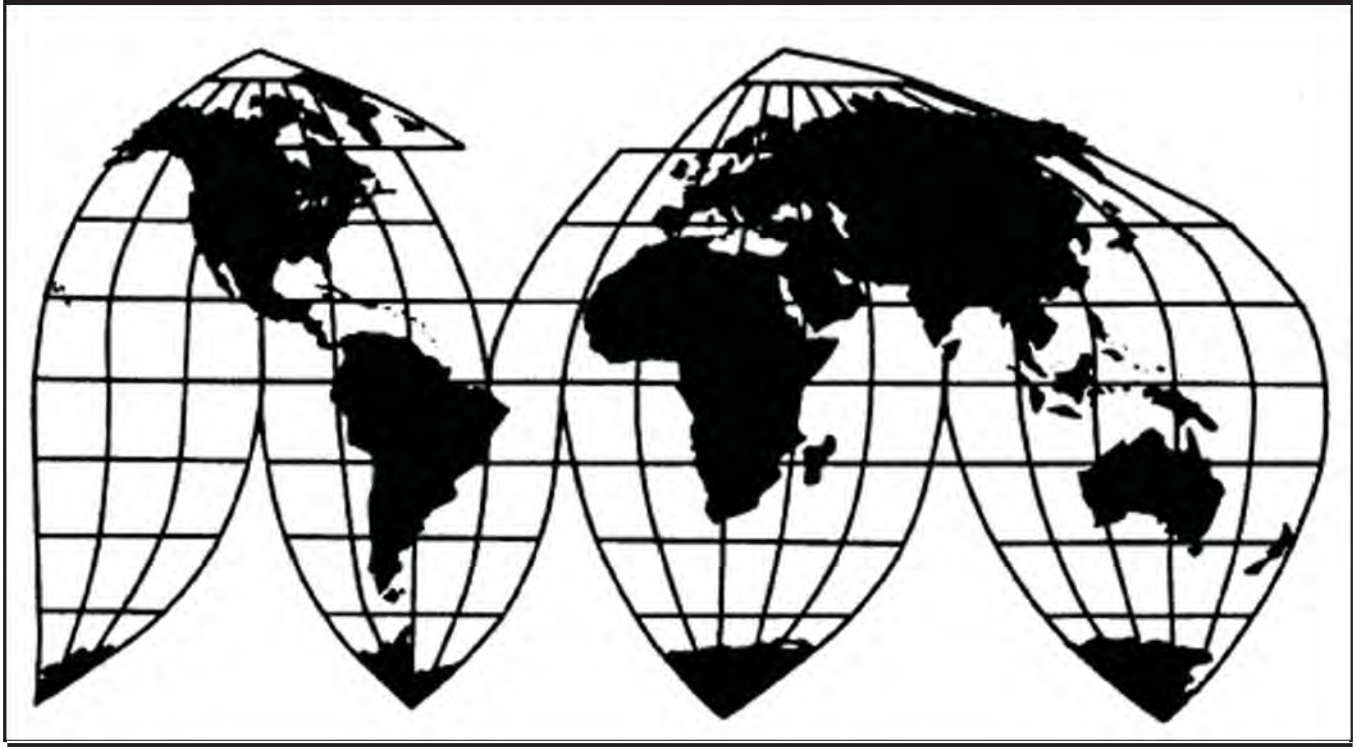
In the Matter of

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME

337-TA-860

Publication 4852 **November 2018**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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United States International Trade Commission
Washington, DC 20436

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In the Matter of

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME

337-TA-860

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November 2018

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

NOTICE OF A COMMISSION FINAL DETERMINATION OF VIOLATION OF SECTION 337; ISSUANCE OF REMEDIAL ORDERS; TERMINATION OF INVESTIGATION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined that there is a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337) by respondents IPtronics A/S of Roskilde, Denmark; IPtronics Inc. of Menlo Park, California; FCI USA, LLC, of Etters, Pennsylvania; FCI Deutschland GmbH of Berlin, Germany; FCI SA of Guyancourt, France; Mellanox Technologies, Inc. of Sunnyvale, California; and Mellanox Technologies Ltd. of Yokneam, Israel (collectively, "Respondents") in the above-captioned investigation. The Commission has issued remedial orders directed to the Respondents' infringing products and has terminated the investigation.

FOR FURTHER INFORMATION CONTACT: Michael Liberman, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-3115. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *http://www.usitc.gov.* The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov.* Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: This investigation was instituted on October 30, 2012, based upon a complaint filed by Avago Technologies Fiber IP (Singapore) Pte. Ltd. of Singapore;

Avago Technologies General IP (Singapore) Pte. Ltd. of Singapore; and Avago Technologies U.S. Inc. of San Jose, California (collectively, "Complainants"), alleging a violation of section 337 of the Tariff Act of 1930, as amended, (19 U.S.C. § 1337) in the importation, sale for importation, or sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of U.S. Patent Nos. 6,947,456 ("the '456 patent") and 5,596,595 ("the '595 patent"). 77 *Fed. Reg.* 65713 (Oct. 30, 2012). In addition to the private parties named as respondents, the Commission named the Office of Unfair Import Investigations as a party in this investigation.

The final Initial Determination ("ID") on violation was issued on December 13, 2013. The ALJ issued his recommended determination on remedy, the public interest and bonding on the same day. The ALJ found that a violation of section 337 has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of the '595 patent. All the parties to this investigation filed timely petitions for review of various portions of the final ID, as well as timely responses to the petitions. The ALJ recommended that the Commission issue a limited exclusion order directed to Respondents' accused products that infringe the '595 patent. The ALJ also recommended that the Commission issue cease and desist orders against the Mellanox and FCI respondents.

On January 15, 2014, Complainants filed a post-RD statement on the public interest pursuant to Commission Rule 201.50(a)(4). On the same day, respondents Mellanox Technologies, Inc. and Mellanox Technologies, Ltd. also filed a submission pursuant to the rule. No responses from the public were received in response to the post-RD Commission Notice issued on December 16, 2013. *See* Notice of Request for Statements on the Public Interest (Dec. 16, 2013).

On February 12, 2014, the Commission issued notice of its determination to review the final ID in part ("the Commission Notice"). 79 *Fed. Reg.* 9764-65 (Feb. 20, 2014). In the Notice, the Commission also set a schedule for the filing of written submissions on the issues under review, including certain questions posed by the Commission, and on remedy, the public interest, and bonding. The Commission also invited briefing from the parties, interested government agencies, and other interested parties with respect to the issues of remedy, the public interest, and bonding. The parties have briefed, with initial and reply submissions, the issues under review and the issues of remedy, the public interest, and bonding. No other submissions were received regarding remedy, the public interest, or bonding.

Having examined the record in this investigation, including the parties' submissions filed in response to the Commission's Notice, the Commission has determined as follows:

(I)) With respect to the '595 patent:

(a) to affirm the ALJ's claim construction of the limitation "current-spreading layer" and infringement and domestic industry (technical prong) determinations relating to that limitation with certain modifications; and

(b) to affirm the ALJ's finding that the Complainants met the economic prong under 19 U.S.C. § 1337(a)(3)(C), and thus not reach the issue of whether the economic prong was met under 19 U.S.C. § 1337(a)(3)(A) and (B).

(II) With respect to the '456 patent:

(a) to affirm the ALJ's infringement and domestic industry (technical prong) determinations with certain modifications in his rationale; and

(b) to affirm the ALJ's finding that the Complainants met the economic prong under 19 U.S.C. § 1337(a)(3)(C), and thus not reach the issue of whether the economic prong was met under 19 U.S.C. § 1337(a)(3)(A) and (B).

The Commission has determined that the appropriate relief in this investigation includes:

(1) a limited exclusion order prohibiting the unlicensed entry of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of U.S. Patent No. 5,596,595 and that are manufactured abroad by or on behalf of, or imported by or on behalf of, respondents IPtronics A/S; IPtronics Inc.; FCI SA; FCI Deutschland GmbH; FCI USA, LLC; Mellanox Technologies, Ltd.; and Mellanox Technologies, Inc.; and (2) cease and desist orders prohibiting importing, selling, marketing, advertising, distributing, transferring (except for exportation), and soliciting U.S. agents or distributors for, optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of U.S. Patent No. 5,596,595 and that are manufactured abroad by or on behalf of, or imported by or on behalf of, respondents FCI USA, LLC and Mellanox Technologies, Inc.

The Commission has further determined that the public interest factors enumerated in section 337(d)(l) and (f)(1) (19 U.S.C. §§ 1337(d)(l), (f)(1)) do not preclude issuance of the limited exclusion order. Finally, the Commission determined that Respondents are required to post a bond in the amount of 3 percent of the entered value of the products covered by the exclusion order and cease and desist orders during the period of Presidential review. The Commission's orders were delivered to the President and the United States Trade Representative on the day of their issuance.

The Commission has therefore terminated this investigation. The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and Part 210 of the Commission's Rules of Practice and Procedure (19 CFR Part 210).

By order of the Commission.

Lisa R. Barton
Acting Secretary to the Commission

Issued: April 17, 2014

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

LIMITED EXCLUSION ORDER

The Commission has determined that there is a violation of Section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the unlawful importation, sale for importation, and sale after importation by Respondents IPtronics A/S; IPtronics Inc.; FCI SA; FCI Deutschland GmbH; FCI USA, LLC; Mellanox Technologies, Ltd.; and Mellanox Technologies, Inc., of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of U.S. Patent No. 5,596,595 ("the '595 patent").

Having reviewed the record of this investigation, including the written submissions of the parties, the Commission has made its determination on the issues of remedy, the public interest, and bonding. The Commission has determined that the appropriate form of relief is a limited exclusion order prohibiting the unlicensed entry of covered optoelectronic devices for fiber optic communications, components thereof, and products containing the same manufactured for or on behalf of Respondents or any of their affiliated companies, parents, subsidiaries, licensees, or other related business entities, or their successors or assigns.

The Commission has also determined that the public interest factors enumerated in 19 U.S.C. § 1337(d) do not preclude the issuance of the limited exclusion order, and that the bond during the period of Presidential review shall be in the amount of 3 percent of the entered value for the covered products.

Accordingly, the Commission hereby **ORDERS** that:

1. Optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of the '595 patent that are manufactured abroad by or on behalf of, or imported by or on behalf of, Respondents or any of their affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns, are excluded from entry for consumption into the United States, entry for consumption from a foreign trade zone, or withdrawal from a warehouse for consumption, for the remaining terms of the patent, except under license of the patent owner or as provided by law.

2. Notwithstanding paragraph 1 of this Order, the aforesaid optoelectronic devices for fiber optic communications, components thereof, and products containing the same are entitled to entry into the United States for consumption, entry for consumption from a foreign-trade zone, or withdrawal from a warehouse for consumption, under bond in the amount of 3 percent of the entered value, pursuant to subsection (j) of Section 337 (19 U.S.C. § 1337(j)) and the Presidential Memorandum for the United States Trade Representative of July 21, 2005 (70 *Fed. Reg.* 43,251), from the day after this Order is received by the United States Trade Representative until such time as the United States Trade

Representative notifies the Commission that this Order is approved or disapproved but, in any event, not later than sixty days after the date of receipt of this Order.

3. At the discretion of U.S. Customs and Border Protection ("CBP") and pursuant to procedures that it establishes, persons seeking to import optoelectronic devices for fiber optic communications, components thereof, and products containing the same that are potentially subject to this Order may be required to certify that they are familiar with the terms of this Order, that they have made appropriate inquiry, and thereupon state that, to the best of their knowledge and belief, the products being imported are not excluded from entry under paragraph 1 of this Order. At its discretion, CBP may require persons who have provided the certification described in this paragraph to furnish such records or analyses as are necessary to substantiate the certification.

4. In accordance with 19 U.S.C. § 1337(l), the provisions of this Order shall not apply to optoelectronic devices for fiber optic communications, components thereof, and products containing the same imported by and for the use of the United States, or imported for, and to be used for, the United States with the authorization or consent of the Government.

5. The Commission may modify this Order in accordance with the procedures described in Section 210.76 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.76).

6. The Secretary shall serve copies of this Order upon each party of record in this investigation and upon the Department of Health and Human Services, the Department of Justice, the Federal Trade Commission, and CBP.

7. Notice of this Order shall be published in the *Federal Register*.

By order of the Commission.

Lisa R. Barton

Acting Secretary to the Commission

Issued: April 17, 2014

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

CEASE AND DESIST ORDER

IT IS HEREBY ORDERED THAT RESPONDENT Mellanox Technologies, Inc., 350 Oakmead Parkway, Suite 100, Sunnyvale, CA 94085, cease and desist from conducting any of the following activities in the United States: importing, selling, marketing, advertising, distributing, transferring (except for exportation), and soliciting U.S. agents or distributors for, optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of U.S. Patent No. 5,596,595 ("the '595 patent") in violation of Section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337).

I.
Definitions

As used in this order:

(A) "Commission" shall mean the United States International Trade Commission.

(B) "Complainants" shall mean Avago Technologies U.S. Inc. of San Jose, California, and Avago Technologies General IP (Singapore) Pte. Ltd. of Singapore.

(C) "Respondent" shall mean **Mellanox Technologies, Inc.**

(D) "Person" shall mean an individual, or any non-governmental partnership, firm, association, corporation, or other legal or business entity other than Respondent or its majority-owned or controlled subsidiaries, successors, or assigns.

(E) "United States" shall mean the fifty States, the District of Columbia, and Puerto Rico.

(F) The terms "import" and "importation" refer to importation for entry for consumption under the Customs laws of the United States.

(G) The term "covered products" shall mean optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of the '595 patent.

II.
Applicability

The provisions of this Cease and Desist Order shall apply to Respondent and to any of its principals, stockholders, officers, directors, employees, agents, licensees, distributors, controlled (whether by stock ownership or otherwise) and majority-owned business entities, successors, and assigns, and to each of them, insofar as they are engaging in conduct prohibited by Section III, *infra*, for, with, or otherwise on behalf of, Respondent.

III.
Conduct Prohibited

The following conduct of Respondent in the United States is prohibited by this Order. For the remaining term of the '595 patent, Respondent shall not:

(A) import or sell for importation into the United States covered products;

(B) market, distribute, sell, or otherwise transfer (except for exportation), in the United States imported covered products;

(C) advertise imported covered products;

(D) solicit U.S. agents or distributors for imported covered products; or

(E) aid or abet other entities in the importation, sale for importation, sale after importation, transfer, or distribution of covered products.

IV.
Conduct Permitted

Notwithstanding any other provision of this Order, specific conduct otherwise prohibited by the terms of this Order shall be permitted if, in a written instrument, the owner of the '595 patent licenses or authorizes such specific conduct, or such specific conduct is related to the importation or sale of covered products by or for the United States.

V.
Reporting

For purposes of this requirement, the reporting periods shall commence on January 1 of each year and shall end on the subsequent December 31. The first report required under this Section shall cover the period from the date of issuance of this order through December 31, 2014. This reporting requirement shall continue in force until such time as Respondent has truthfully reported, in two consecutive timely filed reports, that it has no inventory of covered products in the United States.

Within thirty (30) days of the last day of the reporting period, Respondent shall report to the Commission: (a) the quantity in units and the value in dollars of covered products that it has (i) imported and/or (ii) sold in the United States after importation during the reporting period, and (b) the quantity in units and value in dollars of reported covered products that remain in inventory in the United States at the end of the reporting period.

When filing written submissions, Respondent must file the original document electronically on or before the deadlines stated above and submit eight (8) true paper copies to the Office of the Secretary by noon the next day pursuant to Section 210.4(f) of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-860") in a prominent place on the cover pages and/or the first page. (*See* Handbook for Electronic Filing Procedures, http://www.usitc.gov/secretary/fed_reg_notices/rules/ handbook_on_electronic_filing.pdf). Persons with questions regarding filing should contact the Secretary (202-205-2000). If Respondent desires to submit a document to the Commission in confidence, it must file the original and a public version of the original with the Office of the Secretary and must serve a copy of the confidential version on Complainants' counsel.[1] Any failure to make the required report or the filing of any false or inaccurate report shall constitute a violation of this Order, and the submission of a false or inaccurate report may be referred to the U.S. Department of Justice as a possible criminal violation of 18 U.S.C. § 1001.

VI.
Record-Keeping and Inspection

(A) For the purpose of securing compliance with this Order, Respondent shall retain any and all records relating to the sale, offer for sale, marketing, or distribution in the United States of covered products, made and received in the usual and ordinary course of business, whether in detail or in summary form, for a period of three (3) years from the close of the fiscal year to which they pertain.

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[1] Complainants must file a letter with the Secretary identifying the attorney to receive reports and bond information associated with this Order. The designated attorney must be on the protective order entered in the investigation.

(B) For the purposes of determining or securing compliance with this Order and for no other purpose, subject to any privilege recognized by the federal courts of the United States, and upon reasonable written notice by the Commission or its staff, duly authorized representatives of the Commission shall be permitted access and the right to inspect and copy, in Respondent's principal offices during office hours, and in the presence of counsel or other representatives if Respondent so chooses, all books, ledgers, accounts, correspondence, memoranda, and other records and documents, in detail and in summary form, that must be retained under subparagraph VI(A) of this Order.

VII.
Service of Cease and Desist Order

Respondent is ordered and directed to:

(A) Serve, within fifteen days after the effective date of this Order, a copy of this Order upon each of its respective officers, directors, managing agents, agents, and employees who have any responsibility for the importation, marketing, distribution, or sale of imported covered products in the United States;

(B) Serve, within fifteen days after the succession of any persons referred to in subparagraph VII(A) of this order, a copy of the Order upon each successor; and

(C) Maintain such records as will show the name, title, and address of each person upon whom the Order has been served, as described in subparagraphs VII(A) and VII(B) of this order, together with the date on which service was made.

The obligations set forth in subparagraphs VII(B) and VII(C) shall remain in effect until the expiration date of the '595 patent.

VIII.
Confidentiality

Any request for confidential treatment of information obtained by the Commission pursuant to Section VI of this Order should be made in accordance with Section 201.6 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 201.6). For all reports for which confidential treatment is sought, Respondent must provide a public version of such report with confidential information redacted.

IX.
Enforcement

Violation of this Order may result in any of the actions specified in Section 210.75 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.75), including an action for civil penalties under Section 337(f) of the Tariff Act of 1930 (19 U.S.C. § 1337(f)), as well as any other action that the Commission deems appropriate. In determining whether Respondent is in violation of this Order, the Commission may infer facts adverse to Respondent if it fails to provide adequate or timely information.

X.
Modification

The Commission may amend this Order on its own motion or in accordance with the procedure described in Section 210.76 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.76).

XI.
Bonding

The conduct prohibited by Section III of this Order may be continued during the sixty-day period in which this Order is under review by the United States Trade Representative, as delegated by the President (70 *Fed. Reg.* 43,251 (Jul. 21, 2005)), subject to Respondent posting a bond in the amount of 3 percent of the entered value of each covered product. This bond

provision does not apply to conduct that is otherwise permitted by Section IV of this Order. Covered products imported after the date of issuance of this Order are subject to the entry bond provision as set forth in the Limited Exclusion Order issued by the Commission.

The bond is to be posted in accordance with the procedures established by the Commission for the posting of bonds by complainants in connection with the issuance of temporary exclusion orders. *See* 19 C.F.R. § 210.68. The bond and any accompanying documentation is to be provided to and approved by the Commission prior to the commencement of conduct which is otherwise prohibited by Section III of this Order. Upon acceptance of the bond by the Secretary, (a) the Secretary will serve an acceptance letter on all parties and (b) Respondent must serve a copy of the bond and any accompanying documentation on Complainants' counsel.[2]

The bond is to be forfeited in the event that the United States Trade Representative approves, or does not disapprove within the review period, this Order, unless the U.S. Court of Appeals for the Federal Circuit, in a final judgment, reverses any Commission final determination and order as to a Respondent on appeal, or unless Respondent exports or destroys the products subject to this bond and provides certification to that effect satisfactory to the Commission.

The bond is to be released in the event the United States Trade Representative disapproves this Order and no subsequent order is issued by the Commission and approved, or not disapproved, by the United States Trade Representative, upon service on Respondent of an

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[2] See Footnote 1.

order issued by the Commission based upon application therefore made by Respondent to the Commission.

By order of the Commission.

Lisa R. Barton

Acting Secretary to the Commission

Issued: April 17, 2014

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

CEASE AND DESIST ORDER

IT IS HEREBY ORDERED THAT RESPONDENT FCI USA, LLC, 825 Old Trail Road, Etters, PA 17319, cease and desist from conducting any of the following activities in the United States: importing, selling, marketing, advertising, distributing, transferring (except for exportation), and soliciting U.S. agents or distributors for, optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of U.S. Patent No. 5,596,595 ("the '595 patent") in violation of Section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337).

I.
Definitions

As used in this order:

(A) "Commission" shall mean the United States International Trade Commission.

(B) "Complainants" shall mean Avago Technologies U.S. Inc. of San Jose, California, and Avago Technologies General IP (Singapore) Pte. Ltd. of Singapore.

(C) "Respondent" shall mean **FCI USA, LLC.**

(D) "Person" shall mean an individual, or any non-governmental partnership, firm, association, corporation, or other legal or business entity other than Respondent or its majority-owned or controlled subsidiaries, successors, or assigns.

(E) "United States" shall mean the fifty States, the District of Columbia, and Puerto Rico.

(F) The terms "import" and "importation" refer to importation for entry for consumption under the Customs laws of the United States.

(G) The term "covered products" shall mean optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of the '595 patent.

II.
Applicability

The provisions of this Cease and Desist Order shall apply to Respondent and to any of its principals, stockholders, officers, directors, employees, agents, licensees, distributors, controlled (whether by stock ownership or otherwise) and majority-owned business entities, successors, and assigns, and to each of them, insofar as they are engaging in conduct prohibited by Section III, *infra*, for, with, or otherwise on behalf of, Respondent.

III.
Conduct Prohibited

The following conduct of Respondent in the United States is prohibited by this Order. For the remaining term of the '595 patent, Respondent shall not:

(A) import or sell for importation into the United States covered products;

(B) market, distribute, sell, or otherwise transfer (except for exportation), in the United States imported covered products;

(C) advertise imported covered products;

(D) solicit U.S. agents or distributors for imported covered products; or

(E) aid or abet other entities in the importation, sale for importation, sale after importation, transfer, or distribution of covered products.

IV.
Conduct Permitted

Notwithstanding any other provision of this Order, specific conduct otherwise prohibited by the terms of this Order shall be permitted if, in a written instrument, the owner of the '595 patent licenses or authorizes such specific conduct, or such specific conduct is related to the importation or sale of covered products by or for the United States.

V.
Reporting

For purposes of this requirement, the reporting periods shall commence on January 1 of each year and shall end on the subsequent December 31. The first report required under this Section shall cover the period from the date of issuance of this order through December 31, 2014. This reporting requirement shall continue in force until such time as Respondent has truthfully reported, in two consecutive timely filed reports, that it has no inventory of covered products in the United States.

Within thirty (30) days of the last day of the reporting period, Respondent shall report to the Commission: (a) the quantity in units and the value in dollars of covered products that it has (i) imported and/or (ii) sold in the United States after importation during the reporting period, and (b) the quantity in units and value in dollars of reported covered products that remain in inventory in the United States at the end of the reporting period.

When filing written submissions, Respondent must file the original document electronically on or before the deadlines stated above and submit eight (8) true paper copies to the Office of the Secretary by noon the next day pursuant to Section 210.4(f) of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-860") in a prominent place on the cover pages and/or the first page. (*See* Handbook for Electronic Filing Procedures, http://www.usitc.gov/secretary/fed_reg_notices/rules/ handbook_on_electronic_filing.pdf). Persons with questions regarding filing should contact the Secretary (202-205-2000). If Respondent desires to submit a document to the Commission in confidence, it must file the original and a public version of the original with the Office of the Secretary and must serve a copy of the confidential version on Complainants' counsel.[1] Any failure to make the required report or the filing of any false or inaccurate report shall constitute a violation of this Order, and the submission of a false or inaccurate report may be referred to the U.S. Department of Justice as a possible criminal violation of 18 U.S.C. § 1001.

VI.
Record-Keeping and Inspection

(A) For the purpose of securing compliance with this Order, Respondent shall retain any and all records relating to the sale, offer for sale, marketing, or distribution in the United States of covered products, made and received in the usual and ordinary course of business, whether in detail or in summary form, for a period of three (3) years from the close of the fiscal year to which they pertain.

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[1] Complainants must file a letter with the Secretary identifying the attorney to receive reports and bond information associated with this Order. The designated attorney must be on the protective order entered in the investigation.

(B) For the purposes of determining or securing compliance with this Order and for no other purpose, subject to any privilege recognized by the federal courts of the United States, and upon reasonable written notice by the Commission or its staff, duly authorized representatives of the Commission shall be permitted access and the right to inspect and copy, in Respondent's principal offices during office hours, and in the presence of counsel or other representatives if Respondent so chooses, all books, ledgers, accounts, correspondence, memoranda, and other records and documents, in detail and in summary form, that must be retained under subparagraph VI(A) of this Order.

VII.
Service of Cease and Desist Order

Respondent is ordered and directed to:

(A) Serve, within fifteen days after the effective date of this Order, a copy of this Order upon each of its respective officers, directors, managing agents, agents, and employees who have any responsibility for the importation, marketing, distribution, or sale of imported covered products in the United States;

(B) Serve, within fifteen days after the succession of any persons referred to in subparagraph VII(A) of this order, a copy of the Order upon each successor; and

(C) Maintain such records as will show the name, title, and address of each person upon whom the Order has been served, as described in subparagraphs VII(A) and VII(B) of this order, together with the date on which service was made.

The obligations set forth in subparagraphs VII(B) and VII(C) shall remain in effect until the expiration date of the '595 patent.

VIII.
Confidentiality

Any request for confidential treatment of information obtained by the Commission pursuant to Section VI of this Order should be made in accordance with Section 201.6 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 201.6). For all reports for which confidential treatment is sought, Respondent must provide a public version of such report with confidential information redacted.

IX.
Enforcement

Violation of this Order may result in any of the actions specified in Section 210.75 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.75), including an action for civil penalties under Section 337(f) of the Tariff Act of 1930 (19 U.S.C. § 1337(f)), as well as any other action that the Commission deems appropriate. In determining whether Respondent is in violation of this Order, the Commission may infer facts adverse to Respondent if it fails to provide adequate or timely information.

X.
Modification

The Commission may amend this Order on its own motion or in accordance with the procedure described in Section 210.76 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.76).

XI.
Bonding

The conduct prohibited by Section III of this Order may be continued during the sixty-day period in which this Order is under review by the United States Trade Representative, as delegated by the President (70 *Fed. Reg.* 43,251 (Jul. 21, 2005)), subject to Respondent posting a bond in the amount of 3 percent of the entered value of each covered product. This bond

provision does not apply to conduct that is otherwise permitted by Section IV of this Order. Covered products imported after the date of issuance of this Order are subject to the entry bond provision as set forth in the Limited Exclusion Order issued by the Commission.

The bond is to be posted in accordance with the procedures established by the Commission for the posting of bonds by complainants in connection with the issuance of temporary exclusion orders. *See* 19 C.F.R. § 210.68. The bond and any accompanying documentation is to be provided to and approved by the Commission prior to the commencement of conduct which is otherwise prohibited by Section III of this Order. Upon acceptance of the bond by the Secretary, (a) the Secretary will serve an acceptance letter on all parties and (b) Respondent must serve a copy of the bond and any accompanying documentation on Complainants' counsel.[2]

The bond is to be forfeited in the event that the United States Trade Representative approves, or does not disapprove within the review period, this Order, unless the U.S. Court of Appeals for the Federal Circuit, in a final judgment, reverses any Commission final determination and order as to a Respondent on appeal, or unless Respondent exports or destroys the products subject to this bond and provides certification to that effect satisfactory to the Commission.

The bond is to be released in the event the United States Trade Representative disapproves this Order and no subsequent order is issued by the Commission and approved, or not disapproved, by the United States Trade Representative, upon service on Respondent of an

[2] See Footnote 1.

order issued by the Commission based upon application therefore made by Respondent to the Commission.

By order of the Commission.

Lisa R. Barton

Acting Secretary to the Commission

Issued: April 17, 2014

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING SAME **Inv. No. 337-TA-860**

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **Commission Notice** has been served by hand upon the Commission Investigative Attorney, Matthew N. Bathon, Esq., and the following parties as indicated, on **April 17, 2014.**

Lisa R. Barton, Acting Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc.:

Liane M. Peterson, Esq.
FOLEY & LARDNER LLP
3000 K Street NW, Suite 600
Washington, DC 20007

( ) Via Hand Delivery
(x) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents FCI USA, LLC, FCI Deutschland GmbH and FCI SA:

Tom M. Schaumberg, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1133 Connecticut Avenue, NW, 12th Floor
Washington, DC 20036

( ) Via Hand Delivery
(x) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents Mellanox Technologies, Inc., Mellanox Technologies Ltd., IPtronics A/S (n/k/a Mellanox Technologies Denmark ApS) and IPtronics Inc.:

Jamie D. Underwood, Esq.
ALSTON & BIRD LLP
950 F Street NW
Washington, DC 20004

( ) Via Hand Delivery
(x) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

COMMISSION OPINION

On April 17, 2014, the Commission issued notice of its final determination of a violation of section 337 of the Tariff Act of 1930, as amended, (19 U.S.C. § 1337) ("section 337"), entry of remedial orders, and termination of this investigation. This opinion discusses the Commission's determination on the issues it previously determined to review, and on the issues of remedy, the public interest, and bonding.

I. BACKGROUND AND PROCEDURAL HISTORY

On October 30, 2012, the Commission instituted this investigation with respect to U.S. Patent No. 6,947,456 ("the '456 Patent") and U.S. Patent No. 5,596,595 ("the '595 patent") to determine:

> [W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same that infringe one or more of claims 1, 2, 4, 6-8, 11-13, 15, and 20-24 of the '456 patent and claims 14, 17, and 19 of the '595 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337[.]

77 *Fed. Reg.* 65713 (Oct. 30, 2012). The complainants are Avago Technologies General IP (Singapore) Pte. Ltd. of Singapore and Avago Technologies U.S. Inc. of San Jose, California (collectively, "Avago" or Complainants). 78 *Fed. Reg.* 16296-97 (Mar. 14, 2013). The respondents are IPtronics A/S of Roskilde, Denmark; IPtronics Inc. of Menlo Park, California; FCI USA, LLC of Etters, Pennsylvania; FCI Deutschland GmbH of Berlin Germany; FCI SA of Guyancourt, France; Mellanox Technologies, Inc. of Sunnyvale, California; and Mellanox Technologies Ltd. of Yokneam, Israel (collectively, Respondents). 77 *Fed. Reg.* 65713 (Oct. 30, 2012). The Office of Unfair Import Investigations, represented by the Commission investigative attorney ("the IA" or "Staff"), is a party in this investigation. *Id.*

The technology at issue in the present investigation relates to semiconductor lasers, including the laser structure and capabilities of the laser drivers. Semiconductor lasers are widely used in numerous applications such as providing high-speed optical data links or connecting components of the computer and network systems. '456 patent, col. 1: lls. 5-14.

The purpose of an optical transmitter module in such systems is to convert data signals in electrical form into corresponding data signals in optical form generated by light sources such as semiconductor lasers, including vertical-cavity surface emitting lasers ("VCSELs"). In this manner, the data can be communicated as light signals to another module (*e.g.*, an optical receiver module) via a light-conducting medium such as a fiber optic cable. '456 patent, col. 1: lls. 12-19.

The optical transmitter module commonly employs a laser to convert the electrical data signals into the light data signals. One semiconductor laser broadly utilized for this purpose is a

VCSEL. The VCSEL is configured to operate only with input signals (*e.g.*, drive waveforms) that conform to particular predetermined electrical properties. The data signals, however, do not typically have such predetermined electrical characteristics. Accordingly, a circuit called a VCSEL driver is utilized for accepting the data signals and generating corresponding VCSEL drive signals (*e.g.*, a drive waveform) with the electrical characteristics that are suitable to drive the VCSEL. '456 patent, col. 1: lls. 20-39.

For a surface-emitting laser, radiation is ordinarily emitted through one or more openings in a metal electrode of the laser, where the light emitted from an opening is coupled to the optical fiber. The shape and size of the opening through which light is coupled to the optical fiber can be selected to conform to the shape and size of the fiber. The region of implantation can confine current flow from the electrode to a selected region of an active layer in which light energy is generated at a fixed wavelength in response to current flow. The two interrelated concerns in the design and operation of a surface-emitting laser are the distribution of thermal energy and the distribution of current flow. '595 patent, col. 1: lls. 25-47.

The '595 patent is directed to current-spreading and heat-spreading layers for surface-emitting lasers. JX-0467 ('595 patent, Abstract). Surface-emitting lasers, such as the VCSELs at issue in this investigation, are formed to include layers for improving the heat spreading and current spreading capabilities of the laser. Layers that reduce the thermal impedance or improve the current distribution are used in the VCSELs in order to improve performance and/or increase the useful life of the laser. The layers are formed in order to allow passage of light energy from the optical cavity of the laser through an opening in an electrode. '595 patent, col. 2: lls. 26-33.

Asserted claims 14 and 19 of the '595 patent are directed to a current-spreading layer in the VCSEL. '595 patent, col. 10: lls. 39-60; col. 12: lls. 3-25.

The '456 patent is directed to a laser driver for generating drive waveforms that are suitable for driving a single VCSEL or an array of VCSELs. JX-0471 ('456 patent, Abstract). A laser driver contains a digital controller that is employed to initially program and selectively adjust certain VCSEL drive waveform parameters during the operation of the driver. *Id.*

On December 13, 2013, the ALJ issued his final initial determination ("ID") finding a violation of section 337. Specifically, the ALJ found that a violation has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of the '595 patent.[1] The ALJ also found that no violation was established with respect to the '456 patent.

The Commission determined to review the final ID in part, and issued a Notice dated February 12, 2014 ("the Commission Notice"), 79 *Fed. Reg.* 9764-65 (Feb. 20, 2014), in which the Commission specified the issues under review and posed briefing questions. In particular, the Commission determined to review the following issues:

(I) With respect to the '595 patent:

(a) the ALJ's claim construction of the limitation "current-spreading layer" and infringement and domestic industry (technical prong) determinations relating to that limitation; and

(b) the ALJ's determinations with respect to whether Complainants met the economic

---

[1]The infringing products are identified in the ID at 69, 78, 79, 87, 90, 91, 94, 95.

prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C).

(II) With respect to the '456 patent:

(a) the ALJ's claim construction, infringement, and domestic industry (technical prong) determinations; and

(b) the ALJ's determinations with respect to whether Complainants met the economic prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C).

79 *Fed. Reg.* 9764-65 (Feb. 20, 2014).

The Commission determined not to review the remainder of the final ID. *Id.* The Commission requested the parties to brief the issues under review based on the evidentiary record, and to respond to certain questions pertaining to the issues under review. *Id.* The Commission also requested briefing on the issues of remedy, the public interest, and bonding from the parties as well as from the public and government agencies. *Id.* All the parties to this investigation filed timely written submissions regarding the issues under review, remedy, the public interest, and bonding, and timely reply submissions. No responses were received from the public or government agencies.

II. SUMMARY OF DETERMINATIONS

The Commission has determined as follows with respect to the issues under review and the issues of remedy, the public interest, and bonding.

A. Issues Under Review

(1) The Commission affirms the ALJ's claim construction of the limitation "current-spreading layer" in the '595 patent and infringement and domestic industry (technical prong) determinations relating to that limitation with certain modifications to his rationale.

(2) The Commission affirms the ALJ's determination that the Complainants met the economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(C) with respect to the '595 patent.

(3) The Commission affirms the ALJ's claim construction, infringement, and domestic industry (technical prong) determinations with respect to the '456 patent with minor modifications to his rationale.

(4) The Commission affirms the ALJ's determination that the Complainants met the economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(C) with respect to the '456 patent.

B. Remedy, the Public Interest and Bonding

The Commission determines that: (1) the appropriate remedy is a limited exclusion order directed to Respondents' products that infringe the asserted claims of the '595 patent, and cease and desist orders directed to FCI USA, LLC and Mellanox Technologies, Inc.; (2) the public interest will not be adversely affected by entry of remedial orders; and (3) Respondents are required to post a bond in the amount of 3 percent of the entered value of the products covered by the remedial orders during the period of Presidential review.

III. COMMISSION REVIEW

Commission review of an initial determination is limited to the issues set forth in the notice of review and all subsidiary issues therein. *Certain Bar Clamps, Bar Clamp Pads, and Related Packaging Display and Other Materials*, Inv. No. 337-TA-429, Comm'n Op. at 3 (January 4, 2001). Once the Commission determines to review an initial determination, its review is conducted under a *de novo* standard. *Certain Polyethylene Terephthalate Yarn and Products Containing Same*, Inv. No. 337-TA-457, Comm'n Op. at 9 (June 18, 2002). Upon review the "Commission has 'all the powers which it would have in making the initial

determination,' except where the issues are limited on notice or by rule." *Certain Flash Memory Circuits and Products Containing Same,* Inv. No. 337-TA-382, Commission Opinion on the Issues Under Review and on Remedy, the Public Interest, and Bonding at 9-10 (June 2, 1997), USITC Pub. 3046 (July 1997) (quoting *Certain Acid-Washed Denim Garments and Accessories,* Inv. No. 337-TA-324, Commission Opinion at 5 (Nov. 1992)).

On review, "the Commission may affirm, reverse, modify, set aside or remand for further proceedings, in whole or in part, the initial determination of the administrative law judge. The Commission may also make any findings or conclusions that in its judgment are proper based on the record in the proceeding." 19 C.F.R. § 210.45(c).

IV. DISCUSSION OF THE ISSUES PERTAINING TO THE COMMISSION'S DETERMINATION OF A SECTION 337 VIOLATION

A. The ALJ's claim construction of the limitation "current-spreading layer" in the '595 patent and infringement and domestic industry (technical prong) determinations relating to that limitation.

The ALJ determined that the Accused Products meet the "current-spreading layer" limitation. ID at 75-76. Respondents and the IA petitioned for review of the ALJ's determination. RespPet at 20-35, IAPet. at 12-15. We find that the ALJ correctly construed the limitation "current-spreading layer" in the '595 patent, and we affirm the ALJ's infringement and domestic industry (technical prong) determinations relating to that limitation, with some modifications to the ALJ's rationale underlying his infringement findings.

Respondents argue that the ALJ applied an infringement-based construction of the term "current-spreading layer" to find infringement. RespPet at 20. They note that the ALJ construed the word "layer" in the negative, finding that "layer" is not limited to "a single material layer."

Id. at 21 (citing ID at 44). Respondents contend however, that, when faced with the issues of whether or not the Accused VCSELs infringe and whether or not the [[ ]] VCSEL practices the claimed subject matter, the ALJ did not apply this broad construction, but instead narrowed the construction of "current-spreading layer" to be "one or more layers or portions of layers of any material that have similar electrical and optical properties" which can be determined "based on the [[ ]] of the [[ ]] that is in the semiconductor used in these devices." *Id.* at 22 (citing ID at 73).[2] The IA takes a similar position. *See* IAPet. at 12-15. Complainants disagree and support the ID. ComplResp at 9-34.

We find that the ALJ properly applied the claim construction of "current-spreading layer" in his infringement analysis and the record evidence supports the conclusion that Avago has proven that the Accused Products infringe claims 14 and 19 of the '595 patent by a preponderance of the evidence.[3] We reject the Respondents' and the IA's argument that the ALJ applied a different construction of "current-spreading layer" for the purposes of his infringement analysis. In fact, the ALJ never departed from the construction he set out in the claim construction section of the ID.

Specifically, the ALJ found that:

> Avago has presented sufficient evidence to establish that the [[ ]] VCSEL includes a layer that satisfies the "current-spreading layer" limitations of the asserted claims. In this regard the ALJ finds Dr. Deppe's full testimony worth repeating

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[2]Respondents make a similar argument with respect to Avago's domestic industry product [[ ]] VCSEL, RespPet at 35-36.

[3]Claim 17 of the '595 patent asserted in the notice of investigation and complaint was terminated from the investigation. *See* ID at 9 n. 1.

> here. In particular, the ALJ repeats his explanation of his methodology (Q/A 193) and then his actual analysis. First, Dr. Deppe explained his general methodology . . .

ID at 72. The ALJ's finding relies on the portion of Dr. Deppe's testimony in which Dr. Deppe explains how he arrived at his conclusion that the accused products meet the "current-spreading layer" limitation. ID at 73 (quoting CX-2086 at Q/A 193). That testimony supports the ALJ's infringement determination.

Furthermore, the ALJ found that:

> In particular, the ALJ finds persuasive [Dr. Deppe's] explanation that the reason he only includes [[
>
>]] The ALJ cannot say that this is the perfect approach to [[ ]] but after considering the testimony of both Dr. Deppe and Dr. Chang-Hasnain, the ALJ believes that this, at least, is a reasonable approach to analyzing a [[ ]] The ALJ notes that Dr. Chang-Hasnain offered no real alternative. The ALJ finds that Dr. Chang-Hasnain's reliance on [the] particular way the epi-recipe is laid out, *i.e.*, [[
>
>]] is not persuasive and gives no weight to testimony in this regard. (RX-0006C at Q/A 173-74; Tr. 926:17-928:6, 976:21-24, 981:22-982:23.)

ID at 74-75. Neither Respondents nor the IA show any clear error in this reasoning and finding. *See* RespPet at 20; IAPet at 12-13.

The ALJ further found as follows:

> Thus, the physical realities of the materials involved, not the particular document format, must control. Dr. Deppe has done this and Dr. Chang-Hasnain has not. Accordingly, the ALJ finds

his testimony persuasive.

The ALJ further finds that Dr. Deppe's application of his construction has been consistent across all Accused VCSELs and the Avago [[ ]] VCSEL. As discussed above, the ALJ finds that in each VCSEL, the current-spreading layer includes [[

]]

As discussed in greater detail, *infra*, this means that the current-spreading layer for the [[ ]] VCSELs consists of [[

]] (CX-2086C at Q/A 198.) For the [[ ]] VCSELs, the current-spreading layer consists of [[

]] (CX-2086C at Q/A 195.) For the [[ ]] VCSELs, the current-spreading layer consists of [[

]] (Id. at Q/A 201.) For [[ ]] VCSELs, the current-spreading layer consists of [[

]] (Id. at Q/A 204, 207.) Thus, the ALJ finds that Dr. Deppe applied a similar [application of his construction] across all of the products he analyzed.

Accordingly, the ALJ finds that Avago has presented sufficient evidence to show that these limitations of claims 14 and 19 are met.

ID at 75-76. The ALJ's infringement determinations apply to all of Respondents' Accused Products. *See* ID at 69-95. We reject Respondents' and the IA's contentions that the ALJ's infringement determinations, including specific determinations with respect to [[ ]] VCSEL, [[ ]] VCSEL, [[ ]] VCSEL, and [[ ]] VCSEL are clearly erroneous and not supported by

the record. *See* RespPet at 25-36, IAPet at 12-15. *See also* ComplResp at 26-33. Respondents and the IA did not show any clear error in the ALJ's reasoning and ultimate determination that these limitations of claims 14 and 19 are met. *See* RespPet at 20; IAPet at 12-13. Therefore, based on the record, we find that the ALJ properly found that Avago has proven that the Accused Products infringe claims 14 and 19 of the '595 patent by preponderance of the evidence.

Similarly, the ALJ credited Dr. Deppe's testimony demonstrating that the [[ ]] VCSEL practices claims 14 and 19 of the '595 patent. *See* ID at 187-190. The ALJ properly applied the correct claim construction of "current-spreading layer" and the evidence cited in the ID demonstrates that Avago has proven the technical prong of the domestic industry requirement. *Id.*

While we affirm the ALJ's infringement determinations at issue, we find that certain language in the ID is unsupported by the record and is unnecessary for the ALJ's infringement findings. Accordingly, we modify the ID by striking the following:

1. First full paragraph on page 73, starting with the words "In other words."
2. "of similar compositions" in the first line of the first full paragraph on page 74.
3. The word "similar" in the seventh line on page 75.

We affirm, without modification, the rest of the ID's findings on infringement, claim construction, and domestic industry (technical prong) concerning the '595 patent, including those findings relating to the "current-spreading layer" limitation.

B. The ALJ's determinations on whether Complainants met the economic prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C) with respect to the '595 patent.[4]

The ALJ determined that Complainants failed to show that they met the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(A) (significant investment in plant and equipment). ID at 204. The ALJ found that Complainants demonstrated that they met the economic prong under 19 U.S.C. § 1337(a)(3)(B) (significant investments in labor and capital), ID at 207, and 19 U.S.C. § 1337(a)(3)(C) (substantial investments in domestic research and development), ID at 215, where Complainants' investments in labor and capital were directed toward domestic research and development, and virtually all production of the articles in question takes place overseas.

Respondents contend that the ALJ erred in finding that Complainants met the economic prong of the domestic industry requirement. Complainants and the IA support the ALJ's determination that they met the economic prong under both prong under 19 U.S.C. § 1337(a)(3)(B) and (C).

Respondents' first argument is that the ALJ erred in finding a domestic industry under Section 337(a)(3)(B) because research and development investments, like other

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[4]Section 337 provides that a domestic industry exists if there is in the United States, with respect to the articles protected by the patent:

(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).

non-production-related "exploitation" investments, are cognizable solely under subsection 337(a)(3)(C), and not under subsections 337(a)(3)(A) or (B). RespOpenNotice at 1. Respondents note that the three subsections of 337(a)(3) are in the disjunctive ("or"), suggesting that subsection (C) is intended to cover activities outside the scope of (A) or (B). Respondents argue that this is confirmed by the legislative history, Commission precedent, and case law, all of which, in their view, demonstrate that the investments covered by subsection (C) are in a different category from the types of activities and investments cognizable as a domestic industry under subsections (A) and (B). *Id.* at 4-5.

Further, Respondents argue that subsection (C), unlike subsections (A) and (B), requires that the alleged investments involve "exploitation" of the asserted patents. *Id.* at 1. Respondents also note that subsections (A) and (B) require, respectively, "significant" investment in plant and equipment and "significant" employment of labor and capital, while subsection (C) requires a "substantial" investment. Respondents emphasize that it is undisputed that Avago does not manufacture the alleged domestic industry products in the United States, and that its asserted domestic industry is based on alleged investments in R&D activities.

Complainants argue that their R&D investments are properly considered under section 337(a)(3)(A) and (B) in addition to section 337(a)(3)(C). They argue that the legislative history and case law shows that the three enumerated sections (A), (B) or (C) are to be construed broadly and that subsections (A) or (B) are not limited to just "actual production of the article" in the United States. ComplOpenNotice at 2-3.

The IA contends that Sections 337(a)(3)(A) and (B) have generally been interpreted to

cover expenditures related to the production of articles protected by a patent, while the economic prong analysis related to non-production related expenditures is most appropriately conducted pursuant to Section 337(a)(3)(C). IAOpenNotice at 7-8. The IA submits that under the circumstances of this investigation, it is immaterial whether Avago's investments are analyzed under Section 337(A), (B), or (C).

For the reasons detailed below, we affirm the ALJ's finding that the Complainants have demonstrated that they have made substantial investments in the exploitation of the '595 patent in research and development with respect to the [[ ]] VCSEL in the QSFP product line under 19 U.S.C. § 1337(a)(3)(C).

In support of its domestic industry claim with respect to the '595 patent, Avago relied on expenditures related to the development of its QSFP line of transceivers that contain [[ ]] VCSELs, which are covered by claims 14 and 19 of the '595 patent. *Id.* Avago identified those products as "Avago '595 Domestic Industry Products." *Id.* (citations omitted). [5]

Avago's Fiber Optics Products Division ("FOPD") group in San Jose, CA is responsible for development and sale of the Avago Domestic Industry Products. The Avago FOPD in San Jose, CA is broken down into a number of groups, four of which are pertinent to Avago's domestic industry claim. Avago's FOPD also includes an R&D group in Singapore, but that group's responsibilities are directed not towards [[

]] but instead towards [[ ]]

[5]Collectively with Avago '456 Domestic Industry Products, the '595 Domestic Industry Products constitute Avago Domestic Industry Products. *See id.*

[[ ]] ComplPostHear at 126 (citing CX-2084C QQ. 88-89, 184; CX-2088C QQ. 134-135; CX-2089C QQ. 647-650; JX-0185C at 26:15-27:3). Avago's domestic industry claim did not include any expenditures relating to Avago's Singapore group.

Virtually all of Avago's claimed U.S. investments are made exclusively in the overall R&D and testing of VCSELs and products containing those VCSELs that practice the asserted patents. *See* ID at 208-15. The ALJ properly probed the specific R&D projects, operations, and expenditures to isolate for consideration only those R&D investments incurred in San Jose and qualified as exploitation of the '595 patent. *Id.* at 214-15. The Commission finds that the ALJ's analysis appropriately identified those investments as investments in the exploitation of the '595 patent through Avago's research and development activities in the United States.

As Avago has made an adequate showing that its claimed investments are appropriately considered under Section 337(a)(3)(C), we need not reach the merits of its alternative claim under Section 337(a)(3)(A) and (B). We note that a complainant such as Avago, may plead that it satisfies the domestic industry requirement in the alternative under one or more prongs of Section 337(a)(3). However, it is incumbent upon the complainant to specifically prove that the separate requirements and standards of each prong have been met based on the specific evidence relied upon for that statutory provision.

For example, it is insufficient to merely provide proofs concerning a laundry list of expenditures without adequately explaining why such investments satisfy the specific requirements and standards of each particular subsection of Section 337(a)(3).

Respondents challenge two further aspects of the evidence supporting the ID's economic prong findings. First, respondents contend that Avago's investment of [[ ]] may not have been devoted entirely to the [[ ]] products that practice the '595 patent. Second, Respondents contend that the [[ ]] includes foreign expenditures, including personnel engaged in R&D in Singapore. We affirm the ALJ's determination that the evidence relied upon in the ID is appropriately considered under section 337(a)(3)(C) with a slight modification.

As to the first point, Respondents argued that, while the ALJ initially found that the Complainants invested [[ ]] in R&D spending to develop the entire QSFP product line, *see* ID at 210-11, the ALJ also stated that "Avago presented evidence that it spent approximately [[ ]] to develop the [[ ]] VCSEL, which is found in its QSFP line of products. . . ." ID at 214. Respondents contended that "[t]hese findings are inherently discordant." RespPet at 74.

The parties' submissions in response to the Commission's Notice clarified this discrepancy. *See* ComplOpenNotice at 8.[6] *See also* IAOpenNotice at 11 n.3 ("To the extent that

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[6]Specifically, Complainants submit:

> The R&D investments (along with the corresponding investments in plant and equipment, and labor in capital) that Avago relies on to satisfy domestic industry for the '595 patent are the expenditures made by Avago to develop the QSFP products in the U.S. ***Avago invested at least*** [[ ]] ***in R&D to develop the QSFP line of products, all of which include the*** [[ ]] ***VCSEL***. (*See* JX-0373C at 197 [[
>
>]]; *see* also CX-2088C QQ. 255-72; JX-0373C at 212, 219, 226; CX-2087C at QQ. 272-74, 279-80; CX-1297C at 889 (describing investment in QSFP products containing [[ ]] VCSELs); *see also* CX-2088C Q. 258, 268-71; JX-0373C at 197, 229; CX-0830C at 529 (describing

it is relevant, OUII notes that the [[ ]] investment relates to Avago's QSFP product line.").

With respect to the second issue, we find that the evidence relied upon by the ALJ demonstrates that the U.S. labor cost portion of the [[ ]] is limited to the [[ ]] Avago personnel engaged in R&D in the United States. *See, e.g.*, ID at 206 (citing JX-0373C). *See also* JX-0373C at AV-ITC40068197 (listing [[ ]] employees under "San Jose R&D" group); ComplReplyNotice at 4 n. 6.[7]

> Avago's employment of labor and capital for conducting R&D on the QSFP products containing [[ ]] VCSELs).) These project-based R&D figures are regularly tracked by Avago for all product lines. (*See* CX-2088C QQ. 29, 31-35, 38, 65-68, 107-08, 124-30, 231-46, 255-72, 353-58, 359-65, 366-73; JX-0373C; CX-2023C; CX-2019C; CX-1135C; CX-1417C.) [[
>
>]](*See* CX-2084C QQ. 179-82; CX-2088C QQ. 157-68, 179-91, 196-97; JX-0283C at 139; JX-0275C; JX-0277C; JX-0281C; CX-2087C QQ. 75-77, 80, 82-109.)

ComplOpenNotice at 8 (emphasis added).

[7]Specifically, Complainants point out that:

> For example, Respondents misleadingly refer to a "list of worldwide employees" and assert the record is "unclear as to which employees should be considered U.S. R&D personnel" (Resp. Br. at 10 and fn. 7), but it is clear from the document and supporting testimony exactly which of these employees were located in the U.S. (*See, e.g.*, JX-0373C at AV-ITC40068197 [[
>
>]]; CX- 2089C QQ. 473-74, 484 [[ ]]; CX-2090C Q. 39 [[
>
>]])

Accordingly, we modify the ID by striking the sentence "Avago presented evidence that it spent approximately [[ ]] to develop the [[ ]] VCSEL, which is found in its QSFP line of products, based on the efforts of approximately [[ ]] research and development personnel." that begins on line 6 of page 214 of the ID. We substitute the following in its place: "Avago presented evidence that it spent approximately [[ ]] to research and develop its QSFP line of products, which includes the [[ ]] VCSEL, based on the efforts of approximately [[ ]] research and development personnel."

Finally, Respondents challenge the substantiality of Complainants' investments, arguing that complainants have failed to make an evidentiary showing that their investments in R&D are "substantial" relative to those made by Complainants generally or by others in the fiber optics industry. Resp.Pet. at 76-77. The Commission concludes that the record supports the ALJ's determination that the claimed investments are substantial under Subsection (a)(3)(C). As we held in *Certain Printing and Imaging Devices*, whether investment activities are significant or substantial "is not evaluated according to any rigid mathematical formula," but rather, "entails 'an examination of the facts in each investigation, the article of commerce, and the realities of the marketplace.'" *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Comm'n Op. at 27 (Feb. 17, 2011) ("Printing Devices") (quoting *Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Comm'n Op. at 39 (Aug. 1, 2007)). There are a number of factors and approaches taken by the Commission in making this determination. For example, comparing complainant's domestic expenditures to its foreign expenditures is one of

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ComplReplyNotice at 4 n. 6.

the possible factors that the Commission could but, contrary to Respondents' argument, is not required to consider. *Id.* at 27-28. *Accord, Certain Encapsulated Integrated Circuit Devices and Products Containing Same,* Inv. No. 337-TA-501, Comm'n Op. at 33 (Apr. 4, 2014).

The record in the present investigation demonstrates that Avago's U.S. domestic industry investments are substantial in the context of Avago's business, the relevant industry, and realities of the marketplace. As Avago points out, it invested [[ ]] in R&D and [[ ]] in capital expenses to develop the QSFP products containing [[ ]] VCSELs. ComplOpenNotice at 13 (citing JX-0373C). Put in context, these R&D investments allowed Avago to generate over [[ ]] in revenue from sales of these products from FY09 through the third quarter of FY12. *Id.* (citing CX-2087C Q. 68; RX-1098C). These figures show the relative importance of its R&D investments as they are directly tied to development of the articles protected by the patent and are critically important to Avago's business as a whole.

Furthermore, Avago's FOPD, which is responsible for development of the subject articles, [[ ]] *Id.* (citing CX-2084C QQ. 83-84.) Avago explained that:

> Without this investment, Avago would not have been able to introduce these products and generate this income, which is critical to Avago's operations. (*See id.* at QQ. 86-87, 126, 173, 175 (testifying that Avago's FOPD products are "core products that are Avago's mainstay")). More specifically, Avago's witnesses testified that Avago's domestic VCSEL and VCSEL driver research, including customer qualification activities, is "critical for [Avago's] success as a company," allowing Avago to introduce [[ ]] new VCSEL-based products each year to "fit the evolving needs of Avago's customers." (*See id.* at QQ. 173-75; *see also* CX-2094C Q. 51.) Accordingly, the R&D investments are significant and substantial with respect to the development of the

> products themselves and also within the context of Avago's FOPD division and the company as a whole. *See Printing Devices*, Inv. No. 337-TA-690, Comm'n Op. at 29 (considerations include whether expenses were "significant to complainant's U.S. business" and the "relative importance of these activities to the protected articles") (citing *Certain Battery-Powered Ride-On Toy Vehicles*, Inv. No. 337-TA-314, ID at 20-21 and *Certain Airtight Cast-Iron Stoves*, Inv. No. 337-TA-69, Comm'n Op. at 10-11).

Id. at 13-14. Respondents failed to rebut this evidence.

Likewise, the record indicates that the R&D activities of Avago's FOPD in the U.S. account for approximately [[ ]] of its worldwide R&D activities, thus demonstrating that a substantial portion of the R&D occurs in the U.S. ComplOpenNotice at 15 (citing CX-2084C Q. 129; *see also* CX-1750C 38-40 and Att. D; JX-0152C; CX-2088C QQ. 56-64, 69-76, 95-103; JX-0271C; JX-0411C). Avago submits that all of the R&D directed to VCSEL-based products of the type at issue here occurs in the U.S., with the remaining worldwide R&D relating to non-VCSEL devices [[ ]] *Id.* (citing CX-2084CC QQ. 59, 89, 129-30, 173; Hall Tr., 341:8-14 (testifying all [[ ]] VCSEL development occurred in San Jose, CA); see also JX-0202C at 62:8-13; CX-1750C at 36).

Moreover, as Avago points out, the "nature" of its domestic R&D investments further indicates that they are substantial. The record shows that Avago's domestic R&D investments are connected to aspects of the domestic industry products that practice the claimed elements of the asserted patents, including the '595 patent. *Id.* (citing CX-2087C Q. 121; CX-2094C QQ. 34-36, 41, 51; CX-2090C QQ. 7, 13, 35, 37, 43; CX-1750C at 26; JX-0090C; JX-0264C (describing R&D activities directed towards practicing the asserted claims); CX-2090C Q. 39 (explaining R&D efforts directed to designing VCSELs claimed by the '595 patent that will fit

with the VCSEL driver component of the articles protected by the patents); CX-2094C Q. 36, 43, 51; CX-2090C Q. 37; JX-0264C; JX-0205C at 62:12-63:19, 65:1-66:5, 66:15-25 (explaining R&D efforts directed to designing the particular layers in the VCSELs in the articles protected by the patents as claimed in the '595 patent)). Respondents do not challenge the accuracy of the above evidence.

In its Reply submission, Avago points out additional record evidence of substantiality of its investments. *See, e.g.*, ComplReplyNotice at 8-10. [8]

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[8]Avago points out that:

> The domestic industry products - fiber optic transceivers and active optical cables - are developed by Avago's Fiber Optic Products Division ("FOPD"). Avago's corporate fact sheet identifies "key products" of the company, the first of which are the "fiber optic transceivers" that are the subject of this Investigation. (Compl., Ex. 23.) Through FOPD's R&D investments, Avago is able to introduce [[ ]] new VCSEL-based products each year to "fit the evolving needs of Avago's customers" (CX-2084C QQ. 173-75; CX-2094C Q. 51.), demonstrating the importance of the domestic industry products to Avago's business. (*Id.* at QQ. 83-87, 173-77.) FOPD is one of seven divisions of Avago13 - the other divisions are responsible for diverse areas such as Navigation, Motion Control Products, Wireless and ASIC Products and which serve different industry segments from the fiber optics industry. (*Id.*) Given the range of Avago's divisions and products, Avago submits that the ID properly evaluated Avago's investments in the context of the relevant (FOPD) division of Avago (ID at 209-10, 213-14), rather than with respect to Avago's business as a whole as Respondents would suggest (Resp. Br. at 17-18).
>
> Put in the proper context, Avago's [[ ]] R&D investment for the QSFP products represents [[ ]] of the [[
>
>]] FY2009 R&D U.S. expenditures for the groups that developed the QSFP products (Module, IC and III-V).15 (JX-0411C; CX-2088C QQ. 56-63.) Even when compared to entire U.S. FY2009 FOPD R&D expenses [[ ]]

In sum, the record supports the ALJ's determination that Avago's investments in research and development directed to the [[ ]] VCSEL are substantial and satisfy the economic prong of the domestic industry requirement with respect to the '595 patent under subsection 337(a)(3)(C). *See* ID at 215.

C. The ALJ's claim construction, infringement, and domestic industry (technical prong) determinations with respect to the '456 patent

In their petition for review, complainants challenge the ALJ's claim construction of the claim limitation "parameter for affecting the negative peak portion of the drive waveform," and his infringement and technical prong determinations based thereupon.[9] The Commission reviewed this issue to determine whether there is an "intent requirement" in the ALJ's claim construction of the limitation "parameter for affecting" in the asserted claims of the '456 patent. For the reasons discussed below, we affirm the ID on this issue with slight modifications to the

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> (JX-0411C) and worldwide FY2009 FOPD R&D expenses [[ ]] (JX-0271C; CX-2088C QQ. 69- 75), the QSFP investment represents [[ ]] and [[ ]], respectively. There is no minimum R&D investment required to satisfy domestic industry. *See Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm'n Op. at 25-26 (May 16, 2008) ("minimum monetary expenditure" not required). The ID found Avago's investment to be "substantial" and this finding is properly supported by evidence in the record demonstrating sufficient context for the expenditures and thus, should be affirmed. ID at 212-15; Compl. Br. at 10-15.

ComplReplyNotice at 8-9.

[9]The parties agreed to the following claim construction of the claim term "parameter for affecting:" "A parameter with the purpose of digitally affecting the feature of the drive waveform mentioned in the claim." *See* ID at 56-57.

ALJ's rationale.

Complainants argue that "the ALJ expressly included an intent requirement in his construction of the claim limitation 'parameter for affecting the negative peak portion of the drive waveform', recited in each of the asserted claims." ComplOpenNotice at 16. Complainants contend that this is clear from, *inter alia*, the ALJ's description of the stipulated construction as including an "intent requirement." *Id.* They quote:

> It is unnecessary to resolve this legal question, however, because Avago has agreed to this construction and has pressed this construction (and its intent requirement) to argue for the validity of the claims (CRB at 53-54). Thus, the ALJ finds that "for the purpose of" has its plain meaning and requires more than just causing, even if unintentionally, a negative peak portion.

ID at 108. Complainants argue that this intent requirement is also clear from the ALJ's express rejection of Avago's assertion that the stipulated construction of this limitation requires only proof that the parameter affects the negative peak portion, and that there is no proper basis for the additional requirement of proving that the parameter value was specified by the user with the intent of affecting the negative peak portion. The ID states:

> In its infringement section, Avago argues that the purpose is met "if the recited fact occurs, *i.e.*, that the negative peak portion is affected by the parameter. . . ." (CIB at 83.) Moreover, Avago contents [sic] that "there is no 'intent' requirement that would necessitate proof that the value of the parameter was specified by the user with the intent of affecting the negative peak portion." (CIB at 83.) However, this is directly contrary to the arguments that Avago has repeatedly made to overcome the rafts of art that disclose negative peaking.

ComplOpenNotice at 17 (quoting ID at 104-05). Thus, Complainants contend that the ID's construction improperly included an intent requirement necessitating "proof that the value of the

parameter was specified by the user with the intent of affecting the negative peak portion." *Id.* (quoting ID at 104-05). Complainants argue that the ALJ's stated basis for imposing an intent requirement is incorrect, and led to his erroneous construction. Avago argues that it has never asserted that there is any intent requirement in the "parameter for affecting" claim limitation. Avago submits that, instead, "the 'rafts of [prior] art' to which the ALJ refers are distinguishable because they lack any adjustable parameter for affecting the negative peak portion of the waveform; intent is irrelevant, the prior art lacks any parameter for affecting the negative peak portion of the waveform . . ." *Id.*

Complainants argue that it was an error of law for the ALJ to include an intent requirement in the construction of this limitation. They submit that all of the parties agreed that the proper construction of the claim term "parameter" is "a value input other than the underlying digital data signal." ComplOpenNotice at 18 (citing ID at 57; CIB at 73-74; RRB at 35; SIB at 79.) Avago argues that

> A parameter is merely a value; it exists, but it is inanimate, and therefore it cannot possess intention. Similarly the Complainants, Respondents, and Staff agreed that the proper construction of the claim term "parameter for affecting" is "a parameter with the purpose of digitally affecting the feature of the drive waveform mentioned in the claim." (ID at 57; CIB at 73-74; RRB at 35; SIB at 79.) As with "parameter", a "parameter for affecting" is merely a value with a recited purpose; it exists, but it is inanimate, and therefore it cannot possess intention.

Id. See also id. at 19-27.

Respondents argue that the ALJ did not apply an "intent requirement" in the context of the claim limitation "parameter for affecting" and that Avago has taken the word "intent" out of

context. RespOpenNotice at 21. Respondents submit that there are no issues of infringement related to the intent of the user in using the accused products. They argue that the infringement issue concerns whether the purpose, *i.e.*, the function, of the pre-emphasis parameter is to control a negative peak portion. They point out that no one -- not the ALJ, Respondents, the IA, or Avago -- has ever argued that the construction of "a parameter for affecting" implicates the user's intent in setting the value of the parameter. Respondents submit that Avago's argument that the ALJ applied such a requirement is a mischaracterization with no support in the record. *Id.*

Respondents argue that under the claim construction at issue which was proposed by Avago, and agreed to by Respondents and the IA, "parameter for affecting" means "[a] parameter with the purpose of digitally affecting the feature of the drive waveform mentioned in the claim." *Id.* (citing ID at 56-57). Respondents submit that the agreed construction, though it references a "purpose," does not refer to the "intent" of the user, a state of mind, or any decision-making or choices made by one practicing the invention, as alleged by Avago. Respondents argue that the "purpose" in the stipulated construction refers to the function of the parameter and that it is this meaning of "purpose" was used by the parties throughout the hearing and applied by the ALJ in his ID. Respondents submit that under Avago's erroneous argument, the parameter would only need "to affect" the negative peak portion as opposed to the parameter having "the purpose to [] affect" the negative peak portion. *Id.* (citations omitted). Respondents point out that the problem with Avago's argument is that it recaptures exactly what was disclaimed during prosecution to avoid prior art. *Id.* (citing ID at 107). Respondents argue that if the parties had agreed that merely affecting the negative peak portion was the meaning of the term, they would not have

added the words "with the purpose of," but instead left the term as is. RespReplyNotice at 9.[10]

The IA submits that all parties and the ALJ agreed that the "parameter for affecting" limitation should be construed to mean "a parameter ***with the purpose of*** digitally affecting the feature of the drive waveform mentioned in the claim." ID at 104 (emphasis in original). The IA submits that the ALJ's construction of the "parameter for affecting" does not impose an "intent requirement," noting that the ID found that the "for the purpose of" aspect of the construction "has its plain meaning and requires more than just causing, even if unintentionally, a negative

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[10] In their Reply Submission, Respondents argue:

> After the hearing, Avago must have realized that they had failed to provide any evidence that the purpose of the Respondents' parameter ("pre-emphasis") was to affect a negative peak portion. Thus, their petitions for review and responses to the Commissions questions have now made an effort to run away from the agreed construction, reverting to a construction that any parameter that merely affects would satisfy the limitation. Avago's efforts are mere word play. Avago equates the word "purpose" with "intent," and then equates "intent" with "user's intent." Next, Avago cites case law that says that a "user's intent" cannot avoid infringement of an apparatus claim. Having observed the ALJ's usage of the word "intent" when rejecting their arguments related to "user intent," Avago argues that the ALJ impermissibly read user intent into the claim construction, and that the ID should therefore be reversed. Avago also argues that since "intent" (meaning "user intent") is improper, the word "purpose" (meaning "user intent") should be read to mean merely that the parameter affects. Thus, Avago comes full circle and argues "parameter for affecting" should mean "parameter affecting," reading the word "for" and its construction "purpose" out of the claim. Avago should not be allowed to change its claim construction after the hearing.

RespReplyNotice at 9-10.

peak portion." IAOpenNotice at 14 (citing ID at 108). Accordingly, the ALJ's construction of the "parameter for affecting" limitation requires that the parameter be for the purpose of digitally affecting the negative peak portion, not merely that a negative peak portion might result based on certain parameter settings. *Id.* (citing ID at 104-08). The IA concludes that nothing in the ID suggests that its construction requires that a user intend to affect the negative peak portion of the VCSEL drive waveform. *Id.* (citing ID at 57, 104-08).

The IA also points out that the ALJ's finding that "for the purpose of" requires more than just causing, even if unintentionally, a negative peak portion is consistent with statements made during the prosecution of the '456 Patent. IAOpenNotice at 15 (citing ID at 107-08). The IA noted that the applicants stated that a parameter that merely has an effect on the negative peak portion was not a parameter "for affecting the negative peak portion." *Id.* (citing ID at 107 (citing RX-0827 at AV-ITC50000317)). The IA points out that the applicants further distinguished the claimed invention over the prior art as failing "to teach or suggest the use of digitally programmable parameters for changing the output waveform generated by the laser driver ***in a controlled manner*** as claimed." *Id.* (citing ID at 107 (citing RX- RX-0827 at AV-ITC50000317; RDX-209; RX-0003C at Q. 140)) (emphasis in original).

The IA further notes that, with respect to whether an apparatus claim may properly include an intent requirement, the ALJ found that "[i]t is unnecessary to resolve this legal question, however, because Avago has agreed to this construction and has pressed this construction (and its intent requirement) to argue for the validity of the claims." *Id.* (citing ID at 108) (citation omitted). The IA argues that "[t]aken in context, the Judge's reference to an

'intent requirement' refers to the required purpose of the parameter, which is to control (or digitally affect) the negative peak portion, not to an intent of the user of the claimed apparatus." *Id.* at 15-16 (citing ID at 107-08). The IA concludes that, therefore, the ALJ properly construed the "parameter for affecting" limitation as requiring a parameter with the purpose of digitally affecting the negative peak portion and determined that the accused products do not satisfy this limitation of the asserted claims of the '456 Patent. IAOpenNotice at 16.

The Commission finds that the ALJ correctly construed the term "parameter for affecting" and did not clearly err in his infringement and domestic industry (technical prong) determinations based on this construction. Based on the record and the parties stipulations, he properly construed all of the claim terms. *See* ID at 104 ("The parties have agreed that the phrase "parameter for affecting" should be construed as "a parameter ***with the purpose of*** digitally affecting the feature of the drive waveform mentioned in the claim.") (emphasis added by the ALJ). The ALJ properly found that "for the purpose of" requires more than just causing a negative peak portion. *Id.* at 108. Based on the record, the ALJ properly found that Avago has not established that the pre-emphasis parameter of the accused IPtronics VCSEL drivers is for the purpose of affecting the negative peak portion of the drive waveform and, accordingly, found no infringement. Likewise, the ALJ properly found that Avago did not establish that the "peaking" parameters in Avago's VCSEL drivers are for the purpose of affecting the "negative peak portion," as required by claim 1 and, accordingly, found that Avago failed to establish that its products satisfy the "parameter for affecting" limitation of claim 1 of the '456 Patent. ID at 197-98.

We find, however, that while the ALJ's references to "intent" do not manifest error in his claim construction and infringement and domestic industry analysis, they are unnecessary and confusing. Accordingly, we affirm the ALJ's claim construction and infringement and domestic industry determinations with certain modifications including striking the following language in the ID: (i) The last sentence on the last line on page 104, starting with the word "However" and completed on page 105; (ii) The words "(and its intent requirement")" in the eighth line on page 108; (iii) The words ", even if unintentionally," in the tenth line on page 108. We also strike the last full paragraph on page 106, starting with the word "Moreover," and the first sentence on page 107, starting with the word "Thus;" because this portion of the ID, when taken out of the context, appears to be inconsistent with the ALJ's construction of the term "parameter for affecting."

D. The ALJ's determinations on whether Complainants met the economic prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C) with respect to the '456 patent.

The ALJ determined that Complainants failed to show that they meet the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(A) (significant investment in plant and equipment). ID at 204. The ALJ found that Complainants demonstrated that they meet the economic prong under 19 U.S.C. § 1337(a)(3)(B) (significant investments in labor and capital). ID at 207, and under 19 U.S.C. § 1337(a)(3)(C) (substantial investments in domestic research and development), ID at 214.

For the reasons discussed *supra* with respect to the '595 patent, we find no error in the ALJ's finding that the Complainants' claimed research and development expenditures were

appropriately limited to those investments related to Avago's VCSEL driver products that exploit the '456 patent, and that these investments are substantial in the context of Avag's business. *See* ID at 212-14. Accordingly, we affirm the ID's findings that Avago has satisfied the economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(C).

V. Remedy, the Public Interest, and Bonding

The Commission determines that: (i) the appropriate remedy is a limited exclusion order directed to Respondents' products that infringe the asserted claims of the '595 patent, and cease and desist orders directed to FCI USA, LLC and Mellanox Technologies, Inc.; (ii) the public interest will not be adversely affected by entry of the proposed exclusion order; and (iii) Respondents are required to post a bond in the amount of 3 percent of the entered value of the products covered by the remedial orders during the Presidential review period.

A. Remedy

1. Limited Exclusion Order

In a Section 337 proceeding, the Commission has "broad discretion in selecting the form, scope, and extent of the remedy." *Viscofan, S.A. v. United States Int'l Trade Comm'n*, 787 F.2d 544, 548 (Fed. Cir. 1986). In his Recommended Determination ("RD"), the ALJ recommended that the Commission issue a limited exclusion order ("LEO") directed to the Accused Products of Respondents that infringe the '595 Patent. RD at 230-31.

Complainants seek a limited exclusion order and have not requested that the order cover downstream products. ComplOpenNotice at 49; ComplPostHear at 173.

Respondents argue that a limited exclusion order is not appropriate because Complainants

have not proven that any of the Respondents have violated Section 337. RespOpenNotice at 43. It appears that respondents IPtronics and FCI do not oppose an LEO as to their products if they are found to have violated Section 337. Respondent Mellanox contends that public interest considerations should prevent imposing an exclusion order against Mellanox. *See id.* at 36.

Respondents argue that any remedial order should exempt warranty and replacement parts. RespOpenNotice at 44-46. The ALJ considered and rejected this argument, finding that there is no evidence in the record that Respondents' customers expect any replacement or warranty parts be the same part and not just a comparable part. The ALJ concluded that without such evidence, there is no basis for carving out an exemption from the remedial orders for warranty or replacement parts. RD at 231. IA and Complainants agree. *See, e.g.,* IAReplyNotice at 11-12; ComplReplyNotice at 21.

Based on the record, and consistent with the ALJ's recommendation, we find no basis for granting an exception for imported parts for use as a replacement or for repair under the warranty. The record evidence indicates that repairs and replacements under warranty can be provided to existing customers using available non-infringing products. *See, e.g.*, CX-2084C Q/A 192-193, 197, 202, 210, 216, 228, 229-232, 234-235; JX-0216C at 14:25-15:23, 105:14-16, 106:2-5; JX-0073; CX-0382C at 68:13-72:2; 170:19-171:10; CX-2087C Q/A 216.

Respondents disagree with the ALJ's findings and recommendations. They argue:

> Contrary to the ID and Avago (ID at 231; CICB at 41-42), there is evidence in the record establishing that Mellanox customers ***do*** expect that Mellanox products be used for any warranty work, and that "comparable" parts from other manufacturers are not acceptable (Aghazarian Tr. 725:3-727:4 [[
>
>]]

[[

]] RX-1C Aghazarian St. Q25-26, 37, 54).

RespReplyNotice at 23-24 (emphasis supplied by Repondents).

The portions of the record cited by Respondents above do not demonstrate that "Mellanox customers ***do*** expect that Mellanox products be used for any warranty work, and that 'comparable' parts from other manufacturers are not acceptable." *See* Aghazarian Tr. 725:3-727:4; RX-1C Aghazarian St. Q25-26, 37, 54. The ALJ found that "there is no evidence in the record that Respondents' customers expect any replacement or warranty parts be the same part and not just a comparable part," and that "[w]ithout such evidence, there is no basis for carving an exemption out for warranty or replacement parts in the LEO." Providing support for the ALJ's findings, Complainants point out that "Respondents point to no contracts with customers, let alone any contracts requiring replacement of identical parts." ComplPostHearReply at 69. In response to the notice requesting written comments on remedy, no evidence was submitted to show the terms of the warranty obligations or customers' expectations with respect to warranty replacements and repairs. *See* RespOpenNotice at 44-46; RespReplyNotice at 23-24.

Furthermore, the ALJ evaluated all of the relevant evidence presented at the hearing, and found that the record indicates that there are non-infringing products available as substitutes for the Mellanox infringing products. ID at 223-227. *See, e.g.*, CX-2084C Q/A 192-193, 197, 202, 228, 234-235; CX-2087C Q/A 216; CX-0417C at 68:3-11; CX-0382C at 68:13-72:2; 170:19-171:10; JX-0073.

Moreover, the record shows that, consistent with this factual finding, no third party, including Respondents' customers that use Respondents' products at issue, filed any submissions in response to the Commission notice that would indicate that Respondents' customers will be detrimentally affected if they have to use alternative non-infringing parts and products in their systems as a result of the Commission's remedial orders.[11] *See also* IAReplyNotice at 13; ComplOpenNotice at 27. Our finding is consistent with the ALJ's recommendation on this issue. *See* RD at 231.

We acknowledge the concerns raised by Respondents that there exists the possibility that one or more customers may potentially face certain risks associated with the exclusion of Respondents' infringing products. Among such risks noted by Respondents are less than optimal performance characteristics of the systems utilizing alternative noninfringing parts and products manufactured by other suppliers (as compared to the infringing products); additional substantial monetary costs associated with testing and integrating the alternative non-infringing parts and products into the existing systems, including end-to end

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[11]The Commission Notice dated February 12, 2014 specifically provided that "[p]arties to the investigation, interested government agencies, and any other interested parties are encouraged to file written submissions on the issues of remedy, the public interest, and bonding." *See* 79 *Fed. Reg.* 9765 (Feb. 20, 2014). *Id.* No submissions from any interested parties were received by the Commission in response to its Notice. Furthermore, the Commission Notice requested briefing from the parties concerning, *inter alia*, whether and to what extent Respondents' customers that "operate in extremely important and sensitive areas" would be adversely impacted by the requested remedial orders. *Id.* The parties did not provide evidence that demonstrates that Respondents' customers will be adversely impacted if alternative non-infringing parts and products are used in their systems. *See* ComplOpenNotice at 36-40; RespOpenNotice at 36-41; IAOpenNotice at 23; IAReplyNotice at 15.

solutions in important sectors of U.S. economy; additional time-consuming procedures necessary to re-test and re-certify the existing systems employed by the Respondents' customers if alternative non-infringing parts are to be utilized. However, these concerns were not substantiated by the evidence presented to the ALJ at the hearing. We are mindful of such risks and potential harm to Respondents' customers, and we note that if there are changed circumstances, the Commission has available procedures that can be utilized to address these concerns. Specifically, Respondents may seek modification of the remedial orders issued by the Commission in this investigation, based on information from current customers upon providing necessary evidence demonstrating that the scope of the remedial orders should be modified to exempt warranty or replacement parts for particular systems. For the reasons discussed above, however, we find that the existing record lacks such evidence and does not warrant providing for an exemption for imported parts for use as a replacement or for repair under the warranty at this time.[12]

Respondents further request that the implementation of any remedial orders should be delayed by at least three months to allow Respondents' customers time to re-test and re-qualify new transceivers, active optical cables ("AOCs"), and VCSELs. RespOpenNotice at 47-48. We deny this request. The evidence in the record does not support Respondents' request for delay. As the ALJ properly found, the evidence of record does not "warrant tailoring the remedy in any

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[12]Because of the risks identified in the text, which are not likely to be ameliorated in a timely manner by any modification proceeding, Commissioner Pinkert would grant a short grace period of sixty days prior to implementing exclusion with respect to warranty and replacement shipments. He joins in all other aspects of the Commission's public interest analysis.

way." RD at 223. Specifically, the evidence indicates that alternatives to the accused products are available and capable of filling the demand that would result if the accused products are excluded. *Id. See id.* at 226; *see also* CX-2084C Q/A 192-193, 210, 228, 234-235; JX-0216C at 14:25-15:23, 105:14-16, 106:2-5; JX-0073; CX-0382C at 68:13-72:2. The ALJ also determined that the record does not show that any potential costs to consumers required to switch to alternative products would be substantial. *Id.* at 226-27 ("The ALJ finds that it is likely that the time and expense to qualify alternative suppliers would already have been incurred by OEMs and any downtime will be minimized."). The ALJ specifically found: "As for Mellanox's contentions that costs of switching to these alternatives would be substantial, there is evidence in the record that suggests that this would not be the case." RD at 226. *See* CX-2084C at Q/A 252. *See also* IAReplyNotice at 12; ComplReplyNotice at 21-22. Based on the foregoing, we find that the record evidence does not warrant granting a grace period in this investigation.

Accordingly, we find that the appropriate remedy in this investigation is an LEO covering Respondents' accused products that have been found to infringe the asserted claims of the '595 patent. Consistent with Commission practice, we determine that the LEO should be directed to the accused products of "Respondents or any of their affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns." *See* IA's Proposed LEO at 2.

Based on the record, we determine that the implementation of the remedial orders issued in this investigation should not be delayed in view of the exemption for warranty repair parts. *See* RD at 223; IAReplyNotice at 12.

2. Cease and Desist Order

The Commission may issue a cease and desist order as a remedy for violation of section 337 in addition to, or in lieu of, the issuance of an exclusion order. *See* 19 U.S.C. § 1337(f)(l). Such orders are generally issued when there is a "commercially significant" amount of infringing, imported product in the United States that could be sold by an infringing respondent thereby resulting in evasion of the remedy provided by an exclusion order. *See Certain Protective Cases and Components Thereof,* Commission Opinion, USITC Inv. No. 337-TA-780, 2012 WL 5874344, November 19, 2012; *Certain Condensers, Parts Thereof and Products Containing Same, Including Air Conditioners for Automobiles*, Inv. No. 337-TA-334, Comm'n Op. at 26-28 (Aug. 27, 1997).

The ALJ recommended the issuance of cease and desist orders to Mellanox and FCI. RD at 231-33. The IA and Complainants support the ALJ's recommendation. *See* IAOpenNotice at 20; ComplOpenNotice at 42.

The record indicates that Mellanox and FCI maintain commercially significant amounts of the accused products in inventory in the United States. RD at 233. As the ALJ found, the record shows that as of April 2013, FCI had an inventory of [[ ]] of TRX10GVP2010C1 [[ ]]. RD at 233 (citing CX-0492C at No. 24; CX-0424C at 50:15-20; CX-0437C at 42:12 - 43:11). The ALJ found that this amount was significant in the context of the total volume of units of that product imported since January 2012. *Id.* (citing RX-01590C). The ALJ also found that as of April 2013, Mellanox had [[ ]] of the MC2206310 cable, [[ ]] of the MC2207310 cable, and [[ ]] of the MC210310 cable in inventory in [[ ]] *Id.* (citing CX-0510C at No. 24). He found this amount significant in view of the

record evidence.

Based on the foregoing, we determine to issue cease and desist orders to respondents FCI USA, LLC and Mellanox Technologies, Inc.

B. Public Interest

Before issuing a remedy for a violation of Section 337, the Commission must consider the effect of the remedy on certain public interest considerations: (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) the U.S. production of articles that are like or directly competitive with those which are the subject of the investigation, and (4) U.S. consumers. 19 U.S.C. § 1337(d); *Certain Ink Jet Print Cartridges and Components Thereof,* Inv. No. 337-TA-446, Commission Opinion at 14 (October 2002).

The Commission delegated the matter of public interest to the ALJ for the development of a factual record and recommendations concerning the public interest considerations. 77 Fed. Reg. 65713 (Oct. 30, 2012). At the outset, the ALJ considered the potential impact of the proposed remedy on competitive conditions in the U.S. economy and on U.S. consumers. The ALJ found that numerous alternatives to the accused products could fill the demand that would result if the Accused Products are excluded. RD at 223-27. In making this finding the ALJ relied on several grounds.

First, the ALJ considered evidence that Avago services both the Ethernet and InfiniBand markets including HPC applications. RD at 223 (citing CX-2084C at Q/A 94, 192-193; JX-0216C at 14:25-15:23, 19:3-8.) The ALJ found that Avago sells fiber optic communications devices in the United States that are compatible with both InfiniBand and Ethernet applications,

as well as for Fiber Channel storage solutions. *Id.* (citing CX-2084C Q/A 192-193; JX-0216C at 14:25-15:23, 19:3-8; CX-1126C; CX-2087C Q/A 197-201; CX-1300C.) The ALJ found that the evidence shows that Avago sells "comparable 10 and 14 Gbps products to what Mellanox sells." *Id.* The ALJ further found that because Avago works with a number of contract manufacturers who manufacture Avago's AOC and transceiver products on behalf of Avago, it is likely that Avago has capacity to replace the infringing products should an exclusion order be entered. ID at 223-24 (citing CX-2084C at Q/A 242-243; JX-0216C at 19:17-24.)

Second, the ALJ took into consideration that the evidence suggests that "even though Mellanox touts itself as a provider of end-to-end solutions, the availability of individual components of the larger systems suggests that even without an "end-to-end solution" there would be alternatives for consumers." RD at 225. The ALJ found that even Mellanox markets and sells the individual components of its systems separately as well, *id.* (citing Tr. 710:7-25; CX-0382C at 59:1-5, 215:16-22; CX-0417C at 37:17-20), and that "there are a number of suppliers in the U.S. market that sell AOCs and transceivers separately from other network components demonstrates that the fiber optic communications market is diversified and does not solely look for 'end to end solutions,'" *id.* (citing CX-2084C Q/A 197, 202, 208, 216-217, 222-35; JX-0073; CX-0417C at 68:3-11; CX-0382C at 64:19-65:8, 68:13-72:2, 170:19-171:10; Tr. 713:14-716:17.)

Third, the ALJ found that InfiniBand is an open standard that encourages the interoperability of different components from different suppliers. RD at 225. This suggests that the loss of one supplier will not eliminate the availability of standard compliant hardware for

customers. The ALJ took into consideration that, for example, at Plugfest, an event held twice a year by the InfiniBand Trade Association, component suppliers are invited to test their cables for compliance with the InfiniBand standard and interoperability with other InfiniBand equipment (*e.g.*, Mellanox switches and host channel adapters). *Id.* (citing CX-2084C Q/A 208, 216-217, 222-35; CX-0382C at 64:19-65:8, 68:13-72:2; CX-1447; JX-0073 at 1337-43, 1344-46, 1347-54, 1355-59; Tr. 712:17-25, 713:5-8, 713:14-716:17.)

Fourth, the ALJ found that a number of companies have products that have been certified at Plugfest and would be possible alternatives to the Mellanox products. RD at 226. As the evidence indicates, such alternatives include, for example, for suppliers of QDR active optical cables, Avago, FCI, Finisar, Mellanox, Fujikura, Molex, Samtec, Siemon and Tyco Electronics (TE Connectivity), and, for FDR AOC cable suppliers, 3M, Advanced Photonics, FCI, Fujikura, Mellanox, Samtec, Siemon and Tyco (Te Connectivity). *See id.* (citing CX-2084C at Q/A 192-193, 228, 234-235; JX-0073; CX-0382C at 68:13-72:2) The ALJ specifically found that Avago has participated in Plugfest in the past and has had several of its products that are covered by the asserted patents included on the Integrator List. *Id.* (citing CX-2084C at Q/A 209-15; CX-1447.) The ALJ found that it is likely that "the time and expense to qualify alternative suppliers would already have been incurred by OEMs and any downtime will be minimized." RD at 226-27.

Fifth, the ALJ found that at least some of the alternative suppliers offer products that "undoubtedly are non-infringing alternatives." RD at 227. For example, the ALJ found that the evidence shows that the active optical cables sold by Luxtera/Molex are based on silicon photonics technology, do not incorporate VCSELs and thus, are noninfringing alternatives. *Id.*

(citing CX-2084C Q/A 197. 202; CX-2087C Q/A 216; CX-0417C at 68:3-11; CX-0382C at 170:19-171:10.) The ALJ also noted that one of the alternative AOC suppliers, [[ ]] has a license to the asserted patents. *Id.* (citing Complaint, Ex. 6.)

Sixth, the ALJ stated that to the extent that government customers rely on HPC systems using Mellanox products, those imports would be exempt from the exclusion order under 19 U.S.C. § 1337(l). The ALJ concluded that, therefore, the governmental users Mellanox cites in its briefs will be largely unaffected by any exclusion order. *Id.*

Based on the foregoing, the ALJ found that the evidence does not demonstrate that there will necessarily be a shortage of cables and high speed data systems should an exclusion order issue and so there has been no showing that there will be a substantial adverse impact on competition or U.S. consumers should an exclusion order issue. *Id.*

Likewise, with respect to any impact on public health, safety, and welfare, the ALJ's factual findings analyzed whether there might be any possible harm to the public due to exclusion of the Accused Products. *Id.* at 228-29. Specifically, the ALJ took into consideration that the Commission determined in a prior investigation that exclusion of similar VCSEL-based optoelectronic devices would not harm the public health, safety or welfare. RD at 228 (citing *Certain Optoelectronic Devices, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-669, Comm'n Op. at 4, 7-8 (July 12, 2010)). While the ALJ acknowledged that some time has passed since this determination and different parties are involved in this investigation, he noted that that prior decision does suggest that the public health, safety, and welfare would not be harmed. *Id.*

The ALJ further considered Mellanox claims that its products are sold to key industry segments in the United States, such as for supercomputing applications, hospitals, universities, defense institutions and financial institutions. RD at 228-29 (citing RIB at 145-146.) The ALJ found, however, that the record does not establish harm to the public health, safety, or welfare. The ALJ noted that, first, Mellanox only identifies a handful of customers in each of these industries and has not established the use of its produ cts beyond those few examples. RD at 229 (citing Tr. 716:23-717:11; CX-0382C at 196:2-5)). Second, the ALJ found that Avago supplies products to those very same industries and customers, including [[ ]]. *Id.* (citing CX-2084C at Q/A 94, 199-200, 225, 261-68; CX-1126C; JX-0202C at 22:2-22; RX-0001C at Q/A 18, 44-45; Tr. 343:24-344:11, 345:12-346:5; Tr. 716:18-22)).

The ALJ also found that the record did not show that any impact on the production of like or directly competitive articles in the United States would be sufficient to preclude the issuance of an exclusion order. *Id.* at 229-30. The ALJ considered Mellanox's contention that an exclusion order would have a negative impact on one of its suppliers, [[

]] RD at 229 (citing RIB at 147). First, the ALJ found that the only component that [[

]] *Id.* (citing CX-0382C at 77:17-78:1, 79:1-4, 80:1-3.)

Second, the ALJ considered that [[ ]] is not the only company that makes VCSELs in the United States. The ALJ noted that there is a second supplier, [[ ]] who is licensed under the '595 patent and, therefore, any exclusion order would not impact all VCSEL operations in the United States, because [[ ]] is licensed.

Third, the ALJ rejected Mellanox's contention that if its [[ ]] cables are found to infringe, then [[ ]] customers will be hesitant to purchase VCSELs from [[ ]]. The ALJ found that, rather, "any such harm to [[ ]] would be created as a result of the finding of infringement, not entry of an exclusion order." *Id.*

Finally, the ALJ noted that some evidence in the record suggests that the potential harm to [[ ]] in the United States may be overstated. This is so in light of the evidence adduced by Avago that the products made by [[ ]]. RD at 230 (citing CX-0382C at 80:1-3; CX-0417C at 49:7-9.) The ALJ concluded that, therefore, if Mellanox's products are excluded, [[ ]] will be able to continue selling its comparable products to other customers. The ALJ observed that whether [[ ]] customers will be "hesitant" to purchase products found to infringe Avago's patents turns on the issue of infringement, not remedy.

Before the Commission, Mellanox argued that an exclusion order as to its accused products would represent a "significant harm" to Mellanox suppliers, customers, and the public interest. *See* Mellanox Pub. Int. Stmt. at 1. Mellanox argues that there is insufficient evidence of record to show that equivalent substitutes exist for the accused Mellanox AOCs and that exclusion would result in a "supply crunch." *Id.* at 2. The evidence in the record, however, shows that Avago and other companies provide alternative products that could meet the demand for the accused Mellanox products. *See* RD at 223-26. The record shows that at least some of these alternative suppliers offer products that are already licensed by Avago [[ ]] or employ technologies different than those claimed in the asserted patents. *See id.* at 227.

Mellanox also raised the issue that certain of Respondents' customers that "operate in extremely important and sensitive areas" would be adversely impacted by the requested remedial orders. The Commission requested briefing as to the impact on the specific customers referenced by Mellanox based on the record evidence. Mellanox responded that "Avago's requested remedy would have a deleterious effect on the public interest." RespOpenNotice at 36. Mellanox contends that it:

> provided evidence on the ubiquitous use of its Accused FDR products in entire industries that are key to the US economy, and then provided specific examples of particular companies within those critical sectors (*see* RIB at 145-146; RX-1C at Q20; RX-7C at Q23, 70, 86; RX-408; JX-442C; RX-410; CX-490 at 100-101). Moreover, the examples provided by Mellanox have far-reaching public implications in terms of health, safety or welfare, including storm evacuation protocols, hurricane protection systems, and improved health care service.

Id. at 41. While the cited evidence purports to show the importance of Mellanox's Accused FDR products for key sectors of the U.S. economy, it, however, does not demonstrate specific harm to customers of Mellanox in case the remedial orders are issued in this investigation. *See, e.g.*, RX-1C at Q20.[13]

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[13]Specifically, Vice President of Mellanox Worldwide Sales Operations Ron Aghazarian stated:

[[

]]

Avago notes that this evidence does not show specific harm to customers that "operate in extremely important and sensitive areas," and that suitable alternatives are available to meet all of these customers' needs:

> The evidentiary record demonstrates that any customers of Respondents that allegedly "operate in extremely important and sensitive areas" will not be adversely impacted by the requested remedial orders. Of critical importance here is the fact that a number of substitutes to the accused products exist, including non-infringing alternatives, as properly found by the ALJ (ID at 223, 225-26). Also important is the fact that Mellanox has not presented any evidence of actual harm to a specific customer should the requested relief be granted. Rather, Mellanox has only identified a small list of customers in certain industries (*see* RX-0001C QQ. 44-45) and provided a generalized statement about potential harm and replacement costs that is not specific to a particular customer. *See* RX-0001C QQ. 25-26.

ComplOpenNotice at 36-37.

The IA submits that the RD correctly determined that the statutory public interest factors do not weigh against issuing remedial orders in this investigation. IAOpenNotice at 23. The IA further submits that while the Accused Products may sometimes be used in "extremely important and sensitive applications because of their crucial role in providing high bandwidth solutions for High Performance Computing (HPC) systems," the ALJ correctly found that alternatives to the accused products are available that are capable of filling the resulting demand if the accused products are excluded. IAReplyNotice at 15 (citing RD at 223-28).

[[

]]

RX-1C at Q20.

We find that the evidence does not establish specific harm to any particular customers that operate in extremely important and sensitive applications. It is noteworthy that no Mellanox customer or third party submitted any comments in response to the Commission's notice seeking submissions to address the specific impacts on entities that "operate in extremely important and sensitive areas." *See Certain Personal Data and Mobile Communications Devices*, Inv. No. 337-TA-710, ITC LEXIS 2874, Comm'n Op. (Dec. 29, 2011). The evidence in the record also does not provide a basis to quantify or assess the impact of the remedial orders on specific companies or industries. The evidence shows that numerous alternatives are available in the market to meet U.S. demand. Accordingly, we determine that entry of an LEO and cease and desist orders, as discussed herein, would not be contrary to the public interest in this investigation.

C. Bond During Presidential Review Period

In his RD, the ALJ noted that he and the Commission must determine the amount of bond to be required of a respondent, pursuant to section 337(j)(3), during the 60-day Presidential review period following the issuance of permanent relief. He further noted that the purpose of the bond is to protect the complainant from any injury. ID at 233 (citing 19 C.F.R. §§ 210.42(a)(1)(ii), 210.50(a)(3)). The ALJ noted that when reliable price information is available, the Commission has often set the bond by eliminating the differential between the domestic product and the imported, infringing product. *Id.* (citing *Certain Microsphere Adhesives, Processes for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. a 24 (1995)).

The ALJ further noted that, in other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. ID at 234 (citing *Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm'n Op. at 41 (1995)). The ALJ observed that a 100 percent bond has been required when no effective alternative existed. *Id.* (citing *Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, USITC Pub. No. 3046, Comm'n Op. at 26-27 (July 1997)(a 100 percent bond imposed when price comparison was not practical because the parties sold products at different levels of commerce, and the proposed royalty rate appeared to be de minimis and without adequate support in the record)). Complainants bear the burden of proof with respect to the amount of any bond. *See, e.g., Certain Rubber Antidegredants, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-533, Commission Op. at 39-40, USITC Pub. 3975 (Apr. 2008).

Complainants presented evidence that they had entered into various inter-company licensing and distributorship agreements relating to the asserted patents. Specifically, [[

]] CX-2083C (Anderson Witness Stmt.) at QQ. 105-64 (citing CX-0758C, CX-2100C, JX-0704C, CX-2102C, CX-2103C, JX-0023C, CX-0766C, CX-0765C, CX-0705C). [[

]] CX-2083C at Q. 149. [[ ]]

[[

]] *Id.* at QQ. 150-64. *See* IAOpenNotice at 24.

In his RD, the ALJ stated:

> Should the Commission find a violation, the ALJ recommends that the Commission set a bond at a reasonable royalty rate of the entered value of the accused products based on previous Avago license agreements with unaffiliated companies, if such evidence is available. The ALJ finds that while Avago competes to some extent with some of the accused products it does not compete with all of the accused products. Moreover, it not clear even for the products where there may be some competition whether those products actually compete head-to-head. Thus, the ALJ recommends that a 100% bond would not be appropriate. As for the royalty rate, the ALJ agrees with Respondents that the inter-company license agreements between Avago U.S. Inc., Avago International Sales, Avago Trading, and Avago Fiber IP do not represent the most probative evidence of what that royalty would be. Such agreements are not arm's length transactions and may not be premised on the actual value of the IP, but rather on tax concerns and internal business goals. *See Certain Polyimide Films, Prods. Containing Same, and Related Methods*, Inv. No. 337-TA-772, Initial Determination at 327 (May 10, 2012.). Thus, a royalty rate based on agreements with third parties not commonly owned or controlled by Avago or its parent companies would be the most appropriate basis for determining such a royalty rate, if such evidence exists in the record. If they have not been provided (Avago has not identified them in its brief and the ALJ is not aware of them), then the royalty rate should be set at 0%.

ID at 235.

In its initial submission in response to the Commission's Notice, Avago argues that the bond should be at least 3 percent of the entered value in view of the Commission's prior determination in *Certain Optoelectronic Devices, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-669, Commission Op. at 6-7 (July 12, 2010) ("the 669

Investigation"). ComplOpenNotice at 46-48. Avago submits that the bond amount in that investigation was determined based on an agreement between Avago's predecessor (Agilent) and [[ ]] Avago asserts that [[ ]], the respondent in the 669 Investigation, sold its VCSEL-based business to [[ ]] shortly after the conclusion of the 669 Investigation and notes [[

]] *Id.* at 48

(citing Resp. Pre-Hearing Br. at 209-13).

Respondents oppose Avago's request for 3 percent of the entered value and argue for a zero bond. RespOpenNotice at 48-49. Respondents argue that Avago's suggested bond amount is based on a different action, with different parties, different technologies, and different patents. RespReplyNotice at 24 (citing ComplOpenNotice at 46-48). Respondents argue that "[t]his new theory should be rejected. It is presented without any case law or record evidence to support the notion that a zero bond is statutorily inappropriate (it is not) (*see* RICB at 49), or that it is acceptable to invoke a royalty used in an [[ ]] patent license between two entities that are not part of the present investigation (it is not)." *Id.*

In his reply submission, the IA states that the ALJ's recommendation that no bond be imposed conflicts with the statutory mandate that the bond "be sufficient to protect the complainant from any injury." IAReplyNotice at 17 (citing 19 U.S.C. § 1337(j)(3)). The IA argues that while Avago's present arguments rely on circumstantial evidence, it appears to now accept that a bond rate of 3 percent of the entered value of the covered products is sufficient to protect it from injury. ID (citing ComplOpenNotice at 47-48; *cf. Certain Compact Multipurpose*

Tools, Inv. No. 337-TA-416, Commission Op. at 14, USITC Pub. 3239 (Sept. 1999) (holding that the "critical consideration" is that "the intended beneficiary of the bond" was no longer arguing that a higher bond was necessary to protect it from injury)).

Based on the record, including the parties' submissions in response to the Commission Notice, we determine that the bond during the Presidential review period should be set in the amount of 3 percent of the entered value of the products covered by the remedial orders.

V. CONCLUSION

The Commission has determined that there has been a violation of section 337, and has further determined that the appropriate relief in this investigation includes: (1) an LEO prohibiting the unlicensed entry for consumption into the United States of optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of the '595 patent that are manufactured abroad by or on behalf of, or imported by or on behalf of, Respondents or any of their affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns; and (2) cease and desist orders prohibiting FCI USA, LLC and Mellanox Technologies, Inc. from importing, selling, marketing, advertising, distributing, transferring (except for exportation), and soliciting U.S. agents or distributors for, optoelectronic devices for fiber optic communications, components thereof, and products containing the same covered by one or more of claims 14 and 19 of the '595 patent. The Commission has further determined that consideration of the public interest factors enumerated in section 337(d)(1) and (f)(1) (19 U.S.C. § 1337(d)(1), (f)(1)) do not preclude issuance of remedial orders in this investigation. Finally, the Commission has

determined to set the bond in the amount of 3 percent of the entered value of the products covered by the exclusion order during the period of Presidential review.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: May 9, 2014

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-860

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **Commission Notice** has been served by hand upon the Commission Investigative Attorney, Matthew N. Bathon, Esq., and the following parties as indicated, on **May 9, 2014.**

Lisa R. Barton, Acting Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc.:

Liane M. Peterson, Esq.
FOLEY & LARDNER LLP
3000 K Street NW, Suite 600
Washington, DC 20007

( ) Via Hand Delivery
(X) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents FCI USA, LLC, FCI Deutschland GmbH and FCI SA:

Tom M. Schaumberg, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1133 Connecticut Avenue, NW, 12th Floor
Washington, DC 20036

( ) Via Hand Delivery
(X) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents Mellanox Technologies, Inc., Mellanox Technologies Ltd., IPtronics A/S (n/k/a Mellanox Technologies Denmark ApS) and IPtronics Inc.:

Jamie D. Underwood, Esq.
ALSTON & BIRD LLP
950 F Street NW
Washington, DC 20004

( ) Via Hand Delivery
(X) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME**	**Investigation No. 337-TA-860**

NOTICE OF A COMMISSION DETERMINATION TO REVIEW IN PART A FINAL INITIAL DETERMINATION AND SET A SCHEDULE FOR FILING WRITTEN SUBMISSIONS ON THE ISSUES UNDER REVIEW AND ON REMEDY, THE PUBLIC INTEREST, AND BONDING

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission ("the Commission") has determined to review in part the final initial determination ("ID") issued by the presiding administrative law judge ("ALJ") on December 13, 2013.

FOR FURTHER INFORMATION CONTACT: Michael Liberman, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-3115. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *http://www.usitc.gov*. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: This investigation was instituted on October 30, 2012, based upon a complaint filed by Avago Technologies Fiber IP (Singapore) Pte. Ltd. of Singapore; Avago Technologies General IP (Singapore) Pte. Ltd. of Singapore; and Avago Technologies U.S. Inc. of San Jose, California (collectively, "Complainants"), alleging a violation of section 337 of the Tariff Act of 1930, as amended, (19 U.S.C. § 1337) in the importation, sale for importation, or sale within the United States after importation of certain optoelectronic devices

for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of U.S. Patent Nos. 6,947,456 ("the '456 patent") and 5,596,595 ("the '595 patent"). 77 *Fed. Reg.* 65713 (Oct. 30, 2012). The Commission named IPtronics A/S of Roskilde, Denmark; IPtronics Inc. of Menlo Park, California; FCI USA, LLC, of Etters, Pennsylvania; FCI Deutschland GmbH of Berlin, Germany; FCI SA of Guyancourt, France; Mellanox Technologies, Inc. of Sunnyvale, California; and Mellanox Technologies Ltd. of Yokneam, Israel (collectively, "Respondents") as respondents. The Commission also named the Office of Unfair Import Investigations as a party in this investigation.

The final ID on violation was issued on December 13, 2013. The ALJ issued his recommended determination on remedy, the public interest and bonding on the same day. The ALJ found that a violation of section 337 has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of the '595 patent. All the parties to this investigation filed timely petitions for review of various portions of the final ID, as well as timely responses to the petitions. The ALJ recommended that the Commission issue a limited exclusion order directed to Respondents' accused products that infringe the '595 patent. The ALJ also recommended that the Commission issue a cease and desist order against the Mellanox and FCI respondents.

On January 15, 2014, Complainants filed a post-RD statement on the public interest pursuant to Commission Rule 201.50(a)(4). On the same day, respondents Mellanox Technologies, Inc. and Mellanox Technologies, Ltd. also filed a submission pursuant to the rule. No responses from the public were received in response to the post-RD Commission Notice issued on December 16, 2013. *See* Notice of Request for Statements on the Public Interest (Dec. 16, 2013).

Having examined the record in this investigation, including the ALJ's final ID, the petitions for review, and the responses thereto, the Commission has determined to review the ID in part. In particular, the Commission has determined as follows:

(I) With respect to the '595 patent:

> (a) to review the ALJ's claim construction of the limitation "current-spreading layer" and infringement and domestic industry (technical prong) determinations relating to that limitation;
>
> (b) to review the ALJ's determinations with respect to whether Complainants met the economic prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C).

(II) With respect to the '456 patent:

(a) to review the ALJ's claim construction, infringement, and domestic industry (technical prong) determinations;

(b) to review the ALJ's determinations with respect to whether Complainants met the economic prong of the domestic industry requirement under subsections 337(a)(3)(A), 337(a)(3)(B), or 337(a)(3)(C).

The parties are requested to brief their positions on only the following issues, with reference to the applicable law and the evidentiary record:

(1) With respect to the ID's determination regarding the economic prong of the domestic industry requirement with respect to both asserted patents in this investigation, discuss whether Complainants are permitted to rely upon their research and development investments to satisfy the requirements under section 337(a)(3)(A) and (B) or whether such investments are only applicable to establishing a domestic industry under section 337(a)(3)(C). Explain all relevant statutory provisions, case law, and Commission precedent pertaining to this issue. *See* ID at 201.

(2) With respect to the '595 patent, discuss Complainants' investments in research and development attributed to their products relied upon for satisfying the economic prong of the domestic industry requirements as compared to their complete QSFP product line. Provide citations to the record and a response to the argument raised by Respondents as to "inherently discordant" in the evidence relied upon by Complainants and the ALJ (see Respondents' Petition at 74).

(3) Please provide evidentiary support in the record regarding whether the U.S. investments alleged by Complainants are significant or substantial in the context of the Complainants' business, the relevant industry, and market realities.

(4) With respect to the '456 patent:

(a) Discuss whether there is an "intent requirement" in the context of claim construction of the claim limitation "parameter for affecting." Also, please address any discussion of an "intent requirement" in the ID's infringement analysis with respect to that claim limitation. ID at 104-108.

(b) The ALJ stated that:

> Moreover, the ALJ finds that Respondents also presented evidence that [[
>
>]] Thus, the ALJ finds that this suggests the purpose of that value is [[ ]]
> ID at 106-107.

Complainants argue, *inter alia*, that there is no intrinsic or extrinsic evidence to support the ALJ's construction of this parameter such that it must affect only the negative peak portion, and no other portion of the waveform, that these are open-ended "comprising" claims, and it is undisputed that the inclusion of additional features is insufficient to avoid infringement. *See* Complainants' Petition at 35 (citations omitted).

(i) Please comment on the merits of Complainants' argument.
(ii) Does the ALJ's analysis and finding, quoted above, preclude his determinations that neither the accused products nor the alleged domestic industry products meet the claim limitation "parameter for affecting"?

In connection with the final disposition of this investigation, the Commission may (1) issue an order that could result in the exclusion of the subject articles from entry into the UnitedStates, and/or (2) issue one or more cease and desist orders that could result in the Respondents being required to cease and desist from engaging in unfair acts in the importation and sale of such articles. Accordingly, the Commission is interested in receiving written submissions that address the form of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or are likely to do so. For background, see *Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843 (Dec. 1994) (Commission Opinion).

If the Commission contemplates some form of remedy, it must consider the effects of that remedy upon the public interest. The factors the Commission will consider include the effect that an exclusion order and/or cease and desist orders would have on (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) U.S. production of articles that are like or directly competitive with those that are subject to investigation, and (4) U.S. consumers. The Commission is therefore interested in receiving written submissions that address the aforementioned public interest factors in the context of this investigation. The Commission also specifically requests briefing from the parties concerning the following:

> Please provide evidentiary support in the record regarding whether and to what extent Respondents' customers that "operate in extremely important and sensitive areas" would be adversely impacted by the requested remedial orders. Please explain your position as to the appropriate scope of the remedies that should issue in the event a violation is found in view of the public interest considerations of the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers with specific reference to the evidentiary record.

If the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve or disapprove the Commission's action. *See* Presidential Memorandum of July 21, 2005, 70 Fed. Reg. 43251 (July 26, 2005). During this period, the subject articles would be entitled to enter the United States under bond, in an amount determined by the Commission and prescribed by the Secretary of the Treasury.

WRITTEN SUBMISSIONS: The parties to the investigation are requested to file written submissions on the issues under review. The submissions should be concise and thoroughly referenced to the record in this investigation. Parties to the investigation, interested government agencies, and any other interested parties are encouraged to file written submissions on the issues of remedy, the public interest and bonding. Such submissions should address the recommended determination on remedy, the public interest and bonding issued on December 13, 2013, by the ALJ. Complainants and the IA are also requested to submit proposed remedial orders for the Commission's consideration. Complainants are further requested to provide the expiration date of the '595 and '456 patents and state the HTSUS numbers under which the accused articles are imported. The written submissions and proposed remedial orders must be filed no later than the close of business on February 28, 2014. Reply submissions must be filed no later than the close of business on March 7, 2014. No further submissions on these issues will be permitted unless otherwise ordered by the Commission. Party submissions should not exceed 50 pages for the main submissions and 25 pages for the reply submissions.

Persons filing written submissions must file the original document electronically on or before the deadlines stated above and submit 8 true paper copies to the Office of the Secretary by noon the next day pursuant to section 210.4(f) of the Commission's Rules of Practice and Procedure (19 C.F.R. 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-860") in a prominent place on the cover page and/or the first page. (*See* Handbook for

Electronic Filing Procedures, http://www.usitc.gov/secretary/fed_reg_notices/rules/handbook_on_electronic_filing.pdf). Persons with questions regarding filing should contact the Secretary (202-205-2000).

Any person desiring to submit a document to the Commission in confidence must request confidential treatment. All such requests should be directed to the Secretary to the Commission and must include a full statement of the reasons why the Commission should grant such treatment. *See* 19 C.F.R. § 201.6. Documents for which confidential treatment by the Commission is properly sought will be treated accordingly. A redacted non-confidential version of the document must also be filed simultaneously with the any confidential filing. All non-confidential written submissions will be available for public inspection at the Office of the Secretary and on EDIS.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 C.F.R. Part 210).

By order of the Commission.

Lisa R. Barton
Acting Secretary to the Commission

Issued: February 12, 2014

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-860

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, Matthew N. Bathon, Esq., and the following parties as indicated, on **February 17, 2014.**

Lisa R. Barton, Acting Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc.:

Liane M. Peterson, Esq.
FOLEY & LARDNER LLP
3000 K Street NW, Suite 600
Washington, DC 20007

( ) Via Hand Delivery
( ) Via Express Delivery
(√) Via First Class Mail
( ) Other:_____

On Behalf of Respondents FCI USA, LLC, FCI Deutschland GmbH and FCI SA:

Tom M. Schaumberg, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1133 Connecticut Avenue, NW, 12th Floor
Washington, DC 20036

( ) Via Hand Delivery
( ) Via Express Delivery
(√) Via First Class Mail
( ) Other:_____

On Behalf of Respondents Mellanox Technologies, Inc., Mellanox Technologies Ltd., IPtronics A/S (n/k/a Mellanox Technologies Denmark ApS) and IPtronics Inc.:

Jamie D. Underwood, Esq.
ALSTON & BIRD LLP
950 F Street NW
Washington, DC 20004

( ) Via Hand Delivery
( ) Via Express Delivery
(√) Via First Class Mail
( ) Other:_____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of	
CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING THE SAME	**Inv. No. 337-TA-860**

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

Administrative Law Judge Theodore R. Essex

(December 13, 2013)

Appearances:

For the Complainants Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc.:

John C. Vetter, Esq. of Foley & Ladner LLP of Miami, Florida

Liane M. Peterson, Esq. and Debra A. Lange, Esq. of Foley & Lardner LLP of Washington, D.C.

For Respondents Mellanox Technologies, Inc., Mellanox Technologies, Ltd., and Mellanox Technologies Denmark ApS (f/k/a IPtronics A/S):

Steven D. Hemminger, Esq., Lior Nuchi, Esq., and Xavier Brandwajn, Esq. of Altson & Bird LLP of Menlo Park, California

Jamie D. Underwood, Esq., Scott J. Pivnick, Esq., Thomas W. Davison, Esq., and Adam D. Swain, Esq. of Alston & Bird LLP of Washington, D.C.

For Respondents FCI SA, FCI USA, LLC, and FCI Deutschland GmbH:

Tom Schaumberg, Esq. and David H. Hollander, Esq. of Adduci, Mastriani & Schaumberg, LLP of Washington, D.C.

John P. Donohue, Esq., Henrik D. Parker, Esq., Jeb B. Oblak, Esq., Jeffrey W. Lesovitz, Esq., and Charlie C. Lyu, Esq. of Woodcock Washburn LLP of Philadelphia, Pennsylvania

,

Pursuant to the Notice of Investigation, 77 Fed. Reg. 65713 (October 30, 2012), this is the Initial Determination of the in the matter of *Certain Optoelectronic Devices for Fiber Optic Communications, Components Thereof, and Products Containing the Same*, United States International Trade Commission Investigation No. 337-TA-860. *See* 19 C.F.R. § 210.42(a).

It is held that no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of U.S. Patent No. 6,947,456 ("the '456 patent").

It is held that a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same by reason of infringement of certain claims of U.S. Patent No. 5,596,595 ("the '595 patent").

PUBLIC VERSION

TABLE OF CONTENTS

The following abbreviations may be used in this Initial Determination:

CDX	Complainants' demonstrative exhibit
CIB	Complainants' initial post-hearing brief
CPX	Complainants' physical exhibit
CRB	Complainants' reply post-hearing brief
CX	Complainants' exhibit
Dep.	Deposition
JX	Joint Exhibit
RDX	Respondents' demonstrative exhibit
RIB	Respondents' initial post-hearing brief
RPX	Respondents' physical exhibit
RRB	Respondents' reply post-hearing brief
RRX	Respondents' rebuttal exhibit
RX	Respondents' exhibit
SIB	Staff's initial post-hearing brief
SRB	Staff's reply post-hearing brief
Tr.	Transcript

I. BACKGROUND

A. Institution and Procedural History of This Investigation

By publication of a notice in the *Federal Register* on October 30, 2012, pursuant to subsection (b) of section 337 of the Tariff Act of 1930, as amended, the Commission instituted Investigation No. 337-TA-860 with respect to U.S. Patent No. 6,947,456 (''the '456 Patent'') and U.S. Patent No. 5,596,595 (''the '595 patent'') to determine:

> [W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same that infringe one or more of claims 1, 2, 4, 6-8, 11-13, 15, and 20-24 of the '456 patent and claims 14, 17, and 19 of the '595 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337[.]

77 Fed. Reg. 65713 (October 30, 2012).

The complainants are Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc. (collectively "Avago") of Singapore and San Jose, California, respectively. (78 Fed. Reg. 16296-97 (March 14, 2013).) The Notice of Investigation named the respondents as IPtronics A/S of Roskilde, Denmark; IPtronics Inc. of Menlo Park, California; FCI USA, LLC of Etters, Pennsylvania; FCI Deutschland GmbH of Berlin Germany; FCI SA of Guyancourt, France; Mellanox Technologies, Inc. of Sunnyvale, California; and Mellanox Technologies Ltd. of Yokneam, Israel. (77 Fed. Reg. 65713.) The Commission Investigative Staff ("Staff") of the Office of Unfair Import Investigations is a party in this investigation. (*Id.*)

On February 7, 2013, the ALJ issued an order granting a motion to amend the Complaint and Notice of Investigation to reflect the merger of original complainants, Avago Technologies Fiber IP (Singapore) Pte. Ltd. ("Avago Fiber IP") and Avago Technologies General IP (Singapore) Pte. Ltd. ("Avago General IP"). (Order No. 8.) On March 8, 2013, the Commission

determined not to review ID. (*Notice of Commission Determination Not to Review an Initial Determination Granting Motion to Amend Complaint and Notice of Investigation* (March 8, 2013).)

On July 5-12, 2013, the ALJ conducted the pre-hearing conference and hearing.

On October 18, 2013, the ALJ issued an initial determination extending the target date of the investigation due to the federal government shutdown. (Order No. 22.) On November 15, 2013, the Commission determined not to review the ID. (*Notice of Commission Determination Not to Review an Initial Determination Extending the Target Date* (November 15, 2013).)

On November 23, 2013, the ALJ issued an initial determination extending the target date. (Order No. 23.) On December 12, 2013, the Commission determined not to review the ID. (*Notice of Commission Determination Not to Review an Initial Determination Extending the Target Date* (December 12, 2013).)

On December 9, 2013, the ALJ issued an initial determination extending the target date by three days. (Order No. 24.)

On December 13, 2013, the ALJ issued an initial determination extending the target date by three days. (Order No. 25.)

B. The Parties

1. Avago Technologies General IP (Singapore) Pte. Ltd. & Avago Technologies U.S. Inc.

Complainant Avago Technologies U.S. is a Delaware corporation with a principal place of business in San Jose, California. Complainant Avago Technologies General IP (Singapore) Pte. Ltd. is a Singapore corporation with its principal place of business in Singapore. (CIB at 2.) Complainants Avago Technologies U.S. and Avago General IP (collectively, "Avago") are wholly owned subsidiaries of Avago Technologies Limited, a Singapore corporation. (*Id.*)

Avago is involved in the research, development, manufacture, and sale of various fiber optic communication products and components, including VCSELs, VCSEL drivers, transmitters, transceivers, AOCs, and other optoelectronic products. (Amended Complaint ¶ 15.) Avago General IP is the owner of the asserted patents. (*Id.* at ¶¶ 77, 87.)

2. IPTronics

Respondent IPtronics A/S is a corporation existing under the laws of the Kingdom of Denmark, with a principal place of business in Roskilde, Denmark. (Amended Complaint ¶ 17.) Respondent IPtronics, Inc. is a corporation existing under the laws of the State of Delaware with a principal place of business in Menlo Park, California. (*Id.* at ¶ 22.) IPtronics performs research, development, design testing, sales, and service of VCSEL drivers. (*Id.* at ¶¶ 18, 23.) On July 1, 2013, IPtronics was acquired by respondent Mellanox. (Tr. at 7:1-11.)

3. FCI

Respondent FCI SA is a French corporation with a principal place of business in Guyancourt, France. (Amended Complaint ¶ 25.) Respondent FCI Deutschland GmbH is a German limited liability company with a principal place of business in Berlin, Germany. (*Id.* at ¶ 26.) Respondent FCI USA, LLC is a New York corporation with a principal place of business in Etters, Pennsylvania. (*Id.* at ¶ 28.) FCI sells optoelectronic devices and products, including transceivers and active optical cables. (*Id.* at ¶¶ 27-29.)

4. Mellanox

Respondent Mellanox Technologies, Ltd. is a corporation existing under the laws of Israel with a principal place of business in Yokneam, Israel. (Amended Complaint ¶ 30.) Respondent Mellanox Technologies, Inc. is a California corporation with a principal place of

business in Sunnyvale, California. (*Id.* at ¶ 32.) Mellanox markets and sells transceivers and active optical cables. (*Id.* at ¶¶ 31, 33.)

C. The Patents at Issue and Overview of the Technology

1. The '595 Patent

U.S. Patent No. 5,596,595 ("the '595 Patent"), entitled "Current and Heat Spreading Transparent Lasers for Surface-Emitting Lasers," was filed on June 8, 1995, and issued on January 21, 1997. (*See* JX-0467). Michael R. T. Tan, Yu-Min Huong, and Shih-Yuan Wang are the named inventors of the '595 Patent. (*Id.*) The '595 Patent generally discloses and claims a design for a top-emitting Vertical Cavity Surface Emitting Laser (VCSEL). (JX-0467 at 6:27-28; Figs. 2-5.)

The asserted claims of the '595 Patent are claims 14 and 19.[1] Claim 14 and 19 are independent claim and claims 17 depends on claim 14. These claims read as follows (with the disputed claim terms in **bold**):

> 14. A surface-emitting laser comprising:
>
> an **optical cavity** having an active layer in which light energy is generated at a substantially fixed wavelength in response to electrical current flow;
>
> a top mirror and a bottom mirror on opposed sides of said **optical cavity**, said top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction;
>
> a **current-spreading layer on a side of said top mirror opposite to said optical cavity**, said **current-spreading layer** having a thickness that is **approximately equal to** one-quarter of said wavelength times an integer multiple greater than one,

[1] The Notice of Investigation and Complaint assert claim 17 as well, *see supra* Section I.A. However, none of the parties appear to mention claim 17 in their pre-hearing or post-hearing briefs. (*See, e.g.*, CIB at 35 ("Dr. Deppe has opined that Respondents' imported products include all of the limitations of claims 14 and claim 19 of the '595 patent." (but not mentioning claim 17)). No motion to terminate that claim was ever made. However, the ALJ finds in the absence of any evidence or argument regarding this claim, it is terminated from the investigation.

said **current-spreading layer** being **substantially optically transparent** and being electrically conductive;

a **top electrode formed on a side of said current-spreading layer opposite to said top mirror**, said top electrode having a configuration to define an opening for passage of said light energy generated at said **optical cavity**; and

a bottom electrode on a side of said bottom mirror opposite to said **optical cavity**.

19. A surface-emitting laser comprising:

an **optical cavity** having an active layer in which light energy is generated at a substantially fixed wavelength in response to electrical current flow;

a top mirror and a bottom mirror on opposed sides of said **optical cavity**;

a **current-spreading layer on a side of said top mirror opposite to said optical cavity**, said **current-spreading layer** being **substantially optically transparent** and being electrically conductive, said **current-spreading layer** having a thickness that is **approximately equal to** one-quarter of said wavelength times an odd integer multiple greater than one **wherein said current-spreading layer and layers of said top mirror establish a consistent pattern of alternating indices of refraction**;

a **top electrode formed on a side of said current-spreading layer opposite to said top mirror**, said top electrode having a configuration to define an opening for passage of said light energy generated at said **optical cavity**; and

a bottom electrode on a side of said bottom mirror opposite to said **optical cavity**.

2. The '456 Patent

U.S. Patent No. 6,947,456 ("the '456 Patent"), entitled "Open-loop laser driver having an integrated digital controller," was filed on December 12, 2000, and issued on September 20, 2005. (*See* JX-0471). Jesse Chin, Miaobin Gao, Robert Elsheimer, Matthew Scott Abrams, Heng-ju Cheng, Takashi Hidai, Myunghee Lee, and Song Liu are the named inventors of the '456 Patent. (*Id.*) The '456 Patent is directed to an improved laser driver circuit. (*Id.* at Abstract.)

The asserted claims of the '456 Patent are claims 1, 2, 4, 6-8, 11-13, 15, and 20-24. Claims 1, 8, 15, and 21 are independent claims. (*Id.*) Claims 2, 4, 6, and 20 depend on claim 1,

claim 7 depends on claim 6, claim 11-13 depend on claim 8, claim 22 depends on claim 21, claim 23 depends on claim 22, and claim 24 depends on claim 23. The asserted claims read as follows:

> 1. An optical transmitter comprising:
>
> an array having at least one semiconductor laser;
>
> a memory for storing a plurality of drive waveform parameters;
>
> a driver circuit, coupled to the memory and the array, for receiving data signals and at least one drive waveform parameter, and responsive thereto, for generating at least one drive waveform to drive the semiconductor laser;
>
> wherein the drive waveform includes a negative peak portion;
>
> wherein the drive waveform parameters include at least one parameter for affecting the negative peak portion of the drive waveform.
>
> 2. The optical transmitter of claim 1
>
> wherein the array includes a plurality of semiconductor lasers, each of the plurality of semiconductors lasers associated with its own set of drive waveform parameters;
>
> wherein the driver circuit generates an individual drive waveform for each semiconductor laser based on the set of drive waveform parameters associated with that semiconductor laser increasing the uniformity in the resulting optical waveforms of the semiconductor lasers; and
>
> wherein the driver circuit updates at least one drive waveform parameter during the operation of the transmitter based on one of an aging factor of the array and a temperature factor of the array and generates an updated drive waveform based on the updated drive waveform parameter.
>
> 4. The optical transmitter of claim 1 wherein the driver circuit includes an integrated digital controller and a temperature sensor for sensing the temperature of the driver circuit; and wherein the integrated digital controller selectively updates the drive waveform parameters based on the temperature of the driver circuit.
>
> 6. The optical transmitter of claim 1 wherein the array includes a 1.times.N array of semiconductor lasers.

7. The optical transmitter of claim 6 wherein the semiconductor laser is a vertical cavity emitting laser (VCSEL).

8. A laser driver for generating drive waveforms that drives an array having at least one semiconductor laser comprising:

a storage for storing a plurality of drive waveform parameters;

a digital controller coupled to the storage for initially accessing a first set of drive waveform parameters that correspond to a first semiconductor laser and subsequently accessing the storage for other sets of drive waveform parameters corresponding to the first semiconductor laser based on one of an age factor and a temperature factor; and

a waveform shaping circuit coupled to the digital controller for receiving the set of drive waveform parameters and responsive thereto for generating a drive waveform that is dependent on the set of drive waveform parameters;

wherein the waveform includes a negative peaking portion; and

wherein the drive waveform parameters include at least one parameter for affecting the negative peaking portion of the drive waveform.

11. The laser driver of claim 8 wherein the drive waveform parameters include at least one dc parameter and at least one ac parameter.

12. The laser driver of claim 8 wherein the drive waveform parameters associated with the drive waveform include one of bias current, modulation current, negative peaking depth, and negative peaking duration.

13. The laser driver of claim 8 further comprising: a digital to analog converter for receiving the drive waveform parameters in digital form and responsive thereto for generating corresponding drive waveform parameters in analog form; and wherein the drive waveform parameters in analog form are provided to the waveform shaping circuit.

15. A method for providing a drive waveform that includes ac characteristics for at least one semiconductor laser in a laser driver, the laser driver including an integrated digital controller and a storage for storing a plurality of drive waveform parameters, the method comprising the steps of: employing the digital controller to access from the storage a first set of drive waveform parameters for a first laser; and generating a drive waveform for driving the first laser based on the first set of waveform parameters; employing the digital controller to access from the storage a second set of drive waveform parameters during the operation of the laser driver based on one of a temperature factor and an aging factor; and generating an updated drive waveform for driving the first laser based

on the second set of drive waveform parameters; wherein the waveform includes a negative peaking portion; and wherein the drive waveform parameters includes at least one parameter for affecting the negative peaking portion of the drive waveform.

20. The optical transmitter of claim 1 wherein the drive waveform parameters include a bias current parameter, a modulation current parameter, a negative peaking depth parameter, and a negative peaking duration parameter for each semiconductor laser in the array.

21. An optical transmitter comprising:

an array having at least one semiconductor laser;

a memory for storing a plurality of drive waveform parameters;

a driver circuit, coupled to the memory and the array, for receiving a data signal and at least one drive waveform parameter, and responsive thereto, for generating at least one drive waveform to drive the semiconductor laser;

wherein the drive waveform includes a negative peak portion generated by applying a negative peaking current transient to the data signal during a falling edge of a transition from logic one to logic zero in the data signal, such that the negative peak portion has a duration that is shorter than the duration of its associated data bit;

wherein the drive waveform parameters include at least one parameter for affecting the negative peak portion of the drive waveform.

22. The optical transmitter of claim 21 wherein the driver circuit generates the negative peaking current transient.

23. The optical transmitter of claim 22 wherein the driver circuit generates the negative peaking current transient based on the at least one parameter affecting the negative peaking portion of the drive waveform.

24. The optical transmitter of claim 23 wherein the at least one parameter affecting the negative peaking portion of the drive waveform includes a negative peaking duration parameter and a negative peaking depth parameter.

D. The Products At Issue

1. Complainants' Alleged Domestic Industry Products

Complainants are limited to establishing a domestic industry in the United States based only on the products and claims listed below (Order No. 13).

U.S. Patent No.	Claims	Domestic Industry Products
5,596,595	14, 19	AFBR-79 product line containing the [redacted] VCSEL
6,947,456	1	[redacted] drivers

2. The Accused Products

a) IPtronics Accused Products

The accused IPtronics VCSEL driver products are: IPVD10G2CS (2-channel driver); IPVD12G011 (4-channel driver); IPVD12G4C (4-channel driver); IPVD16G4C (4-channel driver); IPVD3X4 (12-channel driver); IPVD12x12 (12-channel driver); IPVD16G12C (12-channel driver); IPBVD12x12 (evaluation board for 12-channel driver) and IPBVD12G011 (evaluation board for 4-channel driver) (CX-2077 at ¶¶ 53-57).

b) Mellanox Accused Products

The Mellanox Accused Products are AOCs and transceivers (RX-0007C at Q/A 78, 80-81) and form a critical part of the Mellanox Respondents' complete guaranteed "end-to-end interconnect solutions" – the entire integrated computer network interconnect systems provided by the Mellanox Respondents and that combine switches, AOCs, network adaptors, integrated circuits, software, receivers, and transceivers (RX-1C at Q/A 16-17).

The following Mellanox products are accused of infringing claims 14 and 19 of the '595 Patent and claims 1, 6, 7, and 21-23 of the '456 Patent.

Mellanox part Number	VCSEL	Driver
Four-Channel Transceiver		
MC2210411-SR4	[redacted]	[redacted]
Four-Channel Active Optical Cables		
MC2206310	[redacted]	[redacted]
MC2210310	[redacted]	[redacted]
MC2207310	[redacted]	[redacted]

(JX-0699C at Ex. A; JX-0701C at Exs. C and D.)

c) FCI Accused products

The following FCI products are accused of infringing the '595 Patent and the following Active Optical Cables are accused of infringing the '456 Patent.

FCI Item Number	VCSEL	Driver
Four-Channel Active Optical Cables		
ICD040GVP163D-xx	[redacted]	[redacted]
ICD040GVP16EN-xx	[redacted]	[redacted]
ICD040GVP16SI-xx	[redacted]	[redacted]
ICD056GVP163D-xx	[redacted]	[redacted]
ICD056GVP16SI-xx	[redacted]	[redacted]
Twelve-Channel Active Optical Cables		
D120GVP1410LA-xx	[redacted]	[redacted]
D120GVP1410XYxx	[redacted]	[redacted]
D120GVP2410-xx	[redacted]	[redacted]
ICD120GVP1410LAxxxx	[redacted]	[redacted]
ICD120GVP2410-xx	[redacted]	[redacted]
ICD120GVP2420-xx	[redacted]	[redacted]
ICD150GVP2410-xx	[redacted]	[redacted]
ICD150GVP241C-xx	[redacted]	[redacted]
ICD150GVP3410-xx	[redacted]	[redacted]
Optical Transceivers		
TRX10GVP2010C1	[redacted]	
TRX10GVP2010AT01	[redacted]	
TRX10GVP2010CA01	[redacted]	

TRX10GVP2020C1	[redacted]	
TRX08GVP2530	[redacted]	
TRX08GVP2540	[redacted]	
TRX10GVP2001	[redacted]	

(RX-1571.)

II. IMPORTATION OR SALE

Section 337 of the Tariff Act prohibits the importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignees of articles that infringe a valid and enforceable United States patent. *See* 19 U.S.C. § 1337(a)(1)(B). A complainant "need only prove importation of a single accused product to satisfy the importation element." *Certain Purple Protective Gloves*, 337-TA-500, Order No. 17 (September 23, 2004).

Respondents contend that Avago has failed to establish that the accused products have been imported and so the Commission does not have jurisdiction to investigate the alleged violation of Section 337 in this investigation. (RIB at 10.) Avago and Staff disagree. As an initial matter, Avago and Staff both note that Respondents stated in their pre-hearing brief that "Respondents do not contest that the accused products have been imported and that the Commission has jurisdiction to investigate the alleged violation of Section 337 asserted in this investigation." (CIB at 15-16 (quoting Respondents' Joint Pre-Hearing Brief at 49; SRB at 2.) Avago and Staff both argue that Respondents have waived their arguments regarding importation. (CRB at 1; SRB at 2.) The ALJ agrees and finds that Respondents have waived their arguments regarding importation. (*See* Ground Rule 8.1(f).) Moreover, Avago and Staff presented evidence that all of the Respondents meet the importation requirement. (CIB at 16-17; SIB at 13-14.) The ALJ finds that Avago has shown that [redacted]

[redacted] (CX-0382C at 77:17-78:1, 79:1-4, 80:1-3, 81:14-17, 107:4-108:22, 109:10-18, 131:15-132:6; Tr. 719:9-721:12; JX-0442C; JX-0431C; JX-0014C; JX-0482C; JX-0512C; CX-0510C at Nos. 21-22, 24; RX-0001C at Q/A 41, 46-47, 55-56.) The ALJ further finds that the evidence shows that [redacted] (CX-0382C at 107:4-108:6.) The ALJ also finds that the accused products enter the U.S. through [redacted] (CX-0510C at Nos. 21-22.)

The ALJ further finds that the evidence shows that FCI offers to sell and sells accused products in the U.S. and that it also imports those products to the U.S. (RX-1670C Q/A 4-5; RX-0011C Q/A 10; CX-0437C at 55:22-56:11, 57:16-25, 58:9-25, 60:14 – 61:13; CX-0493C at Nos. 21-22, 24; RX-1590C; RX-1571C.) The finds that the FCI accused products are designed in [redacted] and then manufactured and assembled in either [redacted] (RX-1670C Q/A 4-5; RX-0011C Q/A 10.) The ALJ finds that the FCI accused products are imported into the U.S. by FCI through at least [redacted] (CX-0493C at Nos. 21-22.)

Finally, the ALJ also finds that IPtronics manufactures, or has manufactured, the accused products outside of the U.S., sells the accused products in the U.S., sells them for importation into the U.S., and imports them into the U.S. (CX-0386C at 48:4 - 49:25; Tr. 903:15-908:16; CX-0935C.) The ALJ finds that IPtronics [redacted]

[redacted] (Tr. 903:15-908:16; CX-0935C.)

Accordingly, the ALJ finds that Avago has shown that all three Respondents satisfy the importation requirement.

III. JURISDICTION

In order to have the power to decide a case, a court or agency must have both subject matter jurisdiction and jurisdiction over either the parties or the property involved. *See Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Commission Memorandum Opinion, 215 U.S.P.Q. 229, 231 (1981). For the reasons discussed below, the ALJ finds the Commission has jurisdiction over this investigation.

Section 337 declares unlawful the importation, the sale for importation, or the sale after importation into the United States of articles that infringe a valid and enforceable United States patent by the owner, importer, or consignee of the articles, if an industry relating to the articles protected by the patent exists or is in the process of being established in the United States. *See* 19 U.S.C. §§ 1337(a)(1)(B)(I) and (a)(2). Pursuant to Section 337, the Commission shall investigate alleged violations of the Section and hear and decide actions involving those alleged violations.

As set forth *supra* in Section II, Avago has met the importation requirement. Furthermore, Respondents have appeared and participated fully in this investigation Accordingly, the ALJ finds that Respondents have submitted to the jurisdiction of the Commission. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, Pub. No. 1948, Initial Determination at 4, 1986 WL 379287 (U.S.I.T.C., October 15, 1986) (unreviewed by

Commission in relevant part). Thus, the ALJ finds that the Commission has jurisdiction under Section 337 to hear this investigation and has jurisdiction over these Respondents.

IV. STANDING

A. Legal Principles

Commission Rule 210.12 requires that intellectual property-based complaints filed by a private complainant "include a showing that at least one complainant is the owner or exclusive licensee of the subject intellectual property." 19 C.F.R. § 210.12(a)(7). The Commission interprets Rule 210.12(a)(7) in a manner consistent with the standing requirement established by courts in patent infringement cases. *See Certain Catalyst Components and Catalysts for the Polymerization of Olefins*, Inv. No. 337-TA-307, Commission Opinion, 1990 ITC LEXIS 224, at *50 (June 18, 1990) ("[W]e see little basis for inferring a different standing requirement under section 337 than the courts have established in patent infringement cases."); *Certain Point of Sale Terminals & Components Thereof ("Point of Sale Terminals")*, Inv. No. 337-TA-524, Order No. 31 (February 7, 2005). Generally, the patentee—or title holder—at the time suit is filed will satisfy the standing requirement. *See, e.g., Crown Die & Tool v. Nye Tool & Mack Works*, 261 U.S. 24, 40–41 (1923); *AsymmetRx, Inc. v. Biocare Med., LLC*, 582 F.3d 1314, 1318 (Fed. Cir. 2009); *see also Aspex Eyewear, Inc. v. Miracle Optics, Inc.*, 434 F.3d 1336, 1341 (Fed. Cir. 2006) ("The essential issue regarding the right to sue on a patent is who owns the patent."). This is because the Patent Act provides that a "patentee shall have remedy by civil action for infringement of his patent." 35 U.S.C. § 281 (2013). The term "patentee" includes "not only the patentee to whom the patent was issued but also the successors in title to the patentee." *Enzo Apa & Son, Inc. v. Geapag A.G.*, 134 F.3d 1090, 1093 (Fed. Cir. 1998). "[P]atents . . . have the attributes of personal property [and] . . . [a]pplications for patent, patents, or any interest therein

[are] assignable in law by an instrument in writing." 35 U.S.C. § 261 (2013). "The entity to whom the grant of a patent is made by the PTO [or that entity's successor in title] holds 'legal title' to the patent." *Arachnid, Inc. v. Merit Indus., Inc.*, 939 F.2d 1575, 1578 n.2 (Fed. Cir. 1991). Once a complainant "has satisfied its initial showing that it is the owner of the asserted patents, the burden of product shifts to [the respondent] to rebut such a showing." *Certain Computer Products, Components, and Products Containing the Same*, Inv. No. 337-TA-628, Initial Determination, at 15 (March 16, 2009) (unreviewed).

B. '595 Patent

Avago General IP asserts that it owns each of the asserted patents. (*See* CIB at 6-7.) Avago has also submitted the assignments recorded at the United States Patent and Trademark Office ("USPTO") for the '595 Patent. (JX-0469 at AV-ITC50004597-600.) While the recording of an assignment with the PTO does not determine the validity of the assignment, 37 C.F.R. § 3.54, it creates a presumption of validity as to the assignment and places the burden to rebut such a showing on one challenging the assignment. *SiRF Tech., Inc. v. U.S. Int'l Trade Comm'n*, 601 F.3d 1319, 1327-28 (Fed. Cir. 2010) ("The recording of an assignment with the PTO is not a determination as to the validity of the assignment. However, we think that it creates a presumption of validity as to the assignment and places the burden to rebut such a showing on one challenging the assignment." (citation omitted)). Thus, the ALJ finds that Respondents bear the burden to show that the assignment of the asserted patents to Avago is not valid such that Avago lacks standing to bring its complaint. Respondents contend that Avago's predecessor, the Hewlett-Packard Company ("HP") entered into a government contract in 1994 pursuant to which HP lost rights in the '595 Patent. (RRB at 1-5.)

1. The POLO Agreement

In July 1994, the Parallel Optical Link Organization Consortium ("the POLO Consortium") and the Defense Advanced Research Projects Agency ("DARPA") entered into an agreement regarding the development of parallel optical interconnect modules. (*See* JX-0705C.) DARPA agreed to commit approximately $8 million to partially fund the work, and the POLO Consortium agreed to provide $8.75 million. (*Id.* at AGIL0000565.) The POLO Consortium members included HP, E.I. DuPont De Nemours and Company, AMP Incorporated, the University of Southern California, and SDL Incorporated. (*Id.*) Pursuant to the Agreement, the POLO Consortium sought to develop "low-cost, high performance parallel optical interconnect modules for a broad range of dual-use information processing and sensing applications." (*Id.* at AGIL0000567.) HP was to "focus on optoelectronic transmitter/receiver arrays, high-speed electrical packaging, and interconnect module assembly and integration." (*Id.*) In the Statement of Work accompanying the Agreement, HP was specifically tasked, *inter alia*, to "[d]esign and fabricate VCSEL arrays." (*Id.* at AGIL0000585.) The POLO Agreement was to last three years, and thus expired in July 1997. (*See id.* at AGIL0000570.) According to terms of the POLO agreement, the POLO consortium retains "the entire right, title, and interest throughout the world to each subject invention consistent with the provisions of the Articles of Collaboration, this Article, and 35 U.S.C. § 203." (JX-0705C at AGIL0000576-80.) The POLO Agreement defines "subject invention" as: "[s]ubject invention means any invention of a Consortium Member conceived or first actually reduced to practice in the performance of work under [the POLO] Agreement[s]." (JX-0705C at AGIL0000576.)

The ALJ finds that Respondents have failed to show that the POLO Agreement conveyed ownership of the '595 Patent because the ALJ finds that there is no evidence that the inventions of the '595 Patent were "conceived or first actually reduced to practice in the performance of

work" on the POLO programs. In support of their contention that the '595 Patent is a "subject invention" under the POLO Agreement, Respondents rely on drawing a complex series of inferences based on various pieces of circumstantial evidence. (RRB at 2-3.) Tracing through these inferences is no small feat.

Respondents begin by arguing that the '595 Patent was filed within the term of the POLO Agreement. (RRB at 2.) Respondents then note that the '595 Patent preferred embodiments describe designs for top-emitting VCSELs and top emitting VCSELs "were within" the scope of the POLO Agreement's statement of work to "design and fabricate VCSEL arrays." (RRB at 2 (citing JX-0705C at AGIL0000585).) Additionally, Respondents argue that two of the named inventors, Michael Tan and Shih-Yuan Wang, were in change of designing VCSELs for the POLO Agreement when the patent was filed. (RRB at 2.) Respondents then seek to draw further inferences from Tan's inventor notebook. (RRB at 2.) Respondents argue that HP designed "an 850 nanometer top-emitting VCSEL as part of the program." (RRB at 2.) Respondents then contend that "[n]otably, the purported invention disclose for the '595 Patent falls within a group of consecutive pages in Tan's notebook that specifically describe an 850 nanometer VCSEL." (RRB at 2 citing Tr. at 26:5-270:20; 271:14-273:10; JX-0169C at AGIL0000440-450).) Respondents further assert that "[o]ne of those pages identifies the laser that the inventors were working on as being for the POLO project." (RRB at 2 (citing JX-0169C at AGIL0000440; Tr. 266:23-267:18).) Finally, Respondents note that the invention disclose was signed by "Kevin Hahn, a technical lead specifically hired to work on the POLO project." (RRB at 2.)

The ALJ finds these pieces of circumstantial evidence do not come close to establishing by themselves that the '595 Patent is a subject invention. Instead, in order accept Respondents'

arguments, the ALJ would be required to draw a series of inferences from this circumstantial evidence. Respondents have simply presented no evidence that would justify, let alone compel, the ALJ to draw all of the inferences that they ask. For example, the mere fact that the '595 Patent was filed while the POLO Agreement was in effect and it could fall within the broad description of work of that agreement is not sufficient to conclude that the work was done as part of this project. There is no testimony in the record that this was the only VCSEL project that HP was working on at the time. Indeed, Avago presented evidence that while Drs. Tan and Wang worked on POLO, they also worked on other VCSEL projects. (Tr. 264:4-265:4, 277:5-22, 284:4-17; JX-0215C 33:14-40:9.) Moreover, Respondents presented no evidence that the third named inventor Yu-Min Huong had any involvement in POLO. Thus, this evidence is unpersuasive.

Respondents also ask the ALJ to draw a series of inferences from Dr. Tan's laboratory notebook. However, Respondents cite to no actual testimony from Dr. Tan as to what the notebook means. Instead, they cite to testimony from Dr. Dolfi, who admitted that he wasn't aware of exactly what the notebook was discussing besides an 850 nm VCSEL. (Tr. 267:1-268:8.) While Respondents would like the ALJ to draw the inference that the 850 nm VCSEL discussed in the notebook was the VCSEL developed for the POLO Program, the ALJ declines to do so. The ALJ finds that while the notebook does at one point mention "POLO Lasers," it doesn't specifically that this VCSEL was developed for POLO and Respondents fail to offer any competent testimony, beyond some half-hearted speculation by Dr. Dolfi, as to what the notebook is specifically referring to. This is simply insufficient to prove, even by a preponderance of the evidence that the '595 Patent is subject to the POLO Agreement. Finally, Respondents point to the signature of Ken Hahn, a manager who was involved in the POLO

project, as the verifying signature the notebook entry to prove that this entry must be related to the POLO project. However, again Respondents can only speculate about why Mr. Hahn signed this entry, because they offered no evidence that Mr. Hahn only signed entries in lab notebooks related to the POLO projects. It is equally possible that Mr. Hahn was just a person who Dr. Tan found that was available and willing to sign the notebook that day. Without some testimony from someone with actual knowledge of the notebook, we are only left with speculation regarding its contents, which is insufficient to warrant drawing the inferences that Respondents seek.

Moreover, Avago offered some evidence consistent with Avago's reading of the evidence. As program manager of POLO and PONI for HP and Agilent, Dr. Dolfi tracked "subject inventions," *i.e.*, those "conceived or first reduced to practice in the performance of work under" the POLO project. (JX-0705C at AGIL0000576; CX-2093C Q/A 29-39, 51-77; CX-2248C; Tr. 250:4-251:16, 253:5-17; 274:21-275:11; 276:3- 278:9; 278:21-279:23; 281:20- 284:3.) The ALJ notes that the inventive entities for the '595 or '456 patents are not on Dr. Dolfi's tracking spreadsheet. (CX-2248C.) Thus, the ALJ finds that because the Respondents have not shown by a preponderance of the evidence that the inventions of the '595 Patents were conceived or first reduced to practice during work on the POLO or PONI programs, the inventions of the '595 Patent are not "subject inventions" within the meaning of the POLO Agreement.

2. Bona Fide Purchaser for Value

Avago argues that even if the POLO Agreement somehow vested ownership with one or more of the Consortium Members, which Complainants deny, Avago General IP was a bona fide purchaser of the asserted patents and therefore prevails pursuant to 35 U.S.C. § 261. (CIB at 13-14.) Respondents argue that Avago is not a bone fide purchaser for value because it had notice of

the assignment in the POLO Agreement through its employee Dolfi when it purchased the '595 Patent. (RRB at 5.) Respondents assert that "Dolfi negotiated the [POLO Agreement], ran the [POLO] program at HP, and was a member of the Consortium's executive committee." (RRB at 5 (citations omitted).) Respondents contend that "Dolfi was an employee at Agilent and Avago with firsthand knowledge of the DARPA contract's ownership provision, when those companies purchased the '595 Patent." (RRB at 5.) Respondents further argue that Dolfi "maintained copies of [the POLO Agreement] in his files at Agilent and Avago...." (RRB at 5 (citation omitted).) Respondents assert that "Avago and Agilent are charged with Dolfi's knowledge DARPA contract." (RRB at 5.) Respondents argue that "[b]ecause Agilent was on notice of the contract when it obtained the '595 Patent, it was not a bona fide purchaser under § 261." (RRB at 5.)

35 U.S.C. § 261 provides: "An assignment, grant or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the Patent and Trademark Office within three months from its date or prior to the date of such subsequent purchase or mortgage." 35 USC § 261. A "bona fide purchaser is one who purchases legal title to property in good faith for valuable consideration, without notice of any other claim of interest in the property." *Bd. of Trustees of the Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc.,* 583 F.3d 832, 842-844 (Fed. Cir. 2009); *Rhone-Poulenc Agro, S.A. v. DeKalb Genetics Corp.*, 284 F.3d 1323, 1327 (Fed. Cir. 2002). "It is well established that when a *legal title holder* of a patent *transfers his or her title* to a third party purchaser for value without notice of an outstanding equitable claim or title, the purchaser takes the entire ownership of the patent, free of any prior equitable encumbrance." *Rhone-Poulenc Agro*, 284 F.3d at 1333.

The ALJ agrees with Avago that at the time Avago General IP purchased the '595 Patent, it did not have notice of any other claim of interest to the asserted patents and is thus a bona fide purchaser protected by § 261. *See Certain Semiconductor Chips*, Inv. No. 337-TA-753, Comm'n Op. at 62 (August 17, 2012). Respondents' arguments that Avago was on notice based on alleged knowledge of its employee Dr. Dolfi are without merit and suffer from at least two fatal logical flaws.

First, Respondents' arguments completely ignore the transaction by which Avago came into being. As explained in detail in Order No. 12, Avago was formed when a private equity company purchased the Semiconductor Products Group from Agilent Technologies. (*See* Order No. 12.) Thus, Respondents' arguments that Dr. Dolfi was Avago's employee and Avago is charged with constructive knowledge of everything he knew fail, because ***at the time Avago purchased '595 Patent***, Dr. Dolfi was not an employee of Avago, he was still an employee of Agilent. He did not become an employee of Avago until after the transaction closed. (*See* Order No. 12.) The cases that Respondents rely upon, *Roche Molecular Systems*, 583 F.3d 832, and *Filmtec Corp. v. Allied-Signal, Inc.*, 939 F.2d 1568 (Fed. Cir. 1991), confirm this. Both of those cases involve employers being charged with constructive knowledge of what the people who were their employees at the time the transactions occurred knew, not the knowledge of employees who became employees after the transaction occurred. *See Roche Molecular Sys.*, 582 F.3d at 842-43; *Filmtec*, 939 F.2d at 1574. Thus, these cases provide no support for the proposition that a future employee can impute notice to a party for a transaction that occurred before the employee was hired. Thus, at the time the transaction occurred, Avago had no actual notice of the POLO Agreement. Respondents have presented no evidence or argument for any other basis for notice for Avago.

Second, Respondents' arguments are also premised on the belief that Dr. Dolfi knew or should have known that the POLO Agreement assigned the rights to the '595 Patent to others. However, Respondents have not shown that. Instead, Dr. Dolfi testified directly contrary to that position. Dr. Dolfi testified that the Articles of Collaboration for the POLO Agreement provide that any intellectual property arising out of any work pursuant to the program and created by employees of one Consortium member belong solely to that member. (CX-2093C at Q/A 83-89 (citing CX-2249C at Article 7.2); *see also* CX-2083C at Q/A 81-82.) Dr. Dolfi further testified that HP was the only Consortium member that specified, designed, and fabricated VCSELs for the POLO project. (CX-2093C at Q/A 91.) Respondents presented no evidence that in 18 years since the filing of the '595 Patent or in the 16 years since the POLO Agreement expired that any member of the POLO Consortium has ever asserted any ownership rights on behalf of itself, the POLO Consortium, or any other member of the POLO Consortium. Furthermore, the '595 patent was asserted in patent infringement district court litigations filed in 2000 and 2001 before Avago acquired it and there is no evidence that any ownership disputes arose. (CX-2077C at ¶¶ 168, 169.) In addition, for the government to have ownership, the agreements require that the government provide written notice to HP regarding their belief. No such notice was ever alleged to have been provided, and thus the government cannot have any ownership in the '595 patents.

Thus, this situation is directly analogous to the situation before the Commission in *Certain Electronic Chips*, Inv. No. 337-TA-753. In that investigation, Respondents asserted that the University of North Carolina (UNC) had ownership rights in a patent based on a technology development agreement between it and the Massachusetts Institute of Technology (MIT) under a DARPA contract. (*See Certain Electronic Chips*, at 61.) The Commission rejected assertions that the Complainant had notice of ownership rights by UNC (or others) in the patent because

even if the complainant became aware that the patent was related work done under the contract between UNC and MIT (the patent owner), it would not have become aware of the ownership claim. (*Certain Electronic Chips*, at 62.) In this case, even if Avago had been aware of the POLO Agreement (which Respondents have not established), it would not have been on notice of any other ownership rights. If it had inquired of Dr. Dolfi, Avago would have learned nothing because he believed that this invention was outside of the scope of the intellectual property clause of the POLO Agreement. (CX-2093C at Q/A 83-89 (citing CX-2249C at Article 7.2); CX-2083C at Q/A 81-82; *see also Certain Electronic Chips*, at 62.)

Accordingly, for at least these two reasons, the ALJ finds that Avago was a bona fide purchaser for value and has standing. *See Certain Electronic Chips*, at 61-62.

C. '456 Patent

While the Joint Outline of Issues to Decided in the Initial Determination lists whether Avago is the owner of the "patents at issue" as an issue to be decided, Respondents' briefs contain no actual arguments or evidence regarding the issue of ownership or standing for the '456 Patent. (*See* RIB at 7; RRB at 1-5.) Accordingly, the ALJ finds that issue waived. (*See* Ground Rule 8.1(f).) Moreover, Avago has presented evidence of a chain of assignments of ownership from the named inventors to it for the '456 Patent. (*See* JX-0755 at AV-ITC50004184-4190.) Respondents have not challenged these assignments, and thus, they are presumed valid. *See SiRF Tech.*, 601 F.3d at 1327–28 ("The recording of an assignment with the PTO is not a determination as to the validity of the assignment. However, we think that it creates a presumption of validity as to the assignment and places the burden to rebut such a showing on one challenging the assignment." (citation omitted)). Accordingly, the ALJ finds that Avago has shown that it is the owner the '456 Patent and has standing to sue under it.

V. CLAIM CONSTRUCTION

A. Legal Standard

Pursuant to the Commission's Notice of Investigation, this investigation is a patent-based investigation. *See* 77 Fed. Reg. 65713 (October 30, 2012). Accordingly, all of the unfair acts alleged by Avago to have occurred are instances of alleged infringement of the '595 Patent and '456 Patent. Claim interpretation is a question of law. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996); *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1455 (Fed. Cir. 1998). Second, a factual determination must be made as to whether the properly construed claims read on the accused devices. *Markman*, 52 F.3d at 976.

"The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history." *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365–67 (Fed. Cir. 2012) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc)). In construing claims, the ALJ should first look to intrinsic evidence, which consists of the language of the claims, the patent's specification, and the prosecution history, as such evidence "is the most significant source of the legally operative meaning of disputed claim language." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996); *see also Bell Atl. Network Servs., Inc. v. Covad Comm'n. Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The words of the claims "define the scope of the patented invention." *Id.* And, the claims themselves "provide substantial guidance as to the meaning of particular claim terms." *Phillips*, 415 F.3d at 1314. It is essential to consider a claim as a whole when construing each term, because the context in which a term is used in a claim "can be highly instructive." *Id.* Claim terms are presumed to be used consistently throughout the patent, such that the usage of the term

in one claim can often illuminate the meaning of the same term in other claims. *Research Plastics, Inc. v. Federal Pkg. Corp.*, 421 F.3d 1290, 1295 (Fed. Cir. 2005). In addition:

> . . . in clarifying the meaning of claim terms, courts are free to use words that do not appear in the claim so long as the resulting claim interpretation . . . accord[s] with the words chosen by the patentee to stake out the boundary of the claimed property.

Pause Tech., Inc. v. TIVO, Inc., 419 F.3d 1326, 1333 (Fed. Cir. 2005).

Idiosyncratic language, highly technical terms, or terms coined by the inventor are best understood by reference to the specification. *Phillips*, 415 F.3d at 1315–16. While the ALJ construes the claims in light of the specification, limitations discussed in the specification may not be read into the claims. *See Intervet Inc. v. Merial Ltd.*, 617 F.3d 1282, 1287 (Fed. Cir. 2010); *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1288 (Fed. Cir. 2009). Some claim terms do not have particular meaning in a field of art, in which case claim construction involves little more than applying the widely accepted meaning of commonly understood words. *Phillips*, 415 F.3d at 1314. Under such circumstances, a general purpose dictionary may be of use.[2] *See Advanced Fiber Tech. (AFT) Trust v. J & L Fiber Servs., Inc.*, 674 F.3d 1365, 1374–75 (Fed. Cir. 2012).

Claim terms should generally be given their ordinary and customary meaning except "1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner*, 669 F.3d at 1365. "To act as its own lexicographer, a patentee must 'clearly set forth a definition of the disputed claim term . . . .'" *Id.* (quoting *CCS Fitness, Inc. v. Brunswick Corp.*,

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[2] Use of a dictionary, however, may extend patent protection beyond that to which a patent should properly be afforded. There is also no guarantee that a term is used the same way in a treatise as it would be by a patentee. *Phillips*, 415 F.3d at 1322.

288 F.3d 1359, 1366 (Fed. Cir. 2002)). And "[w]here the specification makes clear that the invention does not include a particular feature, that feature is deemed to be outside . . . the patent," even if the terms might otherwise be broad enough to cover that feature. *Id.* at 1366 (internal citation omitted). Thus, if a claim term is defined contrary to the meaning given to it by those of ordinary skill in the art, the specification must communicate a deliberate and clear preference for the alternate definition. *Kumar v. Ovonic Battery Co.*, 351 F.3d 1364, 1368 (Fed. Cir. 2003). In other words, the intrinsic evidence must "clearly set forth" or "clearly redefine" a claim term so as to put one reasonably skilled in the art on notice that the patentee intended to so redefine the claim term. *Bell Atl.*, 262 F.3d at 1268. For example, disclaiming the ordinary meaning of a claim term—and thus, in effect, redefining it—can be affected through "repeated and definitive remarks in the written description." *Computer Docking Station Corp. v. Dell, Inc.*, 519 F.3d 1366, 1374 (Fed. Cir. 2008) (citing *Watts v. XL Sys.*, 232 F.3d 877, 882 (Fed. Cir. 2000)); *see SafeTCare Mfg., Inc. v. Tele-Made, Inc.*, 497 F.3d 1262, 1270 (Fed.Cir.2007) (finding disclaimer of "pulling force" where "the written description repeatedly emphasized that the motor of the patented invention applied a pushing force").

When the meaning of a claim term is uncertain, the specification is usually the first and best place to look, aside from the claim itself, in order to find that meaning. *Phillips*, 415 F.3d at 1315. The specification of a patent "acts as a dictionary" both "when it expressly defines terms used in the claims" and "when it defines terms by implication." *Vitronics*, 90 F.3d at 1582. For example, the specification "may define claim terms by implication such that the meaning may be found in or ascertained by a reading of the patent documents." *Phillips*, 415 F.3d at 1323. "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." *Id.* at 1316. However,

as a general rule, particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Markman*, 52 F.3d at 979.

The prosecution history "provides evidence of how the inventor and the PTO understood the patent." *Phillips*, 415 F.3d at 1317; *see also Pass & Seymour, Inc. v. Int'l Trade Comm'n*, 617 F.3d 1319, 1327 (Fed. Cir. 2010) (quoting *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1478 (Fed. Cir. 1998)). The ALJ may not rely on the prosecution history to construe the meaning of the claim to be narrower than it would otherwise be unless a patentee limited or surrendered claim scope through a clear and unmistakable disavowal. *Trading Tech. Int'l, Inc. v. eSpeed, Inc.*, 595 F.3d 1340, 1352 (Fed. Cir. 2010) (internal citations omitted); *Vitronics*, 90 F.3d at 1582–83. For example, the prosecution history may inform the meaning of the claim language by demonstrating how an inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it otherwise would be. *Vitronics*, 90 F.3d at 1582-83; *see also Chimie v. PPG Indus., Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005) (stating, "The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution."); *Microsoft Corp. v. Multi-tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004) (stating, "We have held that a statement made by the patentee during prosecution history of a patent in the same family as the patent-in-suit can operate as a disclaimer."). The prosecution history includes the prior art cited, *Phillips*, 415 F.3d at 1317, as well as any reexamination of the patent. *Intermatic Inc. v. Lamson & Sessions Co.*, 273 F.3d 1355, 1367 (Fed. Cir. 2001).

Differences between claims may be helpful in understanding the meaning of claim terms. *Phillips*, 415 F.3d at 1314. A claim construction that gives meaning to all the terms of a claim is preferred over one that does not do so. *Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364,

1372 (Fed. Cir.), *cert. denied*, 546 U.S. 972 (2005); *Alza Corp. v. Mylan Labs. Inc.*, 391 F.3d 1365, 1370 (Fed. Cir. 2004). In addition, the presence of a specific limitation in a dependent claim raises a presumption that the limitation is not present in the independent claim. *Phillips*, 415 F.3d at 1315. This presumption of claim differentiation is especially strong when the only difference between the independent and dependent claim is the limitation in dispute. *SunRace Roots Enter. Co., v. SRAM Corp.*, 336 F.3d 1298, 1303 (Fed. Cir. 2003). "[C]laim differentiation takes on relevance in the context of a claim construction that would render additional, or different, language in another independent claim superfluous." *AllVoice Computing PLC v. Nuance Commc'ns, Inc.*, 504 F.3d 1236, 1247 (Fed. Cir. 2007).

Finally, when the intrinsic evidence does not establish the meaning of a claim, the ALJ may consider extrinsic evidence, *i.e.*, all evidence external to the patent and the prosecution history, including inventor testimony, expert testimony and learned treatises. *Phillips*, 415 F.3d at 1317. Extrinsic evidence may be helpful in explaining scientific principles, the meaning of technical terms, and terms of art. *Vitronics*, 90 F.3d at 1583; *Markman*, 52 F.3d at 980. However, the Federal Circuit has generally viewed extrinsic evidence as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Phillips*, 415 F.3d at 1318. With respect to expert witnesses, any testimony that is clearly at odds with the claim construction mandated by the claims themselves, the patent specification, and the prosecution history should be discounted. *Id.* at 1318.

If the meaning of a claim term remains ambiguous after a review of the intrinsic and extrinsic evidence, then the patent claims should be construed so as to maintain their validity. *Id.* at 1327. However, if the only reasonable interpretation renders a claim invalid, then the claim should be found invalid. *See Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999).

B. The '595 Patent

1. Level of Skill in the Art

Avago's technical expert for the '595 Patent, Dr. Dennis Deppe, testified that, in his opinion, a person of ordinary skill in the relevant art in the 1995 timeframe would be someone involved in the design and development of surface emitting lasers or related devices, with the equivalent of a bachelor's degree in electrical, mechanical, optical engineering, or physics. (CX-2086C at Q/A 31.)

Respondents' technical expert, Dr. Connie Chang-Hasnain, testified that, in her opinion, one of ordinary skill in the field of VCSEL structure in the 1993-95 timeframe would have had a doctorate in electrical engineering or physics and several years of laboratory research or professional experience in optoelectronic devices, or equivalent actual experience and at least a master's degree or a graduate student pursuing a doctoral research specifically in optoelectronic devices. (RX-0005C at Q/A 83.)

The Staff suggests that the appropriate level of skill in the art with respect to the asserted patents is at least a bachelor's degree in electrical engineering or physics with several years of laboratory research or professional experience in optoelectronic devices. (SIB at 11.) The Staff submits that it does not appear that resolution of the issues of infringement or validity depends on the level of ordinary skill in the art. (SIB at 11.)

In assessing the level of ordinary skill in the art as of the June 8, 1995, filing date of the application for the '595 Patent, one should consider: (1) the inventor's educational level; (2) the type of problems encountered in the art; (3) prior solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of active workers in the field. *Daiichi Sankyo v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). In view of these factors, the ALJ finds that one of ordinary skill in the art

of the '595 Patent (*i.e.*, the structure of surface emitting lasers) would have had a doctorate in electrical engineering, physics, materials science or a related field, and several years of lab research or professional experience in optoelectronic devices, or equivalent actual experience with at least a master's degree or a graduate student pursuing a doctoral research specifically in optoelectronic devices. (RX-0005C at Q/A 83-86; RX-0002 at Q/A 19-20). The ALJ finds that Avago's expert agreed that, at the time that the '595 Patent was filed, VCSELs were in "the early days of commercialization." (CX-2223C at Q/A 30.) Thus, they would likely only be generally available to the persons described. Moreover, neither Staff nor Avago offer any argument or analysis of the factors above to support their definition of a person of ordinary skill. The ALJ finds persuasive Respondents' expert's testimony that understanding the workings of layers on the order of nanometers thick that are deposited using techniques such as molecular beam epitaxy would be beyond the undergraduate level engineer at the time of the invention of the '595 Patent. In any event, the ALJ agrees with Staff that the level of skill in the art is not dispositive of either infringement or invalidity.

2. "Current Spreading Layer" (All Claims)

Avago	A layer that has its thickness increased to allow current to flow more uniformly. ('595 patent, 6:65-67, 7:38-57.)
Respondents	A layer that allows current to flow laterally.
Staff	A substantially optically transparent layer that allows current to flow laterally.

General Construction Issues

The parties propose constructions and have minor disputes about the wording of them, but no proposed construction for this claim term reflects the principal dispute between the

parties—one that was the main focus of the hearing and the remainder of their briefs dwell extensively on—whether "layer" is limited to a single material layer or not. The ALJ sets this dispute aside for a moment and focuses just on the proposed wordings for the different constructions. Respondents also concede that the two constructions are largely consistent, but object to what they perceive as "uncertainty [injected] in discussing increasing thickness without a reference point." (RIB at 24.) In its brief, Avago concedes that this is a legitimate criticism and offers to clarify its construction that the current-spreading layer must be thicker than the underlying mirror layers. (CIB at 24.) Staff and Respondents in the context of their discussion of invalidity seem to suggest that the current-spreading layer does not need to be thicker than the underlying mirror layers, particularly with respect to claim 19. (*See* RRB at 26-28; SIB at 58-59.)

With respect to the thickness dispute, the ALJ agrees with Respondents and Staff. The claim language here is dispositive. Claim 14 already includes extensive language regarding the thickness of the current-spreading layer and the thickness of the mirror layers so any additional "thickened" requirement would be redundant in that claim. (*See* Claim 14 ("said current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one" and "said top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers").) However, claim 19 is silent as to the thickness of the mirror layers. Thus, including the requirement that the layer be "thickened relative to the mirror" layers would add a significant limitation to claim 19 that had been omitted from it relative to the other claims. *See Curtiss–Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1381 (Fed. Cir. 2006) ("[C]laim differentiation takes on relevance in the context of a claim construction that would render additional, or different, language in another independent claim superfluous[.]").

Moreover, while Avago argues that "[t]he current spreading layer has to be thicker than the underlying mirror layers," it cites to nothing in the patent specification that actually states that. (CIB at 24.) The closest statement in the specification that the ALJ has been able to locate is in the Summary of the Invention, which states:

> Since the current-spreading layer has a thickness of at least one-half wavelength, the uppermost layer of the laser is at least twice as thick as the comparable DBR layer ***of a conventional top-emitting laser***. Conventionally, the uppermost layer is a DBR layer. By increasing the thickness of the uppermost layer, the lateral resistance is reduced, thereby providing a more uniform current injection from a top electrode. However, because the current-spreading layer is an integer multiple of one-half wavelength, the layer is transparent and will not alter the DBR reflectivity of the quarter-wave mirror layers.

(JX-0467 at col. 3, ll. 18-29 (emphasis added).)

Thus, while the specification certainly discusses that the current spreading layer can be thicker than the mirror layers, nothing in this language requires that "thickened relative to the mirror layers" limitation be included. Limiting the claim scope in this way requires either the patentee act as its lexicographer or there be a disavowal of claim scope. *See Thorner*, 669 F.3d at 1365. Respondents are correct that the language above only refers to thickness relative to "convention top-emitting lasers." (RRB at 11-12.) Avago does not contend that the claims are only limited to convention top emitting lasers. Thus, the language here cannot be seen as the patentee acting as its own lexicographer or disclaiming claim scope. It is simply stating that the current-spreading layer will be thicker than mirror layers in a conventional laser, not that the current spreading layer will always be thicker than the mirror layers. (RRB at 12.) Accordingly, the ALJ declines to read the limitation into the term.

As for the "more uniformly" component of Avago's construction, the parties do not discuss it or appear to seriously dispute this requirement. However, the ALJ prefers the wording

of Respondents' and Staff's construction solely because "more uniformly" is somewhat vague and relative. The ALJ notes that the specification indicates by allowing the current to flow laterally it becomes more uniform. (JX-0467 at col.3, ll. 23-26.) Thus, the ALJ believes that Respondents' and Staff's construction accomplishes the same goal as Avago's. Accordingly, the ALJ adopts Respondents' and Staff's wording for the construction. The ALJ now turns to the main dispute regarding this term (and indeed, this patent) about the scope of the term "layer."

"Layer"

Respondents argue that the "current spreading layer" must be "a" layer, i.e., one that is a single film layer. (RIB at 26-34.)

Avago argues that the intrinsic evidence indicates that such a limitation is improper. (CIB at 18-21; 24-26.)

Staff largely supports Respondents' construction, but adds an additional gloss to it. Specifically, Staff submits that the specification of the '595 Patent thus makes clear that the current-spreading layer must comprise a layer of a single material that is one half wavelength thick (or greater in one quarter wavelength increments), or it may comprise a collection of two layers, where the first layer is at least approximately one half wavelength thick and the thickness of the second layer is so slight as to cause little change in the overall thickness of the current-spreading layer.[3] (SIB at 25-26.)

The ALJ finds that Avago's understanding of the term "layer" is correct. It is not limited as Respondents and Staff contend. The ALJ finds that the intrinsic evidence does not support the strained construction that the Respondents propose or the two-part formulation that Staff

[3] The ALJ also notes that Staff is considerably more flexible in applying what is ostensibly a similar construction to Respondents. (*Compare* RIB at 47-48 (grading and buffers are separate layers) *with* SIB at 38-39 (grading and buffers are part of the layer).)

suggests. The ALJ finds that Respondents and Staff seek to read into the patent details of semiconductor fabrication that simply are not present in intrinsic record, let alone the claims. Moreover, the ALJ believes that Respondents' attempt to start this discussion of what is the most ordinary "common English" meaning of "layer" makes little sense in the abstract (RIB at 27), and that the construction of this term is better informed by starting with the intrinsic evidence.

Beginning with the language of the claims, the ALJ notes that they are cast in terms of broad functional language. Rather than defining specific material layers and compositions (*e.g.*, GaAs, AlAs, GaAlAs) and specific material structures (*i.e.*, so many nanometers of GaAs, so many of AlGaAs and so on), the patentee described the elements partially in terms of what different parts of the laser do, i.e., a "current-spreading layer," a "mirror layer," and "active layer." Moreover, the patentee clearly knew how to limit layer. The claims include a number of limitations on where the current-spreading layer is located in the laser ("on a side of said top mirror…"), its optical properties, its electrical properties, and its thickness. (*See* Claim 14.) Thus, the patentee was clear when it intended to limit what the layer was.

Respondents attempt to argue that plain meaning of the word "layer" is a single material layer. (RIB at 28.) However, they admit that "layer" had many meanings in the prior art and can mean a grouping of multiple material layers. (RIB at 28.) The ALJ does not agree that in the face of multiple meanings that the use of the article "a" before "current-spreading layer" means that the narrowest meaning should be adopted or that a single material layer was indicated. By using a broad term such as "layer," Avago is entitled to the full scope of that term as read in light of the specification and intrinsic evidence. *See Thorner*, 669 F.3d at 1367 (emphasizing that "[t]he patentee is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning, unless the patentee explicitly redefines the term or disavows its full scope").

If the full scope encompasses both single material layers and multiple material layers, then the patentee will be entitled to that scope absent some clear disavowal. *See id.*

In this regard, the unasserted claims are informative. The unasserted claims directed to the "current-spreading layer" invention further support a broad reading of the term. For example, claim 18 further provides, "said current-spreading layer being a single layer having a dopant having a graded concentration along said thickness[.]" (JX-0467 at col. 11, ll. 19-21.) If "current-spreading layer" were limited to single material layers as Respondents and Staff claim, then there would seem to be little need to include the language in claim 18 that it is "a single layer." *See Curtiss–Wright*, 438 F.3d at 1381 ("[C]laim differentiation takes on relevance in the context of a claim construction that would render additional, or different, language in another independent claim superfluous[.]").

The other claims directed to the heat-spreading layer provide similar support for a broad interpretation of layer. For example, dependent claim 2 recites a heat-spreading layer that is a "single layer of material." That further demonstrates the patentees awareness of single material layers and its ability to claim that way, if it wanted.

The specification further demonstrates a broad use of the term. The '595 Patent specifies that the current-spreading layer is "at least a single-film layer and the doping of the layer may be graded." (JX-0467 at col. 3, ll. 15-17.) While Respondents attempt to claim that this disclosure "actually require[es] that the 'current spreading' layer be 'a' layer." (RIB at 26.) However, the ALJ agrees with Avago that this indicates that it is not limited to single layer of material. (CIB at 20.) Indeed, the fairest reading of this is that it is not limited to single-film layers as Respondents contend. This reading is based on several things. First, this statement indicates that the patentee knew (as confirmed in claim 18) how to refer to a single material layer, if it wanted

to. By using different, broader language than "single-film layer" throughout the specification, it indicates that "layer" is a broader term. Second, the statement says that the current spreading layer is "*at least* a single-film layer." The ALJ believes the only fair reading of "at least" is that "current-spreading layer" can comprise more than just a single-film layer. Finally, the statement also provides that the "doping of the layer may be graded." Thus, the specification directly comprehends a "layer" with a non-uniform composition. Respondents provide no explanation as to how to reconcile their construction with the specification's explicit teaching that the composition of a layer can vary. As demonstrated by the evidence in this case, the ALJ does not believe that the question of what is a "single material layer" is as straight-forward a question as Respondents argue in claim construction.

The specification provides additional support for a broader construction. For example, the specification also teaches a two-layer embodiment, where the device may have two current spreading layers. (*Id.* at col. 7, ll. 39-58; *see also* col. 3, ll. 29-42.) Staff suggests that this means that "layer" must be a single material. (SIB at 27.) However, simply because there are two current-spreading layers, it does not necessarily follow that each must be a single material composition. In fact, in that embodiment, the specification discloses a "layer" of GaAs with two different compositions: "For example, the upper layer 66 may be a GaAs layer that is epitaxially grown to a thickness of one-half wavelength, *with an upper region having a dopant concentration of approximately* $1.0*10^{19}$ cm3 and *a lower region having a dopant concentration of* $5 * 10^{18}$ cm3." (JX-0467 at col. 7, ll. 38-44.) The specification goes on to explain that: "In some applications, *additional layers*, each having a thickness that is an integer multiple of a half wavelength, may provide advantages (e.g., further reduction in series resistance) when placed between the top electrode 46 and the top mirror structure 44." (*Id.* at col. 7, ll. 55-57.) Thus, the

ALJ finds that there is simply no evidence in the specification that a "layer" must be a single composition of material because here the patentee using it to describe regions (or "layers") of varying composition.

The ALJ further notes that the specification refers several times to "grading" in the composition of a layer. (*See* JX-0467 at col. 3, ll. 40-42 (discussing layers "having a graded concentration of dopant, e.g., carbon."); col. 4, ll. 26-35 ("The interface between GaAs and AlAs in the distributed Bragg reflector mirrors may be graded, but this is not critical. Grading reduces the bandgap discontinuity and lowers the mirror resistance. Preferably, the mirror layers are highly doped in order to further reduce the resistivity. The GaAs and AlAs Bragg mirrors may be uniformly doped to $1*10^{18}$ /cm^3, except for the grading region, where the doping is higher, *e.g.* $5*10^{18}$. The n dopant may be silicon and the p dopant may be carbon, which has been shown not to significantly diffuse out of the graded region.") All of this disclosure about varying composition in different regions suggests a far more nuanced and broad meaning of the word "layer" than Respondents suggest.

As for the prosecution history, Respondents cite to statements where they assert that the absence of an Avago explanation that the "current-spreading layer" was not a single compositional layer supports their view. (RIB at 26 (citing JX-468 at 129).) However, the discussion is silent about whether current spreading layer must be a single material layer. At best, Respondents' complaint is that the applicants failed to explicitly mention that the current spreading layer could be multiple layers to examiner. However, silence in the prosecution history is not a basis for interpreting the claims. See *3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1373-74 (Fed. Cir. 2003) ("'Prosecution history ... cannot be used to limit the scope of a claim unless the *applicant* took a position before the PTO.' *Schwing*

GmbH v. Putzmeister Aktiengesellschaft, 305 F.3d 1318, 1324-25 (Fed. Cir. 2002) (emphasis added).").

Finally, Respondents rely on a number of pieces of extrinsic evidence. The ALJ finds them unpersuasive. Respondents seek to rely on confidential technical documents created more than a decade after the '595 Patent was filed and on the personal testimony of an employee of Avago, *who is not a named inventor.* (RIB at 30-31.) The ALJ knows of no case, nor do Respondents cite one, where evidence so far afield from the intrinsic record can be considered.

Respondents also make a number of statements regarding Dr. Deppe's testimony regarding this construction. (RIB at 32-33.) As with other alleged claim construction issues with this patent, Respondents attempt to turn issues with Dr. Deppe's testimony and his analysis of specific accused products and prior art references into a basis for reading limitations into the claims. The problems with Dr. Deppe's testimony are the proper subject of impeachment and attacking his credibility, not a basis for claim construction.

The ALJ also finds that Respondents' arguments that this construction excludes the preferred embodiment are not based on the construction, which is certainly broad enough to include the preferred embodiment. The ALJ is not holding that the current-spreading layer must be multiple layers, merely that it is not limited to a single material layer. The same hold true for their arguments regarding indefiniteness. The ALJ finds, as will be discussed in greater detail *infra*, that the definiteness arguments rest on problems with Dr. Deppe's testimony and not with the claim construction considered here.

The ALJ does note that while Respondents certainly might have a point if they had developed a record on whether the patent fully enables this claim scope, Respondents have not done so and so the ALJ declines to consider those questions in determining whether or not

Avago's construction is proper. *See Bayer Cropscience AG v. Dow AgroSciences LLC*, 728 F.3d 1324, 1330 (Fed. Cir. 2013) ("This court's decision in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005), while observing that 'validity analysis is [not] a regular component of claim construction,' leaves room for reliance on this bolstering consideration where, as here, the record on invalidity is sufficiently developed to establish grave validity doubts under the court's standards.").

Accordingly, the ALJ rejects Respondents' and Staff's efforts to limit "layer" to a single material layer.

3. "Optical Cavity" (All asserted claims)

Avago	An area from which light energy is transmitted in response to current flow, specifically including an active layer and two spacer layers. ('595 patent, 4:15-18, 7:30-31.)
Respondents	An active layer between a pair of cladding layers.
Staff	An active layer between a pair of cladding layers, from which light energy is transmitted in response to current flow.

Complainants and Staff agree that there is nothing in the specification that limits an active layer to a single compositional layer, as the Respondents claim. (CIB at 22-23; SIB at 32.) The optical cavity limitation in both claim 14 and claim 19 is "an optical cavity having an active layer in which light energy is generated at a substantially fixed wavelength in response to electrical current flow." (JX-0467, claims 14, 19.) Avago argues that the patent specifically says that the optical cavity is formed from an active layer and spacer layers. (*Id.* at col. 4, ll. 15-18, col. 7, ll. 30-31.) All parties use the term "active layer" as part of their definition of optical cavity. As evidenced by their positions on infringement, the point of contention between Respondents on one side and Complainants and Staff on the other is not whether an "active layer"

must be included in the optical cavity — all agree it must be present. Rather, the disagreement concerns what may constitute this active layer.

Respondents claim that an active layer is a material layer, meaning that an active layer is limited to a single layer of homogenous material. (RIB at 42.) This position is based on extrinsic evidence, particularly a dictionary definition of the word "layer" and their expert's opinion. (RIB 41-42.)

The differences between Staff's and Avago's constructions are insignificant. As Staff notes, the specification uses the terms "spacing layers" and "cladding layers" interchangeably. (JX-0467 at col. 4, ll. 8-9.) Respondents do not otherwise appear to dispute Avago or Staff's construction. The ALJ finds that nothing about the term "active layer" suggests that it is a material layer. As discussed in greater detail, *supra,* the term "layer" in the '595 Patent is not necessarily limited to a single material layer. Moreover, the '595 patent explicitly refers in col. 1, lines 35-45, to U.S. Patent 5,266,503 ("Wang patent") when using the same description of active layer found in the asserted claims of the '595 Patent. The Wang patent describes its "active layer" as being "composed of a sandwich of different layers of aluminum gallium arsenide of various compositions." (CX-2086C at Q/A 80; CX-0130 at 5:6-8.); *Arthur A. Collins, Inc. v. Northern Telecom Ltd.*, 216 F.3d 1042, 1044 (Fed. Cir. 2000).

Respondents also cite to extrinsic evidence, but given the relative clarity of the intrinsic evidence. The ALJ sees no need to resort to this expert testimony in construing the claims.

Avago does not appear to object to the Staff's construction. The ALJ finds that it wording is clearer and closer to the wording used in the specification. Accordingly, the ALJ adopts Staff's construction of this term.

4. "Current-Spreading Layer On A Side Of Said Top Mirror Opposite To Said Optical Cavity" (All Claims)

Avago	Plain meaning. The claims do not require that the top electrode be directly physically connected to the current-spreading layer opposite to said top mirror.
Respondents	There are no intervening layer(s) between the top electrode and the current-spreading layer.
Staff	Plain and ordinary meaning.

The parties all agree that the claim phrase "current-spreading layer on a side of said top mirror opposite to said optical cavity" should be given its plain meaning. (*See* CIB at 27; RIB at 45; SIB at 34.) Staff and Avago agree that this phrase indicates that the optical cavity is on one side of the top mirror, and the current-spreading layer is on the side of the top mirror opposite to the optical cavity. (*See* SIB at 34; CIB at 27.) Staff submits, however, that Avago's proposed construction, to the extent that it asks the ALJ to further rule that "[t]he claims do not require" a direct, physical connection is inconsistent with Avago's assertion that this phrase should be given its "plain meaning." Respondents appear to not actively dispute this term. (RIB at 45.) Avago concedes that this point of disagreement is not material to the issue of infringement in this case. (CIB at 27.) Accordingly, the ALJ finds that this phrase should be given its plain and ordinary meaning and declines any further clarification.

5. "Top Electrode Formed on a Side of Said Current Spreading Layer Opposite to Said Top Mirror"

Avago	Plain and ordinary meaning. The claims do not require that the top electrode be directly physically connected to the current-spreading layer opposite to said top mirror
Respondents	There are no intervening layer(s) between the top electrode and the current spreading layer
Staff	Plain and ordinary meaning.

Avago argues that this term should be given its plain and ordinary meaning and that "formed" does not require that the top electrode directly physically connect to the current spreading layer opposite to the top mirror. (CIB at 28-29.)

Respondents contend that by specifying that the top electrode is ***formed*** on a side of the current-spreading layer, the claims require that there be no intervening layers between the top electrode and the current-spreading layer. (*See* RIB at 35-36.). In support of this argument, Respondents note that in certain of the disclosed embodiments, the top electrode is in direct contact with the current-spreading layer. (RIB at 35.) Respondents have not identified any intrinsic evidence, however, to show that "formed on a side" requires a precise location (*i.e.*, in direct contact), as opposed to the plain and ordinary meaning – "created." (*See* RX-0005C at Q/A 135-51.)

Staff is of the view that the claim limitation "top electrode formed on a side of said current-spreading layer opposite to said top mirror" should be given its plain and ordinary meaning.

The ALJ finds that this term should be given its plain and ordinary meaning. As an initial matter, this phrase is similar to the phrase "bottom electrode on a side of said mirror opposite to said optical cavity," which the parties agree should also be given its plain and ordinary meaning, and which does not require that the bottom electrode be directly physically connected to the mirror opposite the optical cavity. The "top electrode" phrase differs from the "bottom electrode" phrase, however, in that it states that the top electrode is ***formed*** on a side of the current-spreading layer. The word "formed" is an ordinary English word that means "created." (*See* SIB. at 26 (discussing Oxford Dictionary definition of "formed" as "bring together parts or combine to create (something)).") The ALJ agrees with Avago and Staff that the '595 Patent

consistently uses the word "formed" to describe the creation of various components of the VCSEL. (*See, e.g.*, JX-0467, Abstract ("Optionally, two half-wavelength layers may be ***formed*** between the electrode and the mirror structure . . ."); *id.* at col. 2, ll. 25-27 ("A surface-emitting laser is ***formed*** to include layers for improving the heat spreading and current spreading capabilities of the laser.."); *id.* at col. 2, ll. 30-32 ("The layers are ***formed*** to allow passage of light energy from the optical cavity of the laser through an opening in an electrode."); *id.* at col. 8, ll. 45-51 ("While the current-confinement layer has been described as being ***formed*** by ion implantation, other techniques may be used. For example, techniques for ***forming*** etched mesas, native oxides or regrowth regions may be employed. If ion implantation is selected for ***forming*** the current-confinement layer, oxygen and helium are included as acceptable substitutes for hydrogen as a source of ions.").)

Moreover, the '595 Patent expressly stated where direct contact was required: "A heat-spreading layer is then ***formed to be in electrical contact with the electrode*** and in thermal contact with the heat-conducting layer." (JX-0467 at col. 2, ll. 40-42.) In addition, the '595 Patent further discloses an embodiment in which there are two current-spreading layers, lower current-spreading layer 64 and upper current-spreading layer 66:

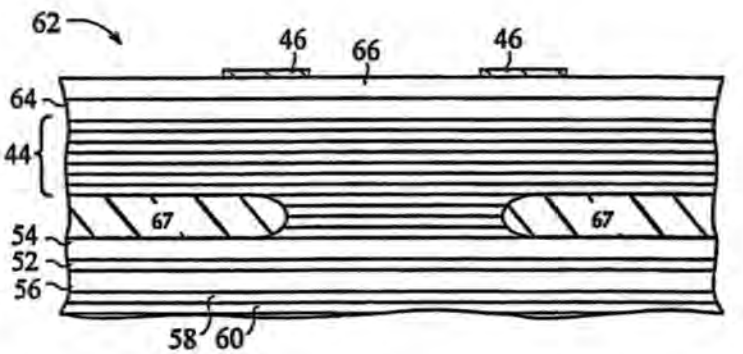

FIG. 4

(*Id.* at Fig. 4.) The ALJ finds that in this embodiment, while upper current spreading layer 66 is in direct contact with the top electrode 46, the lower current-spreading layer 64 is not. "Thus, the current-spreading layers 64 and 66 are positioned below an annular top electrode 46 and above a mirror structure 44." (*Id.* col. 7, ll. 27-29.)

The ALJ agrees with Avago and Staff that nothing in the intrinsic evidence supports construing "formed on a side" to require direct contact. Rather, the '595 Patent consistently describes the creation of VCSEL components as being "formed." Thus, the ALJ rejects Respondents' proposed construction, and the phrase "top electrode formed on a side of said current-spreading layer opposite to said top mirror" and simply gives this term its plain and ordinary meaning as advocated by Avago and Staff.

6. "Approximately equal to" (All claims)

Avago	Plain and ordinary meaning
Respondents	within 1% of
Staff	Plain and ordinary meaning.

Avago argues that Respondents' construction lacks support in the specification and prosecution history. (CIB at 29.) Avago asserts that the articles Respondents rely on involve discussions of the state of the art in VCSEL fabrication and comparisons between VCSELs as designed and as manufactured or grown. (CIB at 29.) Avago contends that the case law indicates that where neither the patent specification nor the prosecution history of the patent requires mathematical precision, a court should not impose one in its claim construction.

Respondents argue that their definition is consistent with the plain and ordinary meaning of "approximately equal to." (RIB at 37-40.) Respondents assert that Avago's expert's testimony has "effectively eviscerat[ed] any notion of a required thickness in the claim[]" and

that "[s]uch absurd results are the principal reason why the further specificity proposed by Respondents is needed." (RIB at 37.) Relying on the testimony of their experts Dr. Jewell and Dr. Chang-Hasnain, Respondents contend that a person of ordinary skill at the time of the invention would understand the phrase to mean within 1%. (RIB at 37.) Respondents argue that this accuracy was needed to achieve the optical properties required. (RIB at 38.) Respondents cite to a host of extrinsic evidence including journal articles, HP internal documents, inventor testimony, and testimony from other VCSEL manufacturers.

Staff agrees with Avago that Respondents' construction is incorrect. Staff notes that rather than defining this phrase in terms of a numerical limit, the patentees chose to describe the required thickness in terms of the operation of the VCSEL. (SIB at 28-29.) Staff submits that nothing in the intrinsic evidence supports limiting "approximately equal to" to within 1% of. (SIB at 29.) Indeed, Staff notes that Dr. Chang-Hasnain testified that while one of ordinary skill in the art would generally understand that a good "rule of thumb" would be that a layer should be within about 1% of its desired thickness, the tolerances of the layer could vary depending on the particular VCSEL at issue. (SIB at 29.)

The ALJ agrees with Avago and Staff that the term "approximately equal to" should be given its plain and ordinary meaning. The ALJ begins by noting that nothing in the claim language indicates the intention to impose a numerical limit on the claims. In addition, there is nothing in the specification even remotely mentioning a 1% limit on "approximately equal to." Indeed, the specification's discussion seems to reject any numerical limits:

> The thickness of the current-spreading layer 42 must be selected so as not to compromise the reflectivity of the DBR mirror structure 44. By forming the layer 42 to have a thickness that is an integer multiple of a half wavelength of the light energy generated at the active layer 52, the current-spreading layer is optically transparent to the emitted light and will not alter the DBR reflectivity of the quarter-wave layers of the mirror structure.

JX-0467 at col. 7, ll. 2-9 (emphasis added). Thus, the specification is clear that the thickness of the current-spreading layer must permit the VCSEL to perform adequately, *i.e.*, it cannot compromise the reflectivity of the DBR mirror structure and must be optically transparent to the emitted light. (*Id.*) The ALJ has reviewed Respondents' extrinsic evidence and while the ALJ finds it helpful in understanding the background to the invention, the ALJ finds it unpersuasive for reading their proposed limitation into the claims.

Respondents seek to turn a disagreement over Dr. Deppe's testimony into a claim construction dispute. There is no dispute that a person of ordinary skill would understand this term in light of the specification. The parties' dispute is essentially whether Dr. Deppe's factual testimony is correct. However, the case law commands that the ALJ focus on the intrinsic evidence and not to rely on extrinsic evidence to depart from the meaning commanded by the intrinsic evidence. *See Phillips*, 415 F.3d at 1319 ("In sum, extrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence."). Thus, that dispute is better resolved through cross-examination, rather than claim construction. Accordingly, the ALJ rejects Respondents' efforts to limit "approximately equal to" to a tolerance of 1%.

7. Wherein Said Current Spreading Layer And Layers of Said Top Mirrors Establish a Consistent Pattern of Alternating Indices of Refraction" (Claim 19)

Avago	Plain meaning. The claims do not require that the current spreading layer be directly physically connected to the top mirrors.
Respondents	A repeating pattern of one or more pairs of adjacent layers with one of the pairs including a current spreading layer and a mirror layer, wherein one layer of the pairs has a comparatively high index of refraction and the adjacent layer has a comparatively low index of refraction

Staff	A repeating pattern of one or more pairs of adjacent layers with one of the pairs including a current-spreading layer and a mirror layer, wherein one layer of the pairs has a comparatively high index of refraction and the adjacent layer has a comparatively low index of refraction.

Avago argues that Respondents' construction ignores the word "consistent." (CIB at 31.) Avago contends that the real dispute appears in Respondents erroneous and unsupported view (their "a layer is a layer" argument) that all layers, including each mirror layer as well as the current-spreading layer be limited to a single layer of material. (CIB at 32-34.) Complainants contend, however, that Respondents' and Staff's proposed construction is both too broad and too narrow. (*See* CIB at 31-33.). In this regard, Complainants assert that for a single pair of layers, there would not be a "consistent" pattern of alternating indices of refraction among the current-spreading layer and the layers of the mirror. *Id.*

Respondents and the Staff have proposed that the phrase "wherein said current-spreading layer and layers of said top mirror establish a consistent pattern of alternating indices of refraction" should be construed as "a repeating pattern of one or more pairs of adjacent layers with one of the pairs including a current spreading layer and a mirror layer, wherein one layer of the pairs has a comparatively high index of refraction and the adjacent layer has a comparatively low index of refraction." (SIB at 32; RIB at 42-43.) In the context of claim 14, the parties have agreed that the phrase "alternating indices of refraction" refers to "one layer having a comparatively high index of refraction and the adjacent layer having a comparatively low index of refraction." Staff argues that the limitation from claim 19 thus necessarily refers to a pattern of one or more pairs of adjacent layers with one of the pairs including a current spreading layer and a mirror layer with alternating indices of refraction. (SIB at 32.)

Staff notes, however, that its proposed construction further requires a "repeating" pattern, which is to say that the pattern of alternating indices of refraction occurs in a pair comprising the

current-spreading layer and the top mirror layer and continues in pairs of mirror layers below the top mirror layer. In other words, by its terms the limitation requires a current-spreading layer and mirror layers, not a single mirror layer. By including the word "repeating," the proposed construction thus contemplates that a consistent pattern of alternating indices of refraction will be found in the current-spreading layer and the layers of the top mirror. Accordingly, the Staff respectfully submits that the Respondents' and Staff's proposed construction should be adopted.

The ALJ adopts Staff's construction. The ALJ notes that Respondents attempt to read their layer construction into this term as well. For the reasons set forth above, the ALJ rejects that argument. The mirror layers do not need to be "a single material layer" as Respondents contend. As for Avago's efforts to require that there be more than one pair of mirror layers, the ALJ agrees with Staff's reasoning regarding the "repeating pattern" set forth above, which appears to address this concern. (SIB at 32.) The ALJ finds that this is consistent with the specification and the claim language. (JX-0467 at col. 8, ll. 23-30.) Avago's other concerns regarding possible buffer layers between the current spreading layer and the mirrors are also addressed by the Staff's reasoning and are more factual questions than issues of claim construction. (CIB at 32.)

Accordingly, the ALJ adopts Staff's construction and reasoning for phrase "wherein said current-spreading layer and layers of said top mirror establish a consistent pattern of alternating indices of refraction" and construes the phrase to mean "a repeating pattern of one or more pairs of adjacent layers with one of the pairs including a current spreading layer and a mirror layer, wherein one layer of the pairs has a comparatively high index of refraction and the adjacent layer has a comparatively low index of refraction."

8. "Substantially Optically Transparent"

Avago	Does not cause a significant adverse effect on the optical performance of the laser.
Respondents	Plain and ordinary meaning to those of ordinary skill in the art; no need to construe.
Staff	Does not cause a significant adverse effect on the optical performance of the laser.

Avago argues that "substantially optically transparent" means that the current spreading layer does not cause a significant adverse effect on the optical performance of the laser. (CIB at 34.) Avago notes that specification states that: "The thickness of current spreading layer 42 must be selected so as to not compromise the reflectivity of the DBR mirror structure 44." (JX-0467 at col. 7, ll. 2-5.) Thus, "the thickness of the 'current spreading layer' must be selected to avoid significantly affecting the optical performance of the VCSEL." (CIB at 34.) Avago notes that the '595 Patent describes using GaAs (gallium arsenide) in a current spreading layer even though it notes that GaAs "is optically absorbing at the emission wavelength." (JX-0467 at col. 7, l. 49.) Avago argues that construction and interpretation that Respondents offer is no more specific than the definition that Avago and Staff have offered and can have the perverse result that an opaque layer could meet the construction. (CRB at 11.)

While Respondents' officially claim that there is no need to construe this term, they explain that the term means that the layer "simply needs to be sufficiently optically transparent to accomplish the goal of the VCSEL that incorporates the layer." (RIB at 43.) Respondents further note that the only mention of the term "substantially optically transparent" is in the context of layers with a thickness that is an integer multiple of ½ wavelength, and so, the term "must be construed to cover layers that are an integer multiple of ½ wavelength." (RIB at 43-44.) The remainder of Respondents' argument involves disputing Avago's expert's application of

Avago's construction to the Ackley I prior art reference. (RIB at 44-45.) Respondents contend that under Avago's expert's application of the construction to the Ackely I patent, the embodiments disclosed in the specification would be inoperable. (RIB at 44.) Respondents also argue that a ½ wavelength layer must be "substantially optically transparent." (RRB at 17-18.)

Staff submits that Avago's construction is entirely consistent with the specification of the '595 Patent. (SIB at 35.) Staff argues that the interpretations of Respondents' "plain and ordinary" meaning by its expert Dr. Chang-Hasnain suffers from the same subjectivity that Respondents complain about. Thus, Staff submits it should be rejected.

The parties' dispute regarding this term does not appear to be so much a dispute about claim construction as it does about the parties' invalidity arguments. In particular, Respondents take more issue with Avago's expert's application of the claim construction than with the actual claim construction itself. (RIB at 43-45.) This is simply not the proper place for these arguments. The ALJ finds that Avago's and Staff's construction is consistent with the claim language and the intrinsic evidence. The requirement that the "current spreading layer" be "substantially optically transparent" reflects the specification's explanation that the current spreading layer is selected "so as not to compromise the reflectivity of the DBR mirror structure 44." (JX-0467 at col. 7, ll. 2-5.) Avago and Staff's construction is consistent with those teachings.

While Respondents ostensibly seek a construction of the plain and ordinary meaning, their expert states that this means that the layer "simply needs to be sufficiently optically transparent to accomplish the goal of the VCSEL that incorporates the layer." The ALJ agrees with Avago and Staff that this construction is not correct. Respondents provide no basis in any intrinsic evidence for what the "goal of the VCSEL" is or how it would be determined. The only

support they offer for this construction is their expert's testimony. The ALJ finds the arguments that they raise regarding Dr. Deppe's application of Avago's construction goes more to the weight his validity testimony should be given, not the proper construction of this term. Accordingly, the ALJ adopts Avago's and Staff's construction as the most consistent with the intrinsic evidence.

9. Agreed Upon Terms

The parties and Staff have agreed on the following constructions.

Claim Term	Agreed Construction
a plurality of quarter wavelength thick layers having alternating indices of refraction	A repeating pattern of one or more pairs of adjacent quarter wavelength thick layers with one layer having a comparatively high index of refraction and the adjacent layer having a comparatively low index of refraction.
Wavelength	The wavelength of light emitted from the laser divided by the refractive index of the relevant material.
bottom electrode on a side of said mirror opposite to said optical cavity	Plain meaning. The claims do not require that the bottom electrode be directly physically connected to the mirror opposite the optical cavity.

C. The '456 Patent

1. Level of Skill in the Art

The parties agree that the level of ordinary skill in the art is someone with at least three to five years of experience designing digital and analog control circuits with a bachelor's degree, or equivalent, in electrical engineering. (CX-2085C at Q&A 6; RX-4C at Q&A 15-16; SIB at 12.)

2. Stipulated Constructions

The parties agree to the following claim constructions:

Claim Term	Stipulated Construction:
parameter (claims 1, 2, 4, 8, 11-13, 15, 20, 21, 23)	A value input other than the underlying digital data signal.

Claim Term	Stipulated Construction:
parameter for affecting (claims 1, 8, 15, 21)	A parameter with the purpose of digitally affecting the feature of the drive waveform mentioned in the claim.
negative peak[ing] (claims 21-23)	A transient present in the VCSEL drive waveform during less than a full bit width of the logical '0' part of the current drive waveform.
negative peak[ing] portion (claims 1, 8, 15, 21)	The portion of the negative peak transient part of the drive waveform that has values below the value the waveform has at the instant in time immediately before the logical '0' to the logical '1' transition begins.
negative peaking depth (claim 12)	The minimum value, relative to the value the waveform has at the instant in time immediately before the logical '0' to the logical '1' transition begins, of the negative peak[ing] portion.
negative peaking duration (claims 12, 20)	The duration in time of the negative peaking transient in the drive waveform, beginning at the instant the drive waveform takes a value less than the value it maintains during a logical '1', continuing through the time when the drive waveform takes its minimum value, and ending at the moment the drive waveform again takes the value that it will maintain until the logical '0' to logical '1' transition begins.
digital controller (claims 8, 15)	Electronic circuitry that uses digital data to control the properties of the drive waveform.
integrated digital controller (claims 4, 15)	A digital controller on the same chip as the laser driver.

(CIB at 73-74; RRB at 35; SIB at 79.)

3. Disputed Construction

Claim Term	Complainants' and Staff's Proposed Construction	Respondents' Proposed Construction
wherein the drive waveform includes a negative peak[ing] portion (claims 8, 15)	Plain and ordinary meaning. *See also* construction of "negative peak[ing] portion"	The drive waveform includes a negative peaking portion for every logic 1 to logic 0 transition

The only disputed claim term between the parties for the '456 Patent is the "wherein the drive waveform includes a negative peak[ing] portion." (CIB at 75; RIB at 90; SIB at 80.) Staff and Avago argue that no construction is necessary and that the claim term should be given its plain and ordinary meaning. (CIB at 75; SIB at 80.)

Respondents argue that the claim term "requires that the negative peak portion exist for every 1 to 0 transition" based on the prosecution history and the '456 Patent specification. (RIB at 90.) Respondents argue that the specification specifically discloses that the negative peak current transient that creates the negative peak portion is generated for every 1 to 0 transition and cite to Figure 4 of the specification in support of their argument. (RIB at 91.)

Respondents assert that this is further supported by the prosecution history – both the original and the reexamination. (RIB at 82-86.) During the original examination, the Examiner noted that negative peaking was a well-known phenomenon in laser drivers when they transition from the logical '1' and '0' levels:

> applicant's argument pertaining to the negative peak portion, semiconductor laser devices used in data communications use well-known modulation techniques which provide the laser device with turn-on (logic 1) and turn-off (logic 0). The process from logic 1 to logic 0 will create an undershoot known as negative peaking this characteristic is inherent within the laser devices involved in switching between on and off of the laser.

(RIB at 82-83 (quoting RX-827 at AV-ITC50000299)). The Examiner found that a laser driver that happens to generate a waveform with a negative peak portion is not an invention because the possibility of a negative peak portion is inherent in any laser communications devices (RIB at 83.) The Examiner rejected the new claims as obvious because "[t]he ac characteristics of the laser device are caused by the switching of on and off of the laser system, which is known in the

art as undershoot or negative peaking as disclosed by Heilman et al. in paragraph [0006]" (RIB at 83.)

In response, the Applicant acknowledged that the mere presence of a negative peak portion was not distinguishable from the prior art, but argued that the claims were distinguishable because the invention requires programmability of the negative peak portion:

> Affecting *(e.g. programming)* aspects of the negative peak portion of the drive waveform, which is illustrated in FIG. 7, is described in the specification on page 10: "One feature of the laser driver of the present invention is the programmability of the ac characteristics, such as negative peaking depth and duration, of the VCSEL drive waveform."

(RIB at 83 (quoting RX-827 at AV-ITC50000316 (emphasis in original).) Thus, Respondents assert that the claims require more than a negative peak portion-- they also require a parameter for affecting the negative peak portion (RIB at 83.) In an amendment after the examiner's final rejection, the Applicant argued that the prior art "fails to teach or suggest the use of digitally programmable parameters for changing the output waveform generated by the laser driver in a controlled manner as claimed" (RIB at 83-84.) Following several other amendments, the claims were allowed. (RIB at 84.)

Respondents further argue that during the 2010 *Ex Parte* Reexamination of the '456 Patent, Avago argued that the '456 Patent claims required a negative peaking portion for every 1 to 0 transition in response to the examiner's rejection of claims 1 and 20 under 35 U.S.C. §102(b) as anticipated by the Bruensteiner reference (RIB at 84.)

> The participants began by discussing the differences between the pre-equalization disclosed by Bruensteiner and the negative peak portions of independent Claims 1, 8, and 15.... The participants discussed how the negative peaking differential transconductance amplifier (NPTDA) 470 shown in FIG. 4 of the '456 Patent "generates a negative peaking current transient 474 ($I_{negpeaking}$ or I_{np}) for every logic 1 to logic 0 transition.

(RIB at 84 (quoting RX-827 at MLX00043012).) Avago further distinguished the Bruensteiner reference because it applied the equalization current, which was identified by the Examiner as the negative peak portion, to the entire bit, "rather than transiently" and argued "the only reasonable interpretation of cols. 8 and 9 of the '456 Patent is that the drive waveform shaping current must be capable of affecting the width of the negative peak portion of the drive waveform, where the negative peak portion lasts for less than the total bit width" (RIB at 84 (quoting RX-827 at MLX00043033).) "The Patent Owner notes its belief that claim 1 already requires an optical transmitter capable of affecting a negative peak portion whose width is less than that of a data bit" (RIB at 84-85 (quoting RX-827 at MLX00043034.) Thus, Respondents assert that Avago admitted that the less than a bit-width limitation applies to all claims of the '456 Patent. (RIB at 85.)

Respondents argue that, as their expert Dr. Lebby explained, while the equalization current lasts for a bit width in the high speed example depicted in Fig. 1, that is only because the clock cycle is the same as the bit width in that 1Gb/s example. (RIB at 85.) In reality, Dr. Lebby testified that the equalization circuit is applied for a full clock cycle, regardless of the bit rate. (RIB at 85 (RX-3C at Q/A 151).) Respondents contend that it is true that, if the data rate is at the highest data rate of the depicted driver circuit, *i.e.*, 1 bit/clock cycle, then the equalization current will be applied for the entire bit, as Avago explained to the Examiner. (RIB at 85.) As a result, Respondents assert that the Examiner allowed the presently-asserted claims over the Bruensteiner reference. However, if the data rate applied by the user of the driver circuit was set to half or a quarter bit per clock cycle, then the equalization current will be applied for half, or less than, the bit period, resulting in a negative peak portion less than a full bit width. (RIB at 85 (RX-3C at Q/A 151, 237-44).) Respondents argue that this was never explained to the Examiner

by Avago even though running a laser at less than its highest data rate is a commonly occurring situation in data transmission and is required by InfiniBand compliant transceivers. (RIB at 85 (citing RX-3C at Q/A 52-53, 151, 172; *see* JX-760).)

Respondents contend that Avago, to overcome the Bruensteiner rejection, also argued that, whereas the claimed subject matter requires that the **negative peak portion occur for every 1 to 0 transition**, (RX-827 at MLX00043012; RDX-212; RX-3C at Q/A 153)), Bruensteiner did not anticipate because, "Bruensteiner's circuit adds an additional equalizing current to the laser current waveform for some, **but not all of the bits**" (emphasis added; RX-827 at MLX00043019; RX-3C Q/A 153). (RIB at 85.) Respondents assert that these statements, combined with those in the specification, support the conclusion that "the drive waveform includes a negative peak portion **for every 1 to 0 transition**." (RIB at 85.) Respondents conclude that in allowing the claims, the Examiner relied on Avago's arguments and claim scope admissions and so the claim scope should be limited accordingly. (RIB at 86 (citing RX-3C at Q/A 170).) Thus, Respondents argue that the "negative peak portion" is not just a dip in a waveform. It is one piece of a larger waveform segment that must have a certain shape, duration, and position within the waveform (*see* RX-3C. at Q/A 173). (RIB at 85.)

Avago argues that Respondents' construction is incorrect because the '456 patent provides no indication or suggestion that a negative peak[ing] portion must be present on every logic 1 to logic 0 transition of the drive waveform. (CIB at 75.) Avago asserts that Respondents' proposed construction is also contradicted and shown to be incorrect by the fact that each of the claims containing this term recites that the drive waveform includes "a" negative peak[ing] portion; none recites a requirement that every logic 1 to logic 0 transition has a negative peak[ing] portion. (CIB at 76.) Avago argues that the portions of the specification that Respondents rely

upon are entitled "Detailed Description of the Preferred Embodiment," and that absent an unambiguous disclaimer of scope, claims are not limited to specific embodiments disclosed in the specification of the patent. (CIB at 76.) As for the prosecution history, Avago asserts that the portions of the prosecution history that Respondents refer to as support for their construction is merely a reference to the description of the preferred embodiment, and therefore is not a disclaimer that could affect the scope of claims. (CIB at 77.)

Staff agrees with Avago's construction. (SIB at 80.) Staff notes that the claim phrase in dispute only requires that the drive waveform include "***a***" negative peaking portion, however, which on its face does not require a negative peaking portion for ***every*** logic 1 to logic 0 transition. (SIB at 81.) Staff argues that while the specification discloses a particular embodiment in which a negative peaking portion is generated for every logic 1 to logic 0 transition, Respondents have not identified any clear and unambiguous disavowal by the patentees such that "wherein the drive waveform includes a negative peaking portion" should be limited to a waveform with a negative peaking portion for every logic 1 to logic 0 transition. (SIB at 81.) Accordingly, the Staff respectfully submits that Respondents' proposed construction should be rejected and this phrase be given its plain and ordinary meaning. (SIB at 81.)

The ALJ adopts Avago and Staff's construction. Respondents do not dispute that the explicit language of the claim does not require that there be a negative peaking portion for every 0 to 1 logic transition. Their arguments rest on alleged clear disavowals in the prosecution history and a bit on the specification. However, this reliance is misplaced. While Avago appears to admit that the specification only discloses such an embodiment, the mere fact that all of the embodiments contain a negative peaking portion before the '0' to '1' transition does not necessarily limit the claims. *See Thorner*, 669 F.3d at 1368 (citing *Kara Tech. Inc. v.*

Stamps.com, 582 F.3d 1341, 1347–48 (Fed. Cir. 2009)). Nor do Respondents identify any effort by the patentee to act as his own lexicographer or language of manifest disclaimer in the specification. *See Thorner*, 669 F.3d at 1366. As for the prosecution history, the case law is clear that such disclaimers must be "both clear and unmistakable." *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1325 (Fed. Cir. 2003). The ALJ does not find the disclaimers that Respondents seek to rely on meet that standard. Respondents rely heavily on two distinct sets of statements in the prosecution history. First, they rely on a summary of the patent owner's interview with the examiner that is summarized in the Patent Owner's Response included in RX-0827. In that summary the patent owner stated that:

> The participants began by discussing the differences between the pre-equalization disclosed by Bruensteiner and the negative peak portions of independent Claims 1, 8, and 15, which compensate for a lag in the laser's response to sharp transitions in the drive waveform. The participants discussed how the negative peaking differential transconductance amplifier (NPDTA) 470 shown in FIG. 4 of the '456 patent "generates a negative peaking current transient 474 ($I_{negpeaking}$ or I_{np}) for every logic 1 to logic 0 transition."[1] The '456 patent also explains how width and depth of the negative peaking current transient 474 are controlled by control signals generated by a digital-to-analog converter from parameters stored in memory.[2]

(RX-0827 at 106 (MLX00043012).)[4]

Contrary to Respondents' assertions, this statement does not amount to "Avago argu[ing] that the '456 Patent claims required a negative peaking portion for every 1 to 0 transition." (RIB at 84.) While they are correct that the paragraph begins by stating that the "participants began by discussing the differences between the pre-equalization disclosed in Bruensteiner and the

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[4] The ALJ notes that RX-0827 is a condensed version of the file history that has several sets of Bates numbering (ITC-AV and MLX) because it appears to be several documents put together. The document also has a RX-0827-XXX numbering that refers to the sequential pages in RX-00827. While the condensed version is very helpful, Respondents inexplicably refer to the ITC-AV and MLX numbering rather than the RX-0827-XXX numbering. For ease of reference the ALJ refers to the RX-0827-XXX numbering.

negative peak portions of independent claims 1, 8, and 15…," the sentence Respondents rely on only discusses what Figure 4 discloses, it certainly doesn't state that the claims require this. At best, these statements are ambiguous about what the claims require. This is not sufficient for disclaimer. *See 3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013). ("Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.").

Second, Respondents rely on statements that characterize Bruensteiner as "adding an equalization current to some but not all of the bits…." (RX-0827 at 113 (MLX00043019).) However, this statement is buried in a longer discussion of how Bruensteiner only affects one type of bit and cannot work with the 1 to 0 transition. Taking the full discussion in context, a fair reading of the discussion is that the Bruensteiner method is only good for one kind of transition and not that the claimed invention must be applied to all 1 to 0 transitions. Thus, this statement does not amount to a clear and unmistakable disclaimer that limits the patent claims.

Even taking these statements together, they do not amount to a limit on claim scope. While statements about the negative peaking being applied to every 1 to 0 transition exist in the prosecution history, it is not clear that patentability was premised on this point. These statements were made in the context of other patentability arguments regarding the disclosure of negative peaking. Avago never specifically argued for the patentability of the claims based on the claims requiring negative peaking for every 1 to 0 transition. Thus, there cannot be a "clear and unmistakable" disclaimer of claim scope under these facts. *See Grober v. Mako Prods., Inc.*, 686 F.3d 1335, 1342 (Fed. Cir. 2012) (rejecting prosecution disclaimer arguments because the applicant's ambiguous statements distinguishing from prior art did not focus on specific prior art features).

VI. INFRINGEMENT DETERMINATION

A. Applicable Law

In a Section 337 investigation, the complainant bears the burden of proving infringement of the asserted patent claims by a preponderance of the evidence. *Certain Flooring Products*, Inv. No. 337-TA-443, Commission Notice of Final Determination of No Violation of Section 337, 2002 WL 448690 at 59, (March 22, 2002); *Enercon GmbH v. Int'l Trade Comm'n,* 151 F.3d 1376 (Fed. Cir. 1998).

Each patent claim element or limitation is considered material and essential. *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991). Literal infringement of a claim occurs when every limitation recited in the claim appears in the accused device, *i.e.,* when the properly construed claim reads on the accused device exactly. *Amhil Enters., Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1562 (Fed. Cir. 1996); *Southwall Tech. v. Cardinal IG Co.*, 54 F.3d 1570, 1575 (Fed Cir. 1995).

If the accused product does not literally infringe the patent claim, infringement might be found under the doctrine of equivalents. The Supreme Court has described the essential inquiry of the doctrine of equivalents analysis in terms of whether the accused product or process contains elements identical or equivalent to each claimed element of the patented invention. *Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 40 (1997).

Under the doctrine of equivalents, infringement may be found if the accused product or process performs substantially the same function in substantially the same way to obtain substantially the same result. *Valmont Indus., Inc. v. Reinke Mfg. Co.,* 983 F.2d 1039, 1043 (Fed. Cir. 1993). The doctrine of equivalents does not allow claim limitations to be ignored. Evidence must be presented on a limitation-by-limitation basis, and not for the invention as a whole.

Warner-Jenkinson, 520 U.S. at 29; *Hughes Aircraft Co. v. U.S.*, 86 F.3d 1566 (Fed. Cir. 1996). Thus, if an element is missing or not satisfied, infringement cannot be found under the doctrine of equivalents as a matter of law. *See, e.g., Wright Medical*, 122 F.3d 1440, 1444 (Fed. Cir. 1997); *Dolly, Inc. v. Spalding & Evenflo Cos., Inc.*, 16 F.3d 394, 398 (Fed. Cir. 1994); *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538-39 (Fed. Cir. 1991); *Becton Dickinson and Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 798 (Fed. Cir. 1990).

The concept of equivalency cannot embrace a structure that is specifically excluded from the scope of the claims. *Athletic Alternatives v. Prince Mfg., Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996). In applying the doctrine of equivalents, the Commission must be informed by the fundamental principle that a patent's claims define the limits of its protection. *See Charles Greiner & Co. v. Mari-Med. Mfg., Inc.*, 92 F.2d 1031, 1036 (Fed. Cir. 1992). As the Supreme Court has affirmed:

> Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole. It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety.

Warner-Jenkinson, 520 U.S. at 29.

To prove direct infringement, Avago must prove by a preponderance of the evidence that each of the accused products either literally infringe or infringe under the doctrine of equivalents the asserted claims of the asserted patents. *Advanced Cardiovascular Sys., Inc. v. Scimed Life Sys., Inc.*, 261 F.3d 1329, 1336 (Fed. Cir. 2001).

A party can also indirectly infringe a patent. To prevail on a claim for indirect infringement, a patentee must first demonstrate direct infringement, and then establish that the "defendant possessed the requisite knowledge or intent to be held vicariously liable." *Dynacore*

Holdings Corp. v. U.S. Philips Corp., 363 F.3d 1263, 1272–73 (Fed. Cir. 2004). The knowledge requirement must be met by a showing of either actual knowledge or willful blindness. *Global–Tech Appliances, Inc. v. SEB S.A.*, — U.S. ——, 131 S. Ct. 2060, 2068 (2011).

Under 35 U.S.C. § 271(b), "[w]hoever actively induces infringement of a patent shall be liable as an infringer." "To prove induced infringement, the patentee must show direct infringement, and that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another's infringement." *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1363 (Fed. Cir. 2012) (internal quotations omitted).

The Supreme Court has held that "induced infringement under § 271(b) requires knowledge that the induced acts constitute patent infringement." *Global-Tech*, 131 S. Ct. at 2070. In so holding, the Supreme Court rejected the Federal Circuit's "deliberate indifference" to a "known risk" test. *Id.* at 2071. It explained that the "knowledge" required under § 271(b) could be satisfied by a showing of actual knowledge or "willful blindness." *Id.* at 2068–71. The Supreme Court explained that a defendant acts with willful blindness if she "subjectively believe[s] that there is a high probability that a fact exists" and "take[s] deliberate actions to avoid learning of the fact." *Id.* at 2070, 2070 n.9. In contrast, a defendant who "merely knows of a substantial and unjustified risk of [ ] wrongdoing" acts recklessly, and a defendant who "should have known of a similar risk, but in fact, did not" acts negligently. *Id.* at 2071. "Inducement requires evidence of culpable conduct, directed to encouraging another's infringement, not merely that the inducer had knowledge of the direct infringer's activities." *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1306 (Fed. Cir. 2006) (*en banc*).

Under 35 U.S.C. § 271(c), "[w]hoever offers to sell or sells within the United States or imports into the Unites States a component of a patented machine, manufacture, combination, or

composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be specifically made to or specially adapted for use in the infringement of the patent, and not a staple article or commodity suitable for substantial non-infringing use, shall be liable as a contributory infringer." "Contributory infringement imposes liability on one who embodies in a non-staple device the heart of a patented process and supplies the device to others to complete the process and appropriate the benefit of the patented invention." *Vita–Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1327 (Fed. Cir. 2009). To state a claim for contributory infringement, an infringer must sell, offer to sell or import into the United States a component of an infringing product "knowing [the component] to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial non infringing use." 35 U.S.C. § 271(c); *see Lucent Techs. v. Gateway, Inc.*, 580 F.3d 1301, 1320 (Fed. Cir. 2009). As with induced infringement, a claim for contributory infringement must also contain allegations of the requisite knowledge of the patent-in-suit at the time of infringement. *Global-Tech*, 131 S. Ct. at 2068. In addition, the patentee bears the burden of proving that the accused products have no substantial non-infringing uses. *See Golden Blount, Inc. v. Robert H. Peterson Co.*, 438 F.3d 1354, 1363 (Fed. Cir. 2006).

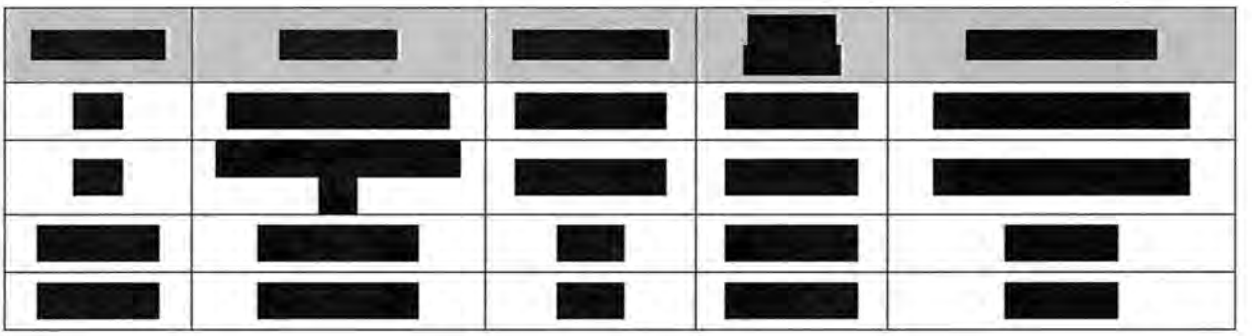
A seller of a component of an infringing product can also be held liable for contributory infringement if: (1) there is an act of direct infringement by another person; (2) the accused contributory infringer knows its component is included in a combination that is both patented and infringing; and (3) there are no substantial non-infringing uses for the accused component, *i.e.*, the component is not a staple article of commerce. *Carborundum Co. v. Molten Equip. Innovations, Inc.*, 72 F.3d 872, 876 (Fed. Cir. 1995).

B. The '595 Patent

Avago asserts that FCI and Mellanox products incorporating VCSELs [redacted] infringe claims 14 and 19 of the '595 Patent. The parties break the products down by VCSEL manufacturer because the structures of the VCSELs vary by manufacturer.

1. [redacted]

Avago identified four products sold or imported by [redacted] and that allegedly infringe claims 14 and 19 of the '595 Patent:



(CX-2086C at Q/A 126-Q127.)

Respondents argue that the [redacted] VCSELs fail to meet five limitations of the asserted claims of the '595 Patent, including: (1) the current-spreading layer thickness; (2) the "top electrode formed on a side of said current spreading layer opposite to said top mirror"; (3) ¼ wavelength thick mirror layers with alternating indices of refraction; (4) "optical cavity having an active layer;" and (5) "a bottom electrode on a side of said bottom mirror opposite said optical cavity. (RIB at 46-48.) Respondents do not contest that the remaining limitations are present. Moreover, Avago presented evidence that they are present. (CX-2086C at Q/A 120-25, 140-41, 152-53, 159-60, 176-81, 190-94, 198-200, 209-13, 215-16, 217-19.)

Staff submits that the only contested limitation that Avago has failed to meet is the first limitation. (SIB at 38-42.) Staff notes that some of the other limitations might not be met, but that is only to the extent they depend or relate to the current-spreading layer limitation.

The ALJ now turns to the contested limitations.

a) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" – Claim 14

Respondents contend that the epitaxial recipe for the [redacted] show that the layers of the top and bottom mirrors are not a quarter wavelength thick, and that they do not have alternating indices of refraction. (RIB at 47.) Specifically, Respondents point to the fact that the [redacted] (RIB at 47-48; [redacted]) Respondents contend that the top mirror [redacted] (RIB at 47-48.) Respondents further contend that the mirror structures do not have alternating indices of refraction, because [redacted] (*Id.* at 47-48.)

Dr. Deppe testified that, in his opinion, the accused products containing [redacted] VCSELs satisfy this limitation of claim 14. (*See* CX-2086C at Q/A 182-88.) Dr. Deppe further testified that the claimed "layers" of the top and bottom mirror properly include graded interface regions, [redacted] (*See id.* at Q/A 172-75.) In Dr. Deppe's view, the top and bottom mirrors of the [redacted] VCSEL thus have quarter wavelength thick layers with alternating indices of refraction. (*Id.* at Q/A 159-60.)

Staff submits that [redacted] products meet this limitation. (SIB at 38-39.)

The ALJ finds that under his construction of layer Avago has shown that this limitation is met. The ALJ finds that while the [redacted] to form "layers" with alternating indices of refraction in the top and bottom mirrors. (*See e.g.*, CX-2086C at Q/A 182-88; JX-0040C.) Accordingly, the ALJ finds that this limitation of claim 14 is satisfied by the [redacted] VCSELs.

b) "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an integer multiple greater than one" – Claim 14; "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one" – Claim 19

Avago's expert, Dr. Deppe, testified that, in his opinion, the [redacted] VCSELs in the accused products include a "current-spreading layer" within the meaning of the asserted claims. (CX-2086C at Q/A 201-203 [redacted] In Dr. Deppe's view, the alleged current-spreading layer comprises [redacted] (*Id.* at Q/A 201.) [redacted] Dr. Deppe concludes that this "layer" of the [redacted] thus satisfying this particular limitation of each asserted claim. (*Id.*) This section of the "recipe" is reproduced below:

[redacted]

Respondents contend that the only "layer" of the epitaxial recipe that has a thickness even approaching the thickness required for the current-spreading layer [redacted] (*See* RX-0006C at Q/A 169-76; *see also* RIB at 46-47.) Moreover, Dr. Chang-Hasnain further testified that [redacted] (RX-0006C at Q/A 173-74.)

The ALJ finds that Avago has presented sufficient evidence to establish that the [redacted] VCSEL includes a layer that satisfies the "current-spreading layer" limitations of the asserted claims. In this regard the ALJ finds Dr. Deppe's full testimony worth repeating here. In particular, the ALJ repeats his explanation of his methodology (Q/A 193) and then his actual analysis. First, Dr. Deppe explained his general methodology:

Q193.	I show you what has been marked asCDX-0097. What is this?
A.	Yes. This is the table I prepared from data supplied in the Respondents' documents identified in the exhibit. It shows the current-spreading layer analysis of each of the accused VCSELs. In each VCSEL from each manufacturer, the current-spreading layer is formed from

The information provided enabled me to calculate both their physical thicknesses and optical thicknesses. Table I shows the VCSEL manufacturer, the current-spreading layer physical thickness according to the '595 current-spreading layer definition, the current-spreading layer optical thickness, the actual multiplier of quarter optical wave thickness, the integer value this multiplier corresponds to, and the precision of the targeted design. It also shows that each current-spreading layer from each manufacturer includes as described in the '595 patent. The precision to the integer multiple of a quarter optical wave is within in each case, indicating that

The current-spreading layer in each case of each VCSEL product includes a

The specific calculated thicknesses for the different products include a current-spreading layer for a current-spreading layer for -- a current-spreading layer for current-spreading layer for the and a current-spreading layer for the

CX-2086C at Q/A 193.)

In other words, he testified that [redacted] He determined that by looking at [redacted] that is the semiconductor used in these devices.

Specifically for the [redacted] VCSELs Dr. Deppe testified (the testimony for claim 14 is representative):

Q201.	Next, please explain how you performed your analysis as to the products that include the VCSEL's.
A.	In the products that incorporate the VCSELs, the

	epitaxial recipe, shows that the VCSELs have a current-spreading that includes Again, the inclusion of such in the DBR quarter-wave mirrors is described in the patent in column 4, lines 20-35 in the description of the mirrors. The use of the graded interfaces was well known in the art at the time of the 595 as important in reducing electrical resistance at interfaces between differing material compositions. The graded interfaces then must be included as part of the optical thickness of a layer. Thus the current-spreading layer is The physical thickness of the current-spreading layer is I calculated the optical thickness of the current-spreading layer to be . Therefore, the optical thickness is approximately one-quarter wavelength times an integer of Although the that makes up the current-spreading layer is optically absorbing, the current-spreading layer is made substantially optically transparent by including . The current-spreading layer is also electrically conductive due to its composition. Also as called out by the 595 patent, the My opinion is further supported by additional testing and analysis, as can be seen in Exhibits E and F, which show the current spreading layer.

(CX-2086C at Q/A 201.)

The ALJ finds his grouping of separate columns of similar compositions is reasonable. In particular, the ALJ finds persuasive his explanation that the reason he only includes [redacted] The ALJ cannot say that this is the perfect approach to graded boundary layers,

but after considering the testimony of both Dr. Deppe and Dr. Chang-Hasnain, the ALJ believes that this, at least, is a reasonable approach to analyzing a graded boundary layer. The ALJ notes that Dr. Chang-Hasnain offered no real alternative. The ALJ finds that Dr. Chang-Hasnain's reliance on particular way the epi-recipe is laid out, *i.e.*, [redacted] is not persuasive and gives no weight to testimony in this regard. (RX-0006C at Q/A 173-74; Tr. 926:17-928:6, 976:21-24, 981:22-982:23.) Her analysis takes almost no account to similar compositions and electrical properties between columns and fails to explain why they are not significant to her analysis. (*Id.*; Tr. 978:14-979:14, 981:1-4.) The ALJ finds it unlikely (to say the least) that electrons or electromagnetic waves would be aware of how these documents are laid out. Thus, the physical realities of the materials involved, not the particular document format, must control. Dr. Deppe has done this and Dr. Chang-Hasnain has not. Accordingly, the ALJ finds his testimony persuasive.

The ALJ further finds that Dr. Deppe's application of his construction has been consistent across all Accused VCSELs and the Avago [redacted] VCSEL. As discussed above, the ALJ finds that in each VCSEL, the current-spreading layer includes [redacted] (CX-2086C at Q/A 193.)

As discussed in greater detail, *infra,* this means that the current-spreading layer for the [redacted] VCSELs consists of [redacted]

[redacted] (CX-2086C at Q/A 198.) For the [redacted] VCSELs, the current-spreading layer consists of [redacted] (CX-2086C at Q/A 195.) For the [redacted] VCSELs, the current-spreading layer consists of [redacted] (*Id.* at Q/A 201.) For both [redacted] VCSELs, the current-spreading layer consists of [redacted] (*Id.* at Q/A 204, 207.) Thus, the ALJ finds that Dr. Deppe applied a similar across all of the products he analyzed.

Accordingly, the ALJ finds that Avago has presented sufficient evidence to show that these limitations of claims 14 and 19 are met.

c) "top electrode formed on a side of said current-spreading layer"– Claims 14 and 19

Dr. Deppe testified that, in his opinion, each of the accused products containing a [redacted] VCSEL include a top electrode formed on a side of the current-spreading layer, as required by claims 14 and 19 of the '595 Patent. (CX-2086C at Q/A 214-16, 235-37.) Dr. Chang-Hasnain opined, however, that because the top electrode of the [redacted] VCSEL contacts [redacted] (RX-0006C at Q/A 178.) In this regard, Respondents argue that "formed on" requires that "there [be] no intervening layer(s) between the top electrode and the current-spreading layer." (RIB at 35-36.) As discussed above, however, the ALJ rejected Respondents' proposed construction as improperly narrow, and the ALJ has held that this phrase should be given its

plain and ordinary meaning. (*Id.*) Accordingly, the ALJ agrees with Staff that the fact that the top electrode [redacted] does not in and of itself mean that this limitation is not satisfied. (SIB at 41.) The ALJ finds that Avago has presented sufficient evidence to demonstrate that this element is met. (CX-2086C at Q/A 214-16, 235-37.)

d) "optical cavity"– Claims 14 and 19

Respondents argue, based on their claim construction, that the [redacted] VCSELs contain multiple active layers, while their claim construction allows only one. (RIB at 48.) Dr. Deppe testified that, in his opinion, the [redacted] VCSELs include an "optical cavity" within the meaning of the asserted claims. (*See* CX-2086C at Q/A 154-57.) According to Dr. Deppe, the optical cavity is found at [redacted] of the epitaxial recipe. (*Id.* at Q/A 154; *see also* CX-0040C.) [redacted] (CX-2086C at Q/A 154.) By contrast, Dr. Chang-Hasnain asserts that rather than identify "an active layer" in the optical cavity, as required by the construction of "optical cavity" proposed by Respondents and the Staff, Dr. Deppe really points to [redacted] different layers. (RX-0006C at Q/A 182.) Thus, in her opinion, this limitation is not met. (*Id.* at Q/A 181.)

The ALJ has already rejected Respondents narrow reading of "active layer." Thus, the ALJ finds that the evidence shows that the [redacted] VCSELs contain an optical cavity, that is, [redacted] from which light energy is transmitted in response to current flow. (*See* CX-2086C at Q/A 154.) Accordingly, the ALJ finds that Avago has proven that the [redacted] VCSELs satisfy this limitation of the asserted claims.

e) "a Bottom Electrode on a Side of Said Mirror Opposite Said Optical cavity" (claims 14 and 19)

Respondents argue that despite Dr. Deppe testifying that he relied solely on certain photographs for his conclusion that the [redacted] VCSELs met the stated "bottom electrode" limitation of claims 14 and 19 (CX-2086C at Q/A 219; Tr. 443:22-444:9), he had no photographs showing where the electrode [redacted] (Tr. 438:12-440:3). Thus, Respondents assert that he had no evidence on which to base a conclusion that this element was met. Respondents contend that Dr. Chang-Hasnain presented a "logical analysis" based on the [redacted] epitaxial recipe that led her to the conclusion that it was likely that the [redacted] electrode was ***not*** located as required by this limitation (RX-0006C at Q/A 180).

Avago argues that Dr. Deppe examined the products, but Dr. Chang-Hasnain did not inspect any of the products before providing her opinions. (Tr. 926:17-928:6.)

The ALJ finds that as Dr. Deppe explained, through his inspection of the products he observed the electrodes [redacted] (Tr. 439:13-25.) Thus, the ALJ finds that Avago has presented sufficient evidence to show that the accused [redacted] products meet this limitation.

f) Summary

The ALJ has found that each of the claim limitations of claims 14 and 19 are met for the [redacted] products. [redacted] (E-16) (claim 14); (CX-2086C Q/A 221-41; [redacted]

[redacted] Accordingly, the ALJ finds that Avago has proved infringement of claims 14 and 19 for these products.

[redacted]

Avago assert that the following [redacted] products containing [redacted] VCSELs allegedly infringe claims 14 and 19 of the '595 Patent:

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

(CX-2086C at Q/A 131.)

The products further break down along two separate epitaxial recipes: [redacted] (CX-2086C at Q/A 204, 207.) The ALJ finds that for purposes of this discussion the two recipes are similar. (*Id.*)

Respondents argue that the [redacted] VCSELs fail to meet four limitations of the asserted claims of the '595 Patent, including: (1) the current-spreading layer thickness; (2) the "top electrode formed on a side of said current spreading layer opposite to said top mirror"; (3) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction;" and (4) "optical cavity having an active layer.". (RIB at 49-52.)

Staff submits that Avago has failed to meet is the current spreading layer limitation and the "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" limitation" of claim 14. (SIB at 43-45.) Staff notes that

some of the other limitations might not be met, but that is only to the extent they depend or relate to the current-spreading layer limitation such as the "top electrode formed on a side

a) "current-spreading layer" thickness limitation

Avago relies on the portion of the [redacted] epitaxial recipe that was produced in this investigation to assert that the [redacted] VCSELs satisfy the "current-spreading layer" limitations of the asserted claims. (*See* JX-0041C.) Specifically, Dr. Deppe testified that, in his opinion, the [redacted] includes a current-spreading layer, [redacted] (CX-2086C at Q/A 207, 230-234.) Similarly, Dr. Deppe testified that the [redacted] also includes a current-spreading layer, [redacted] (*Id.* at Q/A 204, 230-234.) These sections of the epitaxial recipes are reproduced below:

[redacted]

[redacted]

Respondents and Staff rely on Dr. Chang-Hasnain testified based on her analysis of the epitaxial recipes that the [redacted] meet this limitation of the claims. (RX-0006C at Q/A 208-212, 218-219, 222-224.)

The ALJ finds that Avago has met its burden in showing that the [redacted] VCSELs practice this claim element. Specifically, [redacted] Dr. Deppe testified (the testimony for claim 14 is representative):

Q204.	Finally, please explain how you performed your analysis as to the products that include the VCSEL's.
A.	uses two VCSELs – In the products that incorporate the the epitaxial recipe shows that the VCSELs have a current-spreading layer that

Again, the inclusion of such graded layers in the DBR quarter-wave mirrors is described in the patent in column 4, lines 20-35 in the description of the mirrors. The use of the graded interfaces was well known in the art at the time of the 595 as important in reducing electrical resistance at interfaces between differing material compositions. The graded interfaces then must be included as part of the optical thickness of a layer. Thus the current-spreading layer is directly physically connected to the side of the top mirror structure located opposite to the optical cavity.

Therefore, the optical thickness is approximately one-quarter wavelength times an integer of Although the that makes up the current-spreading layer includes

The current-spreading layer is also electrically conductive due to its composition. Also as called out by the 595,

(CX-2086C at Q/A 204.)

As for the [redacted] Dr. Deppe testified:

Q207.	What is the configuration of the current spreading layer in the other VCSEL
A.	In the Mellanox products that incorporate the [redacted] the epitaxial recipe shows that the VCSELs have a current-spreading layer [redacted] Again, the inclusion of such graded layers in the DBR quarter-wave mirrors is described in the patent in column 4, lines 20-35 in the description of the mirrors. The use of the graded interfaces was well known in the art at the time of the 595 as important in reducing electrical resistance at interfaces between differing material compositions. The graded interfaces then must be included as part of the optical thickness of a layer. Thus, here, too, the current-spreading layer is directly physically connected to the side of the top mirror structure located opposite to the optical cavity. The physical thickness of the current-spreading layer is [redacted] Therefore, the optical thickness is approximately one-quarter wavelength times an integer of [redacted] Although the [redacted] that is part of the current-spreading layer is [redacted] The current-spreading layer is also electrically conductive due to its composition. Also as called out in the 595 patent, the [redacted] My opinion is further supported by additional testing and analysis, as can be seen in Exhibit F, which show these structures.

(CX-2086C at Q/A 207 [redacted]

The ALJ finds that this analysis is consistent with the analysis performed on the [redacted] VCSELs. For the same reasons set forth in greater detail above with respect to the [redacted] VCSELs, the ALJ finds this testimony persuasive and finds that Avago has proven that both types of [redacted] VCSELs meet this limitation.

b) "top electrode formed on a side of said current-spreading layer"– Claims 14 and 19

Respondents' arguments regarding the "top electrode" limitation of the asserted claims are essentially identical to those presented in the context of the [redacted] VCSEL. (*See* RIB at

50-51.) The ALJ has found that the current-spreading layer limitation is met. Thus, as also discussed above with respect to the [redacted] products, the ALJ finds that this limitation is met. (CX-2086C at Q/A 215-16.)

c) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" – Claim 14

Respondents argue that Avago has failed to prove that the mirror layer ¼ wavelength thickness limitation of claim 14. (RRB at 21.) Respondents assert that despite having no direct evidence as to the structure of the [redacted] VCSEL mirror layers, Dr. Deppe testifies that the VCSELs "require quarter-wave layers in the top and bottom mirrors" (RRB at 21 (quoting CX-2086C at Q/A 189).) However, Respondents note that he also stated that the layers do not have to be ¼ wavelength thick. (RRB at 21.)

Avago contends that Dr. Deppe does not speculate, instead he relies on the schematic cross-section of the [redacted] VCSEL along with his analysis and photos of the Accused Products containing [redacted] VCSELs. (CRB at 19 (citing CX-2086C at Q/A. 189; Tr. 443:8-16; [redacted] Avago asserts that mirror layers of ¼ wavelength with graded interfaces are the industry norm, and everywhere in the prior art. (CRB at 19 (citing CX-2086C at Q/A 88; 90).) Thus, Avago argues that Dr. Deppe's view that [redacted] VCSELs more likely than not include this feature is well supported and proper.

Staff agrees with Respondents' arguments noting that Dr. Deppe's testimony is unsupported and Dr. Chang-Hasnain testified to the contrary. Thus, Staff contends that Avago has not met its burden of proof with respect to this element.

The ALJ finds that Avago has not met its burden of proof regarding this element. The ALJ notes that while Dr. Deppe testified that, in his opinion, the "quarter wavelength thick

layers" limitation of claim 14 is met in the [redacted] VCSEL (CX-2086C at Q/A 189), the only evidence cited by Dr. Deppe, however, is a "[s]chematic cross section of the VCSEL core" from a [redacted] document (*Id.*; *see also* [redacted] This diagram is reproduced below:

The ALJ find that this diagram does not provide any information regarding the thickness of the mirror layers or their index of refraction, and so does not support Dr. Deppe's opinion. [redacted] While the complete epitaxial recipe for the [redacted] VCSELs (including the mirror layers) was apparently not produced in this investigation, Dr. Deppe states that he believes it "would have confirmed my opinion." *Id.* Yet he admitted during his tutorial that DBR mirror layers ***do not have to be ¼ wavelength*** thick. (Tr. 66:22-67:9; 71:17-72:2). In contrast, Dr. Chang-Hasnain testified the schematic cross-diagram, [redacted] alone is insufficient to establish that this claim limitation is satisfied. (*See* RX-0006C at Q/A 201-07.) Avago does not cite to any other evidence of record to support Avago's assertion that this limitation is met by the [redacted] VCSELs. (*See* CRB at 21.) The ALJ finds that Dr. Deppe's testimony in this regard is speculation, unsupported by this record. The industry norm is not proof because as the Lear

Patent, *infra* demonstrates other thickness are possible, *see* Section VII.B.2. Accordingly, the ALJ find that Avago has not proven that the [redacted] VCSELs meet this element of claim 14.

Claim 19, on the other hand, has no requirement that the mirror layers be "a quarter wavelength thick." Respondents argue that Avago has not proven that the accused devices contain layers with alternating indices of refraction. The ALJ finds that Avago has presented sufficient evidence to show the [redacted] VCSELs meet this limitation, Dr. Deppe testified that they [redacted] which would have layers with alternating indices of refraction. (CX-2086C at Q/A 189, Tr. 443:8-16.)

d) "optical cavity" (Claims 14 and 19)

Respondents argue that Avago has not shown that the [redacted] VCSELs have an "optical cavity having an active layer" within the meaning of the claims. (RIB at 52.) Specifically, Respondents assert that Avago has not shown that there is an active layer surrounded by adjacent spacer or cladding layers. (RIB at 52.) Staff notes that the evidence is "not extensive" but finds that Avago has shown that the [redacted] products meet this element.

The only evidence regarding whether the "optical cavity" limitation is satisfied by the [redacted] VCSELs appears to Dr. Deppe's testimony that the epitaxial recipe and schematic description establish that the [redacted] within the meaning of the asserted claims. (*See* CX-2086C at Q/A 158 [redacted] The ALJ agrees with Staff that the evidence is not extensive, but that it is sufficient to show that this limitation of the asserted claims is satisfied in the [redacted] VCSELs. Specifically, the ALJ finds that [redacted] shows [redacted] and Dr. Deppe testified that [redacted] (CX-2086C at Q/A 158.) The ALJ finds this sufficient to meet this element.

a) Summary

The ALJ finds that Avago has not proved that the [redacted] VCSELs meet each element of claim 14. Accordingly, the ALJ finds that Avago has not proven that claim to be infringed. The ALJ has found that each of the claim limitations of claims 19 are met for the [redacted] products. ([redacted] (CX-2086C Q/A 221-41; [redacted] Accordingly, the ALJ finds that Avago has proved infringement of claims 19 for the [redacted] products.

[redacted]

Avago asserts that the following [redacted] products containing [redacted] VCSELs allegedly infringe claims 14 and 19 of the 595 Patent:

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(CX-2086C at Q/A 114.)

Respondents argue that the [redacted] VCSELs fail to meet five limitations of the asserted claims of the '595 Patent, including: (1) the current-spreading layer thickness; (2) the "top electrode formed on a side of said current spreading layer opposite to said top mirror"; (3) ¼ wavelength thick mirror layers with alternating indices of refraction; and (4) "optical cavity having an active layer." (RIB at 52-55.) Respondents do not contest the remaining limitations. (RIB at 52-55.)

Staff submits that the only contested limitation that Avago has failed to meet is the first limitation. (SIB at 47-48.) Staff notes that some of the other limitations might not be met, but that is only to the extent they depend or relate to the current-spreading layer limitation.

a) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" – Claim 14

Dr. Deppe testified that, in his opinion, the [redacted] Photonics VCSELs satisfy the "quarter wavelength thick layers" limitation of claim 14. (*See, e.g.*, CX-2086C at Q/A 161-71; [redacted] Respondents present similar arguments to those presented in the context of the [redacted] VCSEL. (*See* RIB at 53.) For the same reasons set forth above with regard to the [redacted] VCSELs, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSELs satisfy this limitation of claim 14.

b) "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an integer multiple greater than one" – Claim 14; "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one" – Claim 19

Dr. Deppe testified that, in his opinion, the [redacted] VCSELs in the accused products have a current-spreading layer within the meaning of the asserted claims. (*E.g.*, CX-2086C at Q/A 195-97, 230-34 [redacted] Specifically, Dr. Deppe identifies [redacted] epitaxial recipe as comprising the claimed current-spreading layer. (*Id.*) Those portions of the epitaxial recipes are reproduced below:

[redacted]

For similar reasons to the other VCSELs, Respondents Dr. Chang-Hasnain contend that the [redacted] VCSELS do not meet this limitation. (RIB at 53 (citing RX-0006C at Q/A 80-85, 104-105.)

The ALJ finds that Avago has met its burden in showing that the [redacted] VCSELs practice this claim element. Specifically, Dr. Deppe testified (claim 14 is representative):

Q195.	Let's take the VCSEL suppliers one at a time. Please explain how you performed your analysis as to the VCSEL's.
A.	In the products that incorporate the VCSELs, the epitaxial recipe shows that the VCSELs have a current-spreading layer that includes a portion of: The inclusion of such graded layers in the DBR quarter-wave mirrors is described in the patent in column 4, lines 20-35 in the description of the mirrors. The use of the graded interfaces was well known in the art at the time of the 595 as important in reducing electrical resistance at interfaces between differing material compositions. The graded interfaces then must be included as part of the optical thickness of a layer. Thus the current-spreading layer is directly physically connected to the side of the top mirror structure located opposite to the optical cavity. The physical thickness of the current-spreading layer is Using a refractive index of I calculated the optical thickness of the current-spreading layer at for the current-spreading layer. Therefore, the optical thickness is approximately one-quarter wavelength times an integer of Although the is part of the current-spreading layer is optically absorbing, the current-spreading layer is made substantially optically transparent by using The current-spreading layer is also electrically conductive due to its composition. Furthermore the consistent with the 595 patent. My opinion is further supported by additional testing and analysis, as can be seen in Exhibit E, which show the current spreading layer.

(CX-2086C at Q/A 195.)

For similar reasons to those discussed above with regard to the [redacted] VCSELs, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSELs satisfy the "current-spreading" limitations of the asserted claims.

c) "top electrode formed on a side of said current-spreading layer"– Claims 14 and 19

Dr. Deppe testified that, in his opinion, the [redacted] VCSELS satisfy the "top electrode" limitation of the asserted claims. (*See* CX-2086C at Q/A 214-16, 235-37.) Respondents' arguments regarding this limitation are similar to those presented in the context of the [redacted] VCSEL. (*See* RIB at 53-56.) This argument is substantially similar to the argument considered with regard to the [redacted] products. As with those products, the ALJ has found that the current-spreading layer limitation is met. Thus, the ALJ finds that this limitation is met as well. (*See* CX-2086C at Q/A 214-16, 235-37.)

d) "optical cavity"– Claims 14 and 19

Dr. Deppe testified that, in his opinion, the [redacted] VCSELs satisfy the "optical cavity" limitation of the asserted claims. (*See, e.g.*, CX-2086C at Q/A 146-51; [redacted] Respondents' arguments in opposition are similar to those presented in the context of the [redacted] VCSEL. (*See* RIB at 54-55.) For the same reasons set forth above with regard to the [redacted] VCSEL, the ALJ finds that the evidence shows that the [redacted] VCSELs satisfy this limitation of the asserted claims.

a) Summary

The ALJ has found that each of the claim limitations of claims 14 and 19 are met for the [redacted] products. (Claim 14: (CX-2086C at Q/A 120-25, 140-41, 152-53, 159-60, 176-81, 190-94, 198-200, 209-13, 215-16, 217-19; [redacted] (Claim 19: CX-2086C at Q/A 221-41; [redacted] Accordingly, the ALJ finds that Avago has proved infringement of claims 14 and 19 for these products.

[redacted]

Avago asserts that the following [redacted] products containing [redacted] VCSELs allegedly infringe claims 14 and 19 of the '595 Patent:

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(CX-2086C at Q/A 120.)

Respondents argue that the [redacted] VCSELs fail to meet four limitations of the asserted claims of the '595 Patent, including: (1) the current-spreading layer thickness; (2) the "top electrode formed on a side of said current spreading layer opposite to said top mirror"; (3) ¼ wavelength thick mirror layers with alternating indices of refraction; and (4) "optical cavity having an active layer." (RIB at 55-58.)

Staff submits that the only contested limitation that Avago has failed to meet is the first limitation. (SIB at 45-47.) Staff notes that some of the other limitations might not be met, but that is only to the extent they depend or relate to the current-spreading layer limitation. (SIB at 45-47.)

The ALJ now turns to the disputed limitations.

a) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" – Claim 14

Dr. Deppe testified that, in his opinion, the [redacted] VCSELs satisfy the "quarter wavelength thick layers" limitation of claim 14. (*See, e.g.*, CX-2086C at Q/A 176-81; [redacted]) With regard to this limitation, Respondents present similar arguments as those presented in the context of the [redacted] VCSEL. (RX-0006C at Q/A 118-23. For the same reasons set forth above, the ALJ rejects this argument and finds that the Avago has shown that the [redacted] VCSELs satisfy this limitation of claim 14.

b) "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an integer multiple greater than one" – Claim 14; "current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one" – Claim 19

Respondents and Staff argue that the [redacted] VCSELs do not meet this limitation because there is no single material compositional layer that is a ½ wavelength thick. (RIB at 57; SIB at 46.) However, the ALJ rejected their construction of "current-spreading layer" as improperly narrow. Avago argues that if the ALJ adopts Avago's construction, the [redacted] VCSELs satisfy this claim limitation. (CRB at 15.) Dr. Deppe testified that, in his opinion, the [redacted] VCSELs in the accused products have a current-spreading layer within the meaning of the asserted claims. (*E.g.*, CX-2086C at Q/A 198-200, 230-34 [redacted] Specifically, Dr. Deppe identifies [redacted] as comprising the claimed current-spreading layer. (*Id.*) Those portions of the epitaxial recipes are reproduced below:

[redacted]

Specifically, the ALJ notes Dr. Deppe's testimony for this element (claim 14 is representative):

Q198.	Next, please explain how you performed your analysis as to the products that include the VCSEL's.
A.	In the products that incorporate the VCSELs, the epitaxial recipe, shows that the VCSELs have a current-spreading layer that includes The current-spreading layer includes Again, the inclusion of such graded layers in the DBR quarter-wave mirrors is described in the patent in column 4, lines 20-35 in the description of the mirrors. The use of the graded interfaces was well known in the art at the time of the 595 as important in reducing electrical resistance at interfaces between differing material compositions. The graded interfaces then must be included as part of the optical thickness of a layer. Thus the current-spreading layer is directly physically connected to the side of the top mirror structure located opposite to the optical cavity. The physical thickness of the current-spreading layer is Using the refractive indices actually given in the epi recipe, I calculated the optical thickness of the current-spreading layer at These refractive indices are nearly equivalent to values given in the reference I used, "Refractive-Index of $Ga_{1-x}Al_xAs$," Solid State Communications, CX-1714. Therefore, the optical thickness as targeted by the epitaxial recipe design is approximately one-quarter wavelength times an integer of Although part of the current-spreading layer includes is optically absorbing, the current-spreading layer is made substantially optically transparent by including in the current-spreading layer. The current-spreading layer is also electrically conductive due to its composition. Furthermore the , as called out in the 595 patent. My opinion is further supported by additional testing and analysis, as can be seen in Exhibit E, which show this current spreading layer.

(CX-2086C at Q/A 198.)

For similar reasons to those discussed above with regard to the [redacted] VCSELs, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSELs satisfy the "current-spreading" limitations of the asserted claims. (CX-2086C at Q/A 198, 230-234.)

c) "top electrode formed on a side of said current-spreading layer"– Claims 14 and 19

Dr. Deppe testified that, in his opinion, the [redacted] VCSELS satisfy the "top electrode" limitation of the asserted claims. (*See* CX-2086C at Q/A 215-16.) Respondents' arguments regarding this limitation are similar to those presented in the context of the [redacted] VCSEL. (*See* RIB at 53-56.) This argument is substantially similar to the argument considered with regard to the [redacted] products. As with those products, the ALJ has found that the current-spreading layer limitation is met. Thus, the ALJ finds that this limitation is met as well. (*See* CX-2086C at Q/A 215-16.)

d) "optical cavity"– Claims 14 and 19

Dr. Deppe testified that, in his opinion, the evidence shows that the [redacted] VCSELs satisfy the "optical cavity" limitation of the asserted claims. (*See, e.g.*, CX-2086C at Q/A 152-53; [redacted] With respect to this limitation, Respondents make similar arguments to those presented in the context of the [redacted] VCSEL. (*See* RIB at 58.) Based on the same reasons set forth above with respect to the [redacted] products, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSELs satisfy this limitation of the asserted claims.

e) Summary

The ALJ has found that each of the claim limitations of claims 14 and 19 are met for the [redacted] products. (CX-2086C at Q/A 120-25, 140-41, 152-53, 159-60, 176-81, 190-94, 198-200,

209-13, 215-16, 217-19; [redacted] (claim 14.); (CX-2086C at Q/A 221-41; [redacted] (claim 19). Accordingly, the ALJ finds that Avago has proved infringement of claims 14 and 19 for these products.

C. The '456 Patent

Avago accuses the Mellanox and FCI products of infringing based on their inclusion of an accused IPtronics driver. (RIB at 91.) Claims 1, 2, 4, 6-8, 11-13, 15, and 21-23 are asserted.

The breakdown by products and claims is as follows:

Respondent	'456 Accused Product	Asserted Claims
IPtronics	[redacted]	1, 6, 7, 21-23
		1, 2, 4, 6-8, 11-13, 15, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 2, 4, 6-8, 11-13, 15, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 2, 4, 6-8, 11-13, 15, 21-23
FCI		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 2, 4, 6-8, 11-13, 15, 21-23
Mellanox		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23
		1, 6, 7, 21-23

(CX-2085C at Q/A 44-48, 54 56, 58.)

1. Direct Infringement

Respondents argue that there are two limitations of the claims that the Respondents' products do not practice: (1) "wherein the drive waveform includes a negative peak portion"; and (2) "at least one parameter for affecting the negative peak portion." (RIB at 91.)

a. "negative peak portion"

The parties have agreed that the claim phrase "negative peak portion," which appears in each of the asserted independent claims, should be construed as "the portion of the negative peak transient part of the drive waveform that has values below the value the waveform has at the instant in time immediately before the logical '0' to the logical '1' transition begins." (*See supra*, Section V.C.2.) Moreover, the parties have also agreed that the similar, but distinct, term "negative peaking" should be construed as "a transient present in the VCSEL drive waveform during less than a full bit width of the logical '0' part of the current drive waveform." (*Id.*)

Avago contends that the accused products generate a VCSEL drive waveform that includes a negative peak portion, and that IPtronics refers to this feature as "positive preemphasis." (CIB at 82-88; CX-2085C at Q/A 77-78, 133-135.) [redacted]

Mr. Miller further testified that he tested a small number of the accused products by measuring the electrical output waveforms of the VCSEL driver in operation, and in his view the waveform

included a negative peak portion. (CX-2085C at Q/A 89-103.) In addition to Mr. Miller's testimony, Avago relies on five major categories of evidence in support of its case:

(a) IPtronics technical publications that Avago argues shows in figures and describes in words that [redacted];

(b) testing results from an accused IPtronics VCSEL driver performed by IPtronics that Avago argues shows that [redacted];

(c) testing by Dr. Lebby, which Avago argues shows that [redacted];

(d) testing of accused IPtronics VCSEL drivers performed by Mr. Miller that Avago contends proves that [redacted];

(e) testimony by Mr. Miller contending that at today's ultra-high speeds, that the application of a negative peaking current is only effective to accomplish its intended objective of speeding up the fall time of the optical waveform if the electrical waveform falls below the logical zero level — anything less would simply be useless. (CIB at 80, 81-82 (quoting Tr. 592:13-593, 681:6-17; CX-2085C at Q/A 33-35.)

By contrast, Respondents' technical expert for the '456 Patent, Dr. Lebby, testified that, in his opinion, the evidence shows that the accused IPtronics VCSEL drivers do not satisfy the "negative peak portion" limitation of the asserted claims. (*See, e.g.*, RX-0004C at Q/A 56-138.) Specifically, Dr. Lebby agreed that the IPtronics laser drivers have a pre-emphasis parameter, which adds current to the drive waveform and results in a faster fall time from a logic '1' to logic '0.' (*See id.* at Q/A 70.) Such "negative peaking," however, which was known in the art prior to the '456 Patent, and in his view does ***not*** establish that a negative peak ***portion*** will result in the drive waveform. (*Id.* at Q/A 70-71.) Dr. Lebby further testified that, in his opinion, the results of Avago's testing of certain of the accused products, JX-0114, CX-1733, CX-1734, are insufficient to establish that the drive waveform output by the IPtronics VCSEL drivers includes a negative peak portion. (RX-0004C at Q/A 218-42.) In this regard, Dr. Lebby testified that it is not possible to accurately measure the electrical waveform coming out of a laser driver. (*Id.* at Q/A 234.) In Dr. Lebby's view, Avago's testing procedure is inherently unreliable, and the resulting waveforms are at least as likely to reflect "ringing" or other unintended effects on the signal as opposed to establishing that a negative peak portion is present in the waveform. (*Id.* at Q/A 222-37.) Dr. Lebby supports his conclusion with his own test results, which in his opinion establish that the drive waveforms do not include a negative peak portion within the meaning of the asserted claims. (*Id.* at Q/A 243-75.)

Staff agrees with Respondents that Avago has failed to establish that the accused products have a "negative peak portion." (SIB at 82-84.)

The ALJ finds that Avago has failed to show that the accused products meet the "negative peak portion" limitation. The claimed "negative peak portion" means "the portion of the transient present in the VCSEL drive waveform during less than a full bit width of the logical

'0' part of the current drive waveform that has values below the value the waveform has at the instant in time immediately before the logical '0' to the logical '1' transition begins." (RX-0004C at Q/A 52; RDX-219.) In addition to a negative peak portion, the drive waveform must also exhibit the larger "negative peaking" at a location and duration specified by "negative peaking duration." (Tr. 625:6-630:16; RX-0003C at Q/A 177-182; RDX-217-RDX-221). The ALJ finds that each of the five categories of evidence that Avago relies upon for showing that Respondents practice this limitation is unreliable for proving that Respondents' products meet this limitation.

First, the ALJ considers the results of tests created by Avago's expert Mr. Miller and finds them unreliable and entitled to no weight. The results of his testing are contained within CX-1733, CX-1734, and CX-1717. (CIB at 93.) Avago points out what they believe to be claimed negative peaking portions in CDX-7 - CDX-9. However, the ALJ finds that these tests are unreliable evidence of what actually is occurring in the Accused Products. The ALJ finds that it is well-known that the laser impedance will change with bias level. (RX-0004C at Q/A 209; Tr. 555:25-556:2.) The ALJ finds that the evidence shows that as soon as one places a probe on the connection the waveform changes. (RX-0004C at Q/A 210.) Mr. Miller used a low impedance probe that was around 50 ohms. (CX-2085C Q/A 96.) The ALJ finds that the evidence suggests that regardless of what the VCSEL impedance is, the application of the new 50 ohm load changed the waveform and added reflection points which show up as ringing. (RX-0004C at Q/A 227.) Thus, the resulting waveform from the probe will not be the same waveform that would otherwise be outputted from the driver. (*Id.* at Q/A 234.) The ALJ finds that the evidence that even though Mr. Miller used an AC probe the resulting waveforms are not the true waveforms of the driver circuit. (*Id.* at Q/A 211.)

Dr. Lebby testified at length as to the issues with Mr. Miller's testing method and the testing waveforms that Mr. Miller obtained. (*Id.* at Q/A 219–237.) The ALJ finds that this testimony persuasive. In addition, the ALJ finds that Mr. Miller acknowledged that this testing was not recognized in the industry, failed as many times as it succeeded, and Mr. Miller only presented selected data from the tests that did "succeed":

> 15 JUDGE ESSEX: My understanding is this
> 16 is a test that you devised, so we can't test
> 17 whether this is an accurate test from the field
> 18 in general or from others' work. You know, I
> 19 have got three tests, and my understanding is I
> 20 only have a small portion of the entire run
> 21 that you made on those tests. Is that correct?
> 22 THEWITNESS: That's correct.
> 23 JUDGE ESSEX: Okay.

(Tr. 706:15-23.) Thus, the ALJ finds that this evidence is not reliable and entitled to little if any weight.

Second, Avago relies on the testing of Dr. Lebby. Avago looks to two waveforms that Dr. Lebby observed in his testing of the IPVD12G011 driver. (CIB at 91.) [redacted] (CIB at 91-92.) The Figures are shown below:

However, the ALJ notes that the agreed construction for "negative peak[ing] portion" requires "the portion of the negative peak transient part of the drive waveform that has values below the value the waveform has at **the** instant in time immediately before **the** logical '0' to the logical '1' transition begins." (CIB at 74.) The ALJ agrees with Respondents' interpretation that for parabolic waveforms, such as RX-515 or RX-516, basic geometry requires that the moment when the "the logical '0' to the logical '1' transition begins" is the minimum of the parabolic shape, *i.e.*, the valley of the curve. Applying the definition Avago agreed to, there are no points "below the value the waveform has at [this] instant in time" as the agreed construction requires. Thus, by definition there is no negative peak portion here.

Avago does attempt to insert a hypothetical zero level in RX-515 and take the same level over to RX-516 to show that RX-516 goes below that line. (CIB at 92.) But the ALJ finds that is not how the agreed construction reads: the construction says that one must use **the** '0' to '1' transition immediately following **the** '1' to '0' transition where the subject negative peak portion occurs within the subject waveform, not take a zero level from a waveform with different

settings, and apply it to another waveform. (RX-0003C at Q/A 183-185). Thus, this is not evidence that the claimed "negative peaking portion," and the ALJ finds it unpersuasive.

Third, Avago relies on an IPtronics technical presentation (CX-2255C) that includes a depiction of results of IPtronics' testing of the IPVD12X12C driver (at IPT-01326907) as confirmation that "the use of positive preemphasis causes the measured electrical drive waveform to dip below the logic 0 level, *i.e.*, causes a negative peak portion. (CIB at 89).

The ALJ finds several problems with this conclusion. First, the ALJ finds that there is no explanation of how Avago actually applied the agreed constructions to this figure, which diminishes the weight that can given to it. Second, Avago relies on the testimony of IPtronics' Henning Lysdal to argue that CX-2255C [redacted]. However, as discussed above, with respect to Mr. Miller, the evidence shows that the 50 ohm load is not representative of an actual VCSEL because VCSELs have dynamic impedance, *i.e.*, their electrical characteristics change as

different levels of current flow through. (RX-0004C Q/A 209; Tr. 555:25-556:2). The ALJ finds that the evidence suggests that this constantly changing impedance affects the shape of the waveform in the form of feedback because the VCSEL is part of the driver circuit (RX-0004C at Q/A 293; *see* JX-212C at 344:2-15, 346:4-12, 350:12-25; Tr. 645:2-653:14; RX-0009C at Q/A 46).

Fourth, as for Avago's arguments that based on Mr. Miller's testimony "Respondents' suggestion that they might apply their negative peaking current for so brief a period of time that it would not achieve [generation of a dip below the logic '0' level] simply defies common sense." (CIB at 80). The ALJ finds that Respondents identified evidence [redacted] (*See* JX-0032C at IPT-00902891; RX-00004C at Q/A 171; CX-0419C at 72:19-21). The ALJ agrees with Respondents that [redacted] (RX-0004C at Q/A 171-173; *see* CDX-0007-0009; JX-0471 at 8:64-9:23, Fig. 7).

Finally, Avago relies on IPtronics data sheets. (CIB at 84-88.) However, the ALJ finds that as Dr. Lebby and Mr. Lysdal, one of the authors of the IPtronics documents relied on by Complainants, testified, these documents merely show the principles behind pre-emphasis, not the actual waveforms output to a VCSEL. (*See* Tr. 809:21-811:12, 814:6-10, 854:10-855:15; RX-0004C at Q/A 128). The ALJ finds that the evidence shows that these drawings are theoretical only. (Tr. 856:15-858:5). Indeed, the ALJ notes that even Avago's expert admitted that they are mere cartoons (Tr. 637:21-638:1) that have errors (*id.* at 688:24-690:16). In

addition, the ALJ finds that these documents explain that the output waveform depends on the electrical characteristics of the specific VCSEL being used, how the VCSEL is connected, and the settings for the parameters for the bias current, modulation current, and pre-emphasis. (*See* JX-35C at IPT-00902866; RDX-0312C; RX-00004C at Q/A 131).

Thus, the ALJ finds that Avago has simply failed to establish by a preponderance of the evidence that the output waveforms of the accused IPtronics VCSEL drivers include a negative peak portion within the meaning of the asserted claims. Accordingly, the ALJ finds that Avago has failed to show that the accused products satisfy the "negative peak portion" limitation of the asserted claims.

b. "parameter for affecting"

The asserted independent claims of the '456 Patent require that the drive waveform parameters "include at least one parameter for affecting the negative peak portion of the drive waveform." (*See, e.g.*, JX-0471, *Ex Parte* Reexamination Certificate at 1:36-38 (claim 1).) The parties have agreed that the phrase "parameter for affecting" should be construed as "a parameter ***with the purpose of*** digitally affecting the feature of the drive waveform mentioned in the claim." *See supra*, Section V.C.2 (emphasis added). As discussed below, Avago emphasized in its validity arguments that the parameter must be for affecting a negative peak portion; the fact that it causes a negative peak portion is not enough. (CRB at 53-54.) In its infringement section, Avago argues that the purpose is met "if the recited fact occurs, i.e., that the negative peak portion is affected by the parameter…." (CIB at 83.) Moreover, Avago contents that "there is no 'intent' requirement that would necessitate proof that the value of the parameter was specified by the user with the intent of affecting the negative peak portion." (CIB at 83.) However, this is

directly contrary to the arguments that Avago has repeatedly made to overcome the rafts of art that disclose negative peaking.

Avago argues that Mr. Miller testified that the accused IPtronics VCSEL drivers include a parameter for setting pre-emphasis, [redacted] (*See, e.g.,* CX-2085C at Q/A 80, 138, 311. In Mr. Miller's view, this parameter "affects the negative peaking portion of the drive waveform because it determines the magnitude of the negative peaking current. [redacted] (*See, e.g., id.* at Q/A 79-80.) Avago argues that IPtronics's witnesses admitted that the purpose of positive pre-emphasis in the accused products is to create a negative peak portion in the electronic drive current below the logic '0' level during a logic '1' to logic '0' transition. (CIB at 82 (quoting Tr. 770:10-25, 772:19-773:4.) Avago further argues that, in any event, there is no intent element and so long as the parameter causes a negative peaking portion, it is sufficient to meet the claim limitation. (CIB at 83-84.)

Dr. Lebby testified, however, that the pre-emphasis parameter, [redacted] is not for the purpose of affecting the negative peak portion. (*See* RX-0004C at Q/A 150-73. In Dr. Lebby's view, the purpose of the pre-emphasis parameter [redacted]. (*Id.* at Q/A 149.) Its purpose, therefore [redacted]. This is the same objective of the prior art technique known as negative

peaking, and wholly unrelated to controlling the shape of a negative peak portion." (*Id.* at Q/A 151.)

In addition, the ALJ finds that datasheets, such as the one for the [redacted]. Neither of these purposes has any relation to the portion of the waveform below the logical '0' level, or "negative peaking portion," and are thus not utilized, "for the purpose of digitally affecting the [negative peaking portion] of the drive waveform." (RX-0004C Q/A 150-164, 181-183.) Many other datasheets suggest that there is no such a purpose for these parameters as well. (RDX-0316C-326C; RX-1678C at IPT-00465269-272; JX-0030C at IPT-00918373; RX-1680C at IPT-00696363, -75; RX-1687C at IPT-00876003; JX-0272 at FCI-ITC0016151-52; JX-0035C at IPT-00902866.) Respondents also presented evidence that [redacted]. (*See* RX-0009C at Q/A 52-53, 73-75; Tr. 896:10-14; Tr. 769:16-770:1, 790:15-791:11.)

Moreover, the ALJ finds that Respondents also presented evidence that [redacted].

Thus, the ALJ finds that this suggests the purpose of that value is [redacted].

As for Avago's argument that the construction only requires that the parameter cause a negative peak portion, this position ignores the original prosecution history of the '456 Patent. (JX-756; RX-0827 at AV-ITC50000136-350; RX-0003C at Q/A 124-142; RIB at 82-84). In the original prosecution history, the original Patent Applicant (Agilent) specifically disclaimed the notion that a parameter having any effect on the negative peak portion was equivalent to being "for affecting the negative peak portion." (RX-0827 at AV-ITC50000317). It clearly stated that "[t]he mere existence of the negative peak portion does not enable the use of waveform parameters to affect or program aspects (e.g., the depth or duration) of the negative peak portion as claimed" (RX-0827 at AV-ITC50000317; RDX-208; RX-0003C at Q/A 137-138). They further stated that the prior art "fails to teach or suggest the use of digitally programmable parameters for changing the output waveform generated by the laser driver ***in a controlled manner*** as claimed." (RX-0827 at AV-ITC50000335-336 (emphasis in original); RDX-209; RX-0003C at Q/A 140). This understanding is also consistent with the position that Avago argued regarding invalidity. (*See supra* at VII.C.1.) Thus, there is no basis for Avago's new position regarding this term.

As for the case Avago cites to for the proposition that there can be no intent element in this term, *TriQuint Semiconductor, Inc. v. Avago Tech. Ltd.*, No. 09–1531–PHX–JAT, 2012 WL 1432529 (D. Ariz. Apr. 25, 2012),[5] the ALJ finds it unpersuasive. In addition to having been vacated, one of the cases it relied on actually has issued a more recent decision recognizing

[5] Avago fails to mention (despite the fact that they are a party to this case) that this case was vacated by the court by agreement of the parties. *See TriQuint Semiconductor, Inc. v. Avago Techs. Ltd.*, 2012 WL 1768084 (D. Ariz. May 17, 2012).

"[t]hat there is no binding authority for the position that an apparatus claim may not include an intent element," *3M Co. v. Avery Dennison Corp.*, Civil No. 10–2630, 2013 WL 673838, at *3 (D. Minn. Feb. 25, 2013). After the court in *3M Co.* recognized that incorporating intent into an apparatus claim was allowed, the court stated "that a person of ordinary skill in the art can determine the scope of these claims that include an intent requirement by reviewing internal design documents or through witness testimony" *3M Co.*, 2013 WL 673838, at *3. It is unnecessary to resolve this legal question, however, because Avago has agreed to this construction and has pressed this construction (and its intent requirement) to argue for the validity of the claims (CRB at 53-54). Thus, the ALJ finds that "for the purpose of" has its plain meaning and requires more than just causing, even if unintentionally, a negative peak portion.

Based on the evidence presented, the ALJ finds that Avago has not established that the pre-emphasis parameter of the accused IPtronics VCSEL drivers is for the purpose of affecting the negative peak portion of the drive waveform [redacted]. Accordingly, the ALJ finds that Avago has failed to prove that the accused products satisfy this limitation of each of the asserted independent claims. And because the "parameter for affecting" limitation appears in each of the asserted independent claims, it is also necessarily present in each of the asserted dependent claims. The ALJ finds that the accused products have not been shown to infringe the asserted claims of the '456 Patent.

2. Indirect Infringement

Indirect infringement requires that there be a showing of an underlying act of direct infringement. *See Linear Tech. Corp. v. Impala Linear Corp.*, 379 F.3d 1311, 1326 (Fed. Cir. 2004); *Fujitsu Ltd. v. Netgear, Inc.*, 620 F.3d 1321, 1330-31 (Fed. Cir. 2010). The ALJ found *supra* that Avago failed to show that the accused products directly infringe the asserted claims

for at least two reasons. Thus, Avago has also failed to show Respondents indirectly infringement of the asserted claims.

VII. VALIDITY

A. Background

1. Burden of Proof

One cannot be held liable for practicing an invalid patent claim. *See Pandrol USA, LP v. AirBoss Railway Prods., Inc.*, 320 F.3d 1354, 1365 (Fed. Cir. 2003). However, the claims of a patent are presumed to be valid. 35 U.S.C. § 282; *DMI Inc. v. Deere & Co.*, 802 F.2d 421 (Fed. Cir. 1986). Although a complainant has the burden of proving a violation of section 337, it can rely on this presumption of validity.

Respondents have the burden of proving invalidity of the patent. This "burden is constant and never changes and is to convince the court of invalidity by clear evidence." *i4i v. Microsoft Corp*, 131 S. Ct. 2338, 2243 (2010) (citing Judge Rich in *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F. 2d 1350, 1360 (CA Fed. 1984)). Respondents' burden of persuasion *never shifts*. *Id.* The risk of "decisional uncertainty" remains on the respondent. *Technology Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327 (Fed. Cir. 2008); *see also PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1303, 1305 (Fed. Cir. 2008); *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1360 (Fed. Cir. 2007). Thus, it is Respondent's burden to prove by clear and convincing evidence that any of the alleged prior art references anticipate or render obvious the asserted claims of the patents in suit. Failure to do so means that Respondents lose on this point. *Id.* (stating, "[I]f the fact trier of the issue is left uncertain, the party with the burden [of persuasion] loses.").

Respondents also bear the burden of going forward with evidence, *i.e.*, the burden of production. *Id.* This is "a shifting burden the allocation of which depends on where in the process of a trial the issue arises." *Id.* However, this burden does not shift until a respondent presents "evidence that might lead to a conclusion of invalidity." *Pfizer*, 480 F.3d at 1360. Once a respondent "has presented a prima facie case of invalidity, the patentee has the burden of going forward with rebuttal evidence." *Id.*

2. Indefiniteness

The definiteness requirement of 35 U.S.C. § 112 ensures that the patent claims particularly point out and distinctly claim the subject matter that the patentee regards to be the invention. *See* 35 U.S.C. § 112(b); *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366 (Fed. Cir. 2004). If a claim's legal scope is not clear enough so that a person of ordinary skill in the art could determine whether or not a particular product infringes, the claim is indefinite, and is, therefore, invalid. *Geneva Pharm., Inc. v. GlaxoSmithKline PLC*, 349 F.3d 1373, 1384 (Fed. Cir. 2003). "The fact that [a patentee] can articulate a definition supported by the specification ... does not end the inquiry. Even if a claim term's definition can be reduced to words, the claim is still indefinite if a person of ordinary skill in the art cannot translate the definition into meaningfully precise claim scope." *Halliburton Energy Servs., Inc. v. M–I LLC*, 514 F.3d 1244, 1251 (Fed. Cir. 2008).

Thus, it has been found that:

> When a proposed construction requires that an artisan make a separate infringement determination for every set of circumstances in which the composition may be used, and when such determinations are likely to result in differing outcomes (sometimes infringing and sometimes not), that construction is likely to be indefinite.

Halliburton Energy Servs., 514 F.3d at 1255.

"[B]ecause claim construction frequently poses difficult questions over which reasonable minds may disagree, proof of indefiniteness must meet 'an exacting standard.'" *Wellman, Inc. v. Eastman Chemical Co.*, 642 F.3d, 1355, 1366 (Fed. Cir. 2011) (citations omitted). "An accused infringer must ... demonstrate by clear and convincing evidence that one of ordinary skill in the relevant art could not discern the boundaries of the claim based on the claim language, the specification, the prosecution history, and the knowledge in the relevant art." *Id.*

3. Anticipation

A patent may be found invalid as anticipated under 35 U.S.C. § 102(a) if "the invention was known or used by others in this country, or patented or described in a printed publication in this country, or patented or described in a printed publication in a foreign country, before the invention thereof by the applicant for patent." 35 U.S.C. § 102(a).[6] A patent may be found invalid as anticipated under 35 U.S.C. § 102(b) if "the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States." 35 U.S.C. § 102(b). Under 35 U.S.C. § 102(e), a patent is invalid as anticipated if "the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent." 35 U.S.C. § 102(e). Anticipation is a question of fact. *Texas Instruments, Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1177 (Fed. Cir. 1993) ("*Texas Instruments II*"). Anticipation is a two-step inquiry: first, the claims of the asserted patent must be properly construed, and then the construed claims must be compared to

[6] The ALJ notes that a number of the provisions (and the numbering) of Title 35 have changed with the passage the Leahy-Smith America Invents Act. Because this patent is governed by the prior provisions of the Patent Act as it was in force when the asserted patents issued, the ALJ cites only to the relevant provisions as they were before the AIA.

the alleged prior art reference. *See, e.g.*, *Medichem, S.A. v. Rolabo, S.L.*, 353 F.3d 928, 933 (Fed. Cir. 2003). It is axiomatic that claims are construed the same way for both invalidity and infringement. *W.L. Gore v. Garlock, Inc.*, 842 F.2d 1275, 1279 (Fed. Cir. 2008.)

"Claimed subject matter is 'anticipated' when it is not new; that is, when it was previously known. Invalidation on this ground requires that *every element and limitation* of the claim was *previously described in a single prior art reference*, either *expressly or inherently*, so as to place a person of ordinary skill in possession of the invention." *Sanofi-Synthelabo v. Apotex, Inc.*, 550 F.3d 1075, 1082 (Fed. Cir. 2008) (emphasis added) (citing *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 1379 (Fed. Cir. 2003) and *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1267-69 (Fed. Cir. 1991)).

To anticipate, a single prior art reference must be enabling and it must describe the claimed invention, *i.e.*, a person of ordinary skill in the field of the invention must be able to practice the subject matter of the patent based on the prior art reference without undue experimentation. *Sanofi*, 550 F.3d at 1082. The presence in said reference of *both* a specific description and enablement of the subject matter at issue are required. *Id.* at 1083.

To anticipate, a prior art reference also must disclose all elements of the claim within the four corners of said reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *see also Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1345 (Fed. Cir. 2007) (stating, "Anticipation is established by documentary evidence, and requires that every claim element and limitation is set forth in a single prior art reference, in the same form and order as in the claim."). Further, "[b]ecause the hallmark of anticipation is prior invention, the prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in

the claim.'" *Id.* (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). The Federal Circuit explained this requirement as follows:

> The meaning of the expression 'arranged as in the claim' is readily understood in relation to claims drawn to things such as ingredients mixed in some claimed order. In such instances, a reference that discloses all of the claimed ingredients, but not in the order claimed, would not anticipate, because the reference would be missing any disclosure of the limitations of the claimed invention 'arranged as in the claim.' But the 'arranged as in the claim' requirement is not limited to such a narrow set of 'order of limitations' claims. Rather, *our precedent informs that the 'arranged as in the claim' requirement applies to all claims and refers to the need for an anticipatory reference to show all of the limitations of the claims arranged or combined in the same way as recited in the claims, not merely in a particular order*. The test is thus more accurately understood to mean 'arranged or combined in the same way as in the claim.'

Id. at 1370 (emphasis added). Therefore, it is not enough for anticipation that a prior art reference simply contains all of the separate elements of the claimed invention. *Id.* at 1370-71 (stating that "*it is not enough [for anticipation] that the prior art reference discloses part of the claimed invention, which an ordinary artisan might supplement to make the whole*, or that it includes multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention." (emphasis added)). Those elements must be arranged or combined in said reference in the same way as they are in the patent claim.

If a prior art reference does not expressly set forth a particular claim element, it still may anticipate the claim if the missing element is inherently disclosed by said reference. *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002); *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Inherent anticipation occurs when "the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Id.* In other words, inherency may not be established by probabilities or possibilities. *See Continental*

Can, 948 F.2d at 1268. Thus, "[t]he mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Id.*

The critical question for inherent anticipation here is whether, as a matter of fact, practicing an alleged prior art reference necessarily features or results in each and every limitation of the asserted claim at issue. *See, e.g., Toro Co. v. Deere & Co.*, 355 F.3d 1313, 1320 (Fed. Cir. 2004).

If there are "slight differences" between separate elements disclosed in a prior art reference and the claimed invention, those differences "invoke the question of obviousness, not anticipation." *NetMoneyIN*, 545 F.3d at 1071; *see also Trintec*, 295 F.3d at 1296 (finding no anticipation and stating that "the difference between a printer and a photocopier may be minimal and obvious to those of skill in this art. Nevertheless, obviousness is not inherent anticipation."). Statements such as "one of ordinary skill may, in reliance on the prior art, complete the work required for the invention," and that "it is sufficient for an anticipation if the general aspects are the same and the differences in minor matters is only such as would suggest itself to one of ordinary skill in the art," *actually relate to obviousness*, not anticipation. *Connell*, 722 F.2d at 1548.

4. Obviousness

Included within the presumption of validity is a presumption of non-obviousness. *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 714 (Fed. Cir. 1984). Obviousness is grounded in 35 U.S.C. § 103, which provide, *inter alia*, that:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, 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 negative by the manner in which the invention was made.

35 U.S.C. § 103(a). Under 35 U.S.C. § 103(a), a patent is valid unless "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a). The ultimate question of obviousness is a question of law, but "it is well understood that there are factual issues underlying the ultimate obviousness decision." *Richardson-Vicks Inc.*, 122 F.3d at 1479; *Wang Lab., Inc. v. Toshiba Corp.*, 993 F.2d 858, 863 (Fed. Cir. 1993).

Obviousness is a question of law based on underlying facts, as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). "The Graham factors are (1) the scope and content of the prior art, (2) the difference between the prior art and the claimed invention, (3) the level of ordinary skill in the field of the invention, and (4) any relevant objective considerations." *Soverain Software LLC v. NewEgg, Inc.*, 705 F.3d 1333, 1336 (Fed. Cir. 2013). "The Graham Court explained that 'the ultimate question of patent validity is one of law.'" *Id.* (citing *Graham*, 383 U.S. at 17).

"Generally, a party seeking to invalidate a patent as obvious must demonstrate 'by clear and convincing evidence that a skilled artisan would have been motivated to combine the teaching of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.'" *OSRAM Sylvania, Inc. v. Am. Induction Techs., Inc.*, 701 F.3d 698, 706-707 (Fed. Cir. 2012) (quoting *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007)); *see also Amgen, Inc. v. F. Hoffman–LA Roche Ltd.*, 580 F.3d 1340, 1362 (Fed. Cir. 2009) ("An obviousness determination requires that a skilled artisan would have perceived a reasonable expectation of success in making the invention in light

of the prior art." (citations omitted)). "The Supreme Court has warned, however, that, while an analysis of any teaching, suggestion, or motivation to combine known elements is useful to an obviousness analysis, the overall obviousness inquiry must be expansive and flexible." *OSRAM*, 701 F.3d at 707.

Obviousness may be based on any of the alleged prior art references or a combination of the same, and what a person of ordinary skill in the art would understand based on his knowledge and said references. If all of the elements of an invention are found, then:

> a proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. *Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure.*

Velander v. Garner, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (emphasis added) (internal citations omitted).

The critical 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. *See C.R. Bard v. M3 Sys.*, 157 F.3d 1340, 1352 (Fed. Cir. 1998). For example:

> *[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.* Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, *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. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered,* and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398, 418-19 (2007) (emphasis added). The Federal Circuit case law previously required that, in order to prove obviousness, the patent challenger must demonstrate, by clear and convincing evidence, that there is a "teaching, suggestion, or motivation to combine. The Supreme Court has rejected this "rigid approach" employed by the Federal Circuit in *KSR Int'l Co. v. Teleflex Inc.*, 500 U.S. 398, 415 (2007). The Supreme Court stated:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. Sakraida and Anderson's-Black Rock are illustrative–a court must ask whether the improvement is more than the predictable use of prior art elements according to their established function.
>
> Following these principles may be more difficult in other cases than it is here because the claimed subject matter may involve more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement. 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. To facilitate review, this analysis should be made explicitly. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusions of obviousness"). 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.
>
> [. . .]
>
> The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents. The

> diversity of inventive pursuits and of modern technology counsels against limiting the analysis in this way. In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends. Granting patent protection to advance that would occur in the ordinary course without real innovation retards progress and may, in the case of patents combining previously known elements, deprive prior inventions of their value or utility.

KSR, 550 U.S. at 417-419. The Federal Circuit has harmonized the KSR opinion with many prior circuit court opinions by holding that when 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, or carry out the claimed process, 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)(citing *Medichem S.A. v. Rolabo S.L.*, 437 F.3d 1175, 1164 (Fed. Cir. 2006)); *Noelle v. Lederman*, 355 F.3d 1343, 1351-52 (Fed. Cir. 2004); *Brown & Williamson Tobacco Corp. v. Philip Morris, Inc.*, 229 F.3d 1120, 1121 (Fed. Cir. 2000) and *KSR*, 550 U.S. at 416 ("a combination of elements 'must do more than yield a predictable result'; combining elements that work together 'in an unexpected and fruitful manner' would not have been obvious"). Further, a suggestion to combine need not be express and may come from the prior art, as filtered through the knowledge of one skilled in the art. *See Certain Lens-Fitted Film Pkgs.*, Inv. No. 337-TA-406, Order No. 141 at 6 (May 24, 2005).

"Secondary considerations," also referred to as "objective evidence of non-obviousness," must be considered in evaluating the obviousness of a claimed invention, but the existence of such evidence does not control the obviousness determination. *Graham*, 383 U.S. at 17-18. A court must consider all of the evidence under the *Graham* factors before reaching a decision on obviousness. *Richardson-Vicks Inc.*, 122 F.3d at 1483-84. Objective evidence of non-

obviousness may include evidence of the commercial success of the invention, long felt but unsolved needs, failure of others, copying by others, teaching away, and professional acclaim. *See Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 894 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 857 (1984); *Avia Group Int'l, Inc. v. L.A. Gear California*, 853 F.2d 1557, 1564 (Fed. Cir. 1988); *In re Hedges*, 783 F.2d 1038, 1041 (Fed. Cir. 1986); *Kloster Speedsteel AB v. Crucible Inc.*, 793 F.2d 1565 (Fed. Cir. 1986), *cert. denied*, 479 U.S. 1034 (1987). The burden of showing secondary considerations is on the patentee and, in order to accord objective evidence substantial weight, a patentee must establish a nexus between the evidence and the merits of the claimed invention; a *prima facie* case is generally set forth "when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent." *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995); *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988), *cert. denied*, 488 U.S. 956 (1988); *Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, Comm'n Op. (March 15, 1990). Once a patentee establishes nexus, the burden shifts back to the challenger to show that, *e.g.*, commercial success was caused by "extraneous factors other than the patented invention, such as advertising, superior workmanship, etc." *(Id.)* at 1393.

Generally, a prior art reference that teaches away from the claimed invention does not create *prima facie* case of obviousness. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994; *Certain Rubber Antidegradants*, Inv. No. 337-TA-533 (Remand), Final ID (Dec. 3, 2008) (stating, "*KSR* reaffirms that obviousness is negated when the prior art teaches away from the invention.")). However, the nature of the teaching is highly relevant. *Id.* "A reference may be said to *teach away when* a person of ordinary skill, upon reading the reference, would be *discouraged from*

following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *Id.* (emphasis added). For example, "a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant." *Id.*

The Federal Circuit has recently explained, moreover, that the obviousness inquiry requires examination of all four Graham factors. *E.g.*, *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1375 (Fed. Cir. 2012). Indeed, courts must consider all of the Graham factors prior to reaching a conclusion with respect to obviousness. *In re Cyclobenzaprine Hydrochloride Extended–Release Capsule Patent Litig.*, 676 F.3d 1063, 1076–77 (Fed. Cir. 2012) (collecting cases). At all times, the burden is on the defendant to establish by clear and convincing evidence that the patent is obvious. *Id.* at 1077–78.

* * *

B. '595 Patent

Respondents argue that the asserted claims of the '595 Patent are "invalid for several reasons, including anticipation, obviousness, and indefiniteness."

1. Ackley I (JX-0725) (Claim 14) (Anticipation)

Respondents assert that U.S. Patent No. 5,337,327 to Ackley (the "Ackley I Patent") (JX-0725) anticipates claim 14. (RIB at 62-65.) The Ackley I Patent is entitled "VCSEL with Lateral Index Guide," was filed on February 22, 1993, and issued on August 9, 1994. (JX-0725, cover.) Thus, the ALJ finds that the Ackley I Patent is prior art to the '595 Patent under at least 35 U.S.C. § 102(a).

Respondents assert and Dr. Chang-Hasnain testified that, in her opinion, each limitation of claim 14 is disclosed in the Ackley I Patent. (RIB at 62-65; RX-0005C at Q/A 255-77.) Avago argues and Dr. Deppe testified, however, that the Ackley I Patent fails to disclose a "current-spreading layer" that is "substantially optically transparent" within the meaning of the asserted claims. (CRB at 23-24; CX-2223C at Q/A 126-34.)

The Ackley I Patent discloses a VCSEL comprised of top mirror stack 19 composed of alternating one quarter wavelength thick layers of aluminum gallium arsenide (AlGaAs) and aluminum arsenide (AlAs). (JX-0725 at col. 3, ll. 24-30.) According to the patent, the "[t]hickness of the last alternating layer is approximately one half wave length instead of one quarter wave length as is used for the other alternating layers." (*Id.* at col. 3, ll. 30-32.) Figure 1 of the Ackley I patent is reproduced below:;

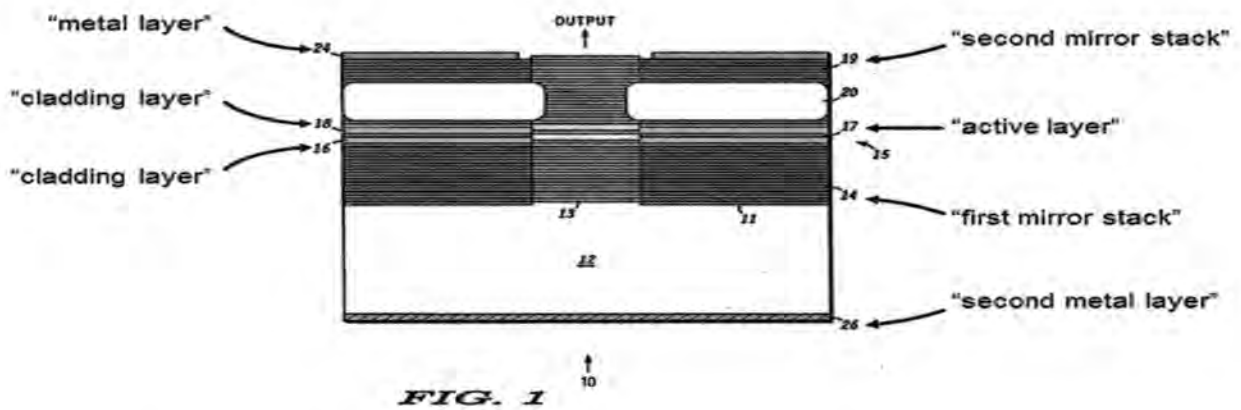


FIG. 1

(JX-725, Fig. 1.)

Respondents contend and Dr. Chang-Hasnain testified that in her view this last, thicker layer satisfies the "current-spreading layer" limitation of claim 14 because it must inherently be both "substantially optically transparent" and "electrically conductive," as required by the claim, or else the VCSEL would not function. (RIB at 64-65; RX-0005C at Q/A 263, 269.) Respondents argue that Avago's contention that the Ackley I patent does not disclose a

"substantially optically transparent" current-spreading layer means that the Ackely I patent would have to describe a VCSEL that does not work. (RIB at 64.) Respondents assert that this is unlikely to be the case. (RIB at 64.) In any event, Respondents contend an operational device is not necessary. (RIB at 64.) Respondents also argue under their construction the layer taken by itself must be optically transparent, which is confirmed by the '595 Patent. (RIB at 64-65.)

Avago and Staff agree that Respondents have failed to prove that Ackley I patent anticipates claim 14. Both Avago and Staff rely on Dr. Deppe's testimony that based on the disclosure of the Ackley I patent, the top layer would either be made of two possible materials. (CRB at 23-24; SIB at 64-65.) Avago and Staff further argue that Dr. Deppe further testified that with the first material the surface would degrade so much as to not allow light to pass and the second material would cause destructive interference with layers beneath it. (CRB at 23-24; SIB at 64-65.) In both cases, the optical performance of the VCSEL would be substantially degraded, which means the Ackley I patent does not teach the "substantially optically transparent" claim element. (*Id.*)

The ALJ finds that Respondents have failed to prove by clear and convincing evidence that the Ackley I patent anticipates claim 14. The ALJ finds that Dr. Deppe testified, the thickened mirror layer of interest in the Ackley I Patent would have been made from either AlGaAs or AlAs. (*See* CX-2223C at Q/A 132; JX-0725 at col. 3, ll. 24-30.) The ALJ finds that Dr. Deppe testified, if the uppermost layer were made of AlAs without any sealing layer above it (the Ackley I patent does not disclose a sealing layer above the uppermost layer), the layer would have degraded to a brownish dust, such that it would not be "substantially optically transparent." (*Id.*) The ALJ further finds that, Dr. Deppe explained, if the top layer were made from AlGaAs one half wavelength thick, it would have caused destructive interference with the quarter

wavelength thick layer of AlAs directly below it. (*Id.*; *see also* Tr. at 1212:11 – 1217:1.) The ALJ finds that Dr. Deppe explained, under this second situation the alleged disclosure of Ackley I would cause a significant adverse effect on the optical performance of the laser. (CX-2223C at Q/A 132; *see also id.* at 1219:5-19.) Dr. Chang-Hasnain, on the other hand, merely testified that the "substantially optically transparent" requirement is "inherent" without addressing whether, in fact, a thickened AlGaAs layer on the top of the VCSEL would cause a significant adverse effect on the optical performance of the laser. (*See* RX-0005C at Q/A 263, 269.) Thus, the ALJ finds that in light of the evidence that Avago presented evidence regarding the "substantially optically transparent" requirement and Respondents failure to convincingly address Avago's arguments, that Respondents have failed to prove by clear and convincing evidence that the VCSEL such as that described in column three of the Ackley I Patent would satisfy the asserted claims' requirement for a "current-spreading layer" that is "substantially optically transparent." (CX-2223C at Q/A 132) Accordingly, the ALJ finds that Respondents have not shown that claim 14 is invalid as anticipated by the Ackley I Patent.[7]

2. Lear Patent (Claims 14 and 19) (Anticipation)

Respondents assert that U.S. Patent No. 5,568,499 to Lear (the "Lear Patent") (JX-0733) anticipates claims 14 and 19 of the '595 Patent. (RIB at 65-71.) The Lear Patent, entitled "Optical Device with Low Electrical and Thermal Resistance Bragg Reflectors," was filed on April 7, 1995, and issued on October 22, 1996. (JX-0733, cover.) Thus, the Lear Patent is prior art to the '595 Patent under at least 35 U.S.C. § 102(e).

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[7] The ALJ notes that this result might be different without the presumption of validity and the requirement that invalidity be proved by clear and convincing evidence. The ALJ finds that here Respondents have not met this high burden.

Respondents contend that the Lear Patent discloses each of the claim limitations set forth in claims 14 and 19. (RIB at 65-71; *see also* RX-0005C at Q/A 206-30.) The principal dispute regarding the Lear Patent is whether the reference discloses the "current-spreading layer" of the asserted claims. (RIB at 65-71; CIB at 51-54; RX-0005C at Q/A 206-30; CX-2223C at Q/A 108-15.)

As shown in an annotated version of Figure 1 of Lear (from RDX-51) below, Lear discloses a VCSEL with an active region 18 that is made of an active layer 28 and cladding layers 30; a first DBR mirror 14 with quarter-wavelength thick layers and alternating indices of refraction; a second DBR mirror 16 with quarter-wavelength thick layers and alternating indices of refraction; an upper electrode 20 with an opening for the passage of light; and a lower electrode 22 underneath the substrate 12 (RX-00005C at Q/A 213).

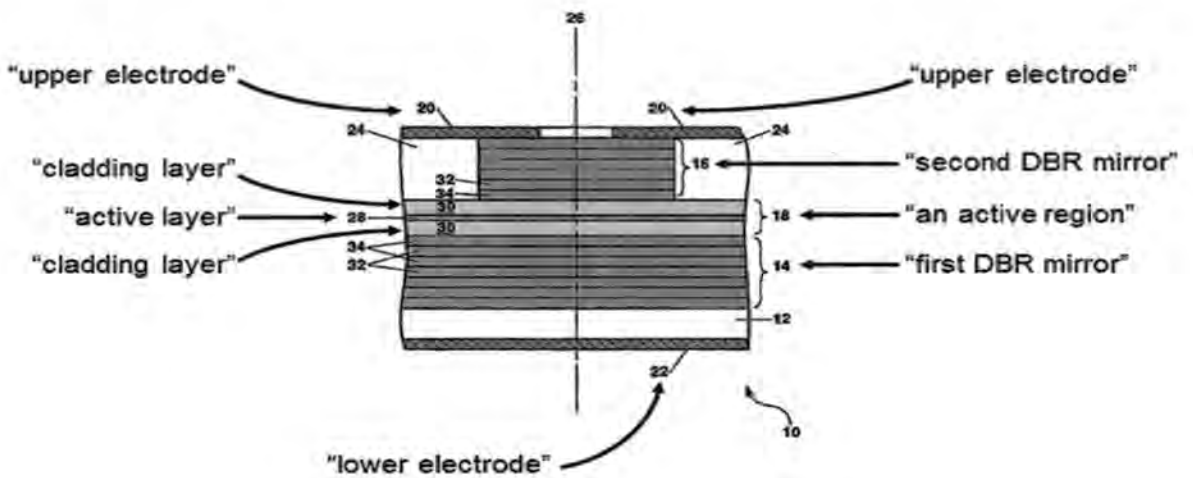


FIG. 1

The dispute centers on how to interpret a passage of Lear that describes Figure 1:

> The second DBR mirror also comprises at least one pair of semiconductor layers (each pair including a first layer 32 and a second layer 34), with each layer in the pair being substantially one quarter wavelength thick (or an odd multiple thereof), and having a different index of refraction to provide for reflection of light at the wavelength of operation of the device 10.

(JX-0733 at col. 8, ll.10-16.)

a. Claim 14

Respondents argue that "[p]roperly read, this description allows that "each" layer be considered individually and that "each" layer can be any multiple of a ¼ wavelength thick." (RIB at 67.). Thus, Respondents conclude that "this passage specifically allows for a VCSEL having multiple pairs of mirror layers that are ¼ wavelength thick (as called for by clam 14) while also having a top layer (or perhaps a pair of top layers) that are an odd multiple (*e.g.*, 3) of a ¼ wavelength thick." (RIB at 67-68.) Respondents argue that Avago's reading of this passage is flawed because rather than applying the word "each" as stated, Dr. Deppe effectively substitutes the word "every." (RIB at 68.) Respondents argue that there is nothing in the quoted passage, however, that would require that "every" layer be treated identically. (RIB at 68.)

Avago argues that the Distributed Bragg Reflector (DBR) mirror was a structure well-known in the art. (CIB at 52.) Avago asserts that Lear, in conjunction with its parenthetical "or an odd multiple thereof" refers to a DBR mirror. (CIB at 52.) Avago contends that a person of ordinary skill in the art reading, "The semiconductor layers ***within each DBR mirror*** are preferably about one-quarter wavelength thick (or an odd multiple of one quarter wavelength) for a wavelength of operation of the device so that a reflection of light from each pair of semiconductor layers is additive" would understand the reference to mean that all of the layers can be 1/4 or 3/4 wavelength. (CIB at 52.) Thus, Avago argues that the Lear Patent does not disclose or teach increasing the thickness of the uppermost layer of the top mirror stack over those of the other layers. (CIB at 53.) Instead, Avago asserts that the Lear Patent teaches that each mirror has to have at least one pair of layers, high index layer 32 and low index layer 34, and each layer has to have the same thickness, either ¼ wavelength or an odd multiple thereof. (CIB at 53.) Thus, Avago argues that Claim 14 is not anticipated because there is no teaching in

Lear to suggest increasing the thickness of the upper layer to create a current-spreading layer while maintaining a mirror comprising ¼ wavelength layers, as explicitly required in claim 14. (CRB at 27.)

Staff agrees with Avago and submits that there does not appear to be any teaching in the Lear Patent, however, that the thickness of the top layer (and only the top layer) should be increased while leaving the thickness of the remaining layers of the mirror stack the same. (SIB at 57.)

The ALJ agrees with Avago and Staff that the Lear Patent fails to disclose increasing the thickness of the upper layer while maintaining a mirror comprising ¼ wavelength layers, as required by claim 14. Respondents focus on the passage in col. 8, ll. 10-16. However, the ALJ finds that even giving the passage the most favorable possible reading to Respondents (which for reasons discussed below, the ALJ does not believe it should be given), it, at best, teaches that a layer in the DBR mirror stack could be thickened. In effect, Respondents argue that because one layer could be thickened, that layer could be the top layer, and thus, the Lear Patent could disclose the thickened top layer of claim 14. The ALJ finds that even this best reading requires piling possibility upon possibility in a way that cannot meet clear and convincing evidence.

If this were not enough to show that Respondents have failed to prove by clear and convincing evidence that the Lear Patent anticipates claim 14, the ALJ further finds that Respondents' reading of this passage is likely not correct. This is especially the case when read in the context of the entire patent.

The ALJ finds that upon reading col. 7, ll. 29-34 of the Lear Patent a person of ordinary skill would reach the conclusion that Respondents' reading of col.8, ll. 10-16 is likely ***not*** correct. That discussion provides that: "The semiconductor layers *within **each** DBR mirror* are preferably

about one-quarter wavelength thick (or an odd multiple of one quarter wavelength)." The ALJ agrees with Avago that a person of ordinary skill would understand the reference to mean that ***each*** of the layers in the entire mirror stack would be 1/4 wavelength thick or odd multiple thereof—not that one layer would be ¾ wavelength thick while the rest remained ¼ wavelength thick. (JX-0733 at col. 7, ll. 29-34; CX-2223C at Q/A 108-15; Tr. 1229-1231.) The ALJ finds that this is consistent with the normal understanding of what a DBR mirror is—all the layers are of the same optical thickness. (*Supra*, Sec. VI.B.2.c.) With this understanding so established here, the ALJ finds that it is unlikely that the passage in column 8 that Respondents rely upon teaches such a completely different embodiment where one layer (or pair of layers), which could be the top layer, is thickened and all the rest are held the same. Moreover, the ALJ finds that when the Lear Patent wished to disclose that some layers should be different than others, it knew precisely how to disclose that. Instead of increasing solely the thickness of the top layer in order to spread the current, the Lear Patent teaches altering doping concentration:

> ***In one or more of the uppermost pairs*** of semiconductor layers of the second DBR mirror 16, ***the doping concentration may be increased*** to about 10^{19} cm^{-3} or more ***to facilitate electrically contacting the second DBR mirror 16 with a deposited upper electrode 20.***

(JX-0733 at col. 8, ll. 21-25.) Thus, the ALJ finds that Respondents' reading of the Lear Patent is not likely to be correct and cannot constitute clear and convincing proof that the Lear Patent discloses a surface-emitting laser with a "current-spreading layer" that is at least one half wavelength thick with top and bottom mirrors comprised of quarter wavelength thick layers. (CX-2223C at Q/A 108-115; Tr. 1229-1231.) Accordingly, Respondents have failed to prove by clear and convincing evidence that the Lear Patent anticipates claim 14.

b. Claim 19

Respondents also argue Claim 19 is anticipated by the Lear Patent. (RIB at 69-71.) Importantly, claim 19 does not require that the current-spreading layer be thicker than the underlying mirror layers. (RIB at 69.) Avago contends that claim 19 is not anticipated because at most Lear teaches to make all of the DBR mirror layers ¾ wavelength, and it says nothing about what this top layer of this configuration would look like or whether it would be substantially optically transparent in this type of device. (CRB at 28.) Avago argues that Respondents have failed to show by clear and convincing evidence whether that configuration would amount to a substantially optically transparent current spreading layer. (CRB at 28.) Avago asserts that Dr. Deppe actually testified that it would depend on the rest of the structure whether the VCSEL would work and the current-spreading layer would be substantially optically transparent. (CRB at 28.) Avago further asserts that Dr. Chang-Hasnain also did not provide testimony necessary to meet the clear and convincing burden either. She did not testify that increasing the thickness of the top two layers, and possibly other layers, as she claims was taught by Lear, would not cause an adverse affect on laser performance or result in a substantially optically transparent current spreading layer positioned between a top electrode and a mirror. (CRB at 28.)

Staff submits that with regard to the "current-spreading layer," claim 19 requires, *inter alia*, that it be "substantially optically transparent" and have "a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one." (SIB at 58.) Staff agrees with Respondents that even if all of the mirror layers were made ¾ of a wavelength thick rather than just the top layers, the Lear Patent would still satisfy the thickness requirement of claim 19. (SIB at 58-59.) This is because claim 19 has no requirement that the

current spreading layer be thicker than the mirror layers. (SIB at 59.) Staff submits that in that configuration, Respondents have not shown that the current-spreading layer would be "substantially optically transparent" as required by claim 19. (SIB at 59-60.) Thus, Staff argues that, while it is a "very close question," Respondents have failed to prove by clear and convincing evidence that claim 19 is anticipated by the Lear Patent. (SIB at 59-60.)

The ALJ agrees with Avago and Staff that Respondents have failed to demonstrate by clear and convincing evidence that the Lear Patent teaches the "substantially optically transparent" limitation as construed by the ALJ when the layers of the DBR mirror are at least ¾ (or odd integer multiple of a ¼) wavelength thick. (Tr. 1229-1231.) The only evidence Respondents offered in this regard, is cursory testimony by Dr. Chang-Hasnain that in her view the upper layer would be optically transparent. (*See* RX-0005C at Q/A 214, 222.) This is simply insufficient to meet the clear and convincing standard of proof. While the ALJ agrees with Staff that this issue presents a very close question and the result would likely be different under a preponderance of the evidence standard, Respondents bear the burden of proving by clear and convincing evidence that the ¾ wavelength configuration of Lear Patent would meet the "substantially optically transparent" requirement. The ALJ finds that they have failed to present clear and convincing evidence that the Lear Patent discloses a current-spreading layer that is substantially optically transparent within the meaning of claim 19. Accordingly, the ALJ finds that that claim 19 has not been shown to be invalid as anticipated by the Lear Patent.

3. Ackley I (JX-0725) In View of "Several Other Patents" (Claim 19)

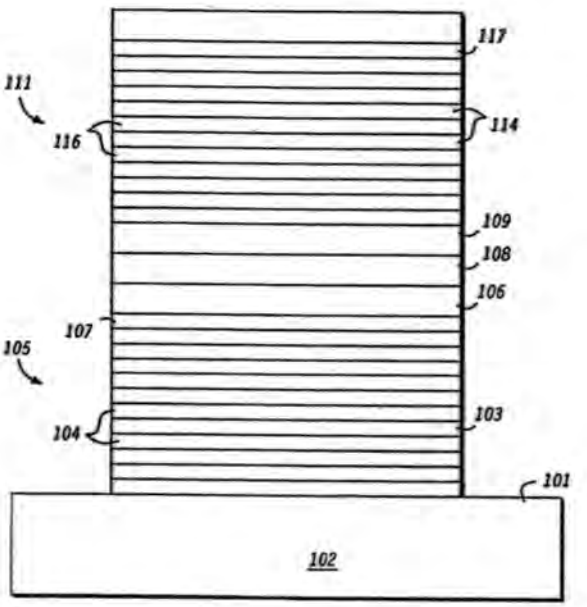
Respondents also argue that claim 19 of the '595 Patent would be rendered obvious by the Ackley I patent in view of any of a number of other patents. Specifically, Respondents argue that it would be obvious to modify Ackley I's teaching of a thick ½ wavelength layer into a layer

that is slightly thicker at ¾ wavelength. (RIB at 72.) However, as the ALJ found above, Ackley I fails to teach a "substantially optically transparent" current-spreading layer. (*See supra* Section VII.B.1.) Respondents do not address those findings in their obviousness arguments. Thus, the ALJ's findings with respect the "substantially optically transparent" current-spreading layer apply with equal force to Ackley I. Accordingly, the ALJ finds that Respondents have not shown by clear and convincing evidence that claim 19 is rendered obvious by the Ackley I patent, either alone or in combination.

4. Grudzinski Patent (JX-0730) (Claims 14 and 19) (Anticipation and Obviousness)

U.S. Patent No. 5,547,898 to Grodzinski et al., entitled Method for P-Doping a Light Emitting Device," was filed on September 18, 1995 and issued on August 20, 1996 (the "Grodzinski Patent"). (JX-0730.) The Grodzinski Patent claims priority to an application filed on July 5, 1994. (JX-0730, cover.) Thus, the ALJ finds that the Grodzinski Patent is prior art under at least 35 U.S.C. § 102(e).

Figure 1 of the Grodzinski Patent is set forth below:



(JX-0730, Figure 1.)

FIG. 1

Figure 1 depicts a VCSEL (or at least a portion of a VCSEL) comprising a top mirror 111 including alternating layers 114 and 116, each of which are one quarter wavelength thick. (JX-0730 at col. 3, ll. 29-39.) Layer 117, which is depicted at or near the top of the mirror stack, has a thickness of either three quarters or one half wavelength. (*Id.* at col. 3, ll. 39-45 ("[T]hickness of an aluminum gallium arsenide layer 117 . . . which is the last layer of aluminum gallium arsenide on DBRs 111, is set at a thickness of either three quarters of a wavelength or one half a wavelength, instead of one quarter wavelength as used in the other alternating layers 114 and 116.").)

Avago raises two arguments why the Grodzinski Patent does not anticipate. (CRB at 29-31.) First, Avago argues that Respondents' arguments are based on assumptions about the unlabeled layer on Figure 1. (CRB at 29-30.) Avago argues that Respondents have not shown

what the unlabeled layer is and for that reason it cannot render the '595 Patent invalid. Second, Avago argues that Respondents have failed to show disclosure of any electrode that might be used with the device as required by the claims.

Respondents argue that the Grodzinski Patent "specifically teaches setting the top layer 'at a thickness of either three quarters of a wavelength or one half a wavelength, instead of one quarter wavelength as used in the other alternating layers.'" (RIB at 73 (quoting JX-0730 at col. 3, ll. 38-45).) Respondents assert that "even beyond the usefulness of its teachings for demonstrating the obviousness of claim 19 over Ackley I, Grodzinski actually teaches all of the elements of claims 14 and 19 and thereby anticipates them." (*Id.*) Respondents assert that "[t]here is also explicit language in the specification describing the top layer of the top DBR as being either ½ or ¾ wavelength thick . . . [and] (Given this specific teaching, there is a high likelihood that the top layer 117 is mis-marked in Figure 1." (RIB at 73 (citations omitted).)

Respondents admit "[t]he only items not explicitly taught by the text are the presence of the top and bottom electrodes." (RIB at 73.) Instead Respondents argue that "those two elements are inherent in the teachings of Grodzinski, or at worst would have been obvious design choices amongst one of only two configurations to any one of ordinary skill in the art at the time who was trying to make use of the Grodzinski VCSEL structure." (*Id.*) Respondents assert that there is no dispute that any VCSEL would require an electrode of some kind, and those of ordinary skill would be well aware of the very limited number of potentially usable electrode designs. (*Id.*) Respondents contend that this is not a case where one was working to modify or combine two designs, but rather one where a skilled technician was building an operable device once given the guts of the design. (*Id.*)

Staff submits that Respondents have failed to prove by clear and convincing evidence to establish that the Grodzinski Patent disclosed the "top electrode" limitation of the asserted claims. (SIB at 62.) Staff also agrees that Respondents have not shown that Grodzinski Patent renders the asserted claims obvious. (SIB at 62-63.)

The ALJ find that Respondents have failed to prove that the Grodzinski Patent anticipates or renders obvious the asserted claims. Specifically, the ALJ finds that Respondents have failed to show by clear and convincing evidence that the Grodzinski Patent discloses a substantially optically transparent current-spreading layer and a top electrode formed on the side of such a current spreading layer having a configuration to define an opening for the passage of light energy. The ALJ finds that while Dr. Chang-Hasnain testified that, in her opinion, layer 117 satisfies the "current-spreading layer" limitation of the asserted claims, (RX-0005C at Q/A 239), but there is an unlabeled layer on top of layer 117, and the Grodzinski Patent does not appear to explain what that layer is intended to depict (*Id.* at Q/A 241). In her testimony, Dr. Chang-Hasnain testified that the unlabeled element could be either a current-spreading layer or a top electrode. (*Id.* at Q/A 241.) At the hearing, Dr. Chang-Hasnain testified that, in her view, Figure 1 erroneously labeled the second layer as 117, when the top depicted layer should actually have been labeled 117. (Tr. at 1015:10 – 1016:1.) However, Dr. Chang-Hasnain further testified that, in the alternative, there was a "remote probability" that the unlabeled top layer of Figure 1 depicted a top electrode. (*Id.*) The ALJ finds that this uncertainty about what the unlabeled layer is dooms Respondents' invalidity arguments.

Indeed, as Dr. Deppe testified, if the unlabeled layer above layer 117 depicted a top electrode, it would have been either a solid transparent electrode (for a top-emitting VCSEL) or a solid opaque electrode (for a bottom-emitting device). (CX-2223C at Q/A 121-22.) The ALJ

finds that in either case, a top electrode for the VCSEL disclosed in the Grodzinski Patent need not have an opening for the passage of light as required by the asserted claims. (*Id.* at Q/A 124-25.)

The ALJ finds that, according to Dr. Deppe, such an electrode would not satisfy the "top electrode" limitation of the asserted claims, which requires, *inter alia*, a "top electrode having a configuration to define an opening for passage of said light energy generated at said optical cavity." (*Id.* at Q/A 122.)

As for Dr. Chang-Hasnain's contention that, while the Grodzinski Patent does not explicitly disclose a top electrode, a top electrode would have been inherent, as it would have been necessarily required in order for the depicted VCSEL to operate, Tr. 1016:24 – 1017:8, the ALJ finds that Respondents have failed to show by clear and convincing evidence that such a feature would be inherent, *see* CX-2223C at Q/A 120-125. Accordingly, the ALJ finds that Respondents have failed to show by clear and convincing evidence that the Grodzinski Patent anticipates the asserted claims of the '595 Patent.

As for Respondents obviousness contentions, they are facially inadequate. With regard to the missing top electrode, Dr. Chang-Hasnain testified that one of skill in the art would have "at least tried an electrode with an opening [for passage of light] . . . since that type of electrode was more traditional and avoided the problems of a transparent metal layer electrode." (RX-0005C at Q/A 251.) However, "[e]vidence of obviousness, especially when that evidence is proffered in support of an 'obvious-to-try' theory, is insufficient unless it indicates that the possible options skilled artisans would have encountered were 'finite,' 'small,' or 'easily traversed,' and that skilled artisans would have had a reason to select the route that produced the claimed invention." *Cyclobenzaprine*, 676 F.3d at 1072 (citing *Ortho–McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520

F.3d 1358, 1364 (Fed. Cir. 2008)). "[W]here the prior art, at best, gives only general guidance as to the particular form of the claimed invention or how to achieve it, relying on an 'obvious-to-try' theory to support an obviousness finding is impermissible." *Cyclobenzaprine*, 676 F.3d at 1072-72 (quotations and citations omitted). Nothing in Dr. Chang-Hasnain's testimony sheds light on why a skilled artisan would have chosen the claimed top electrode configuration in the absence of knowing the structure of claimed invention. Thus, the absence of such testimony suggests that skilled artisans would not have encountered finite, small, or easily traversed options in developing the claimed VCSEL. *See id.* Accordingly, Respondents have also failed to show that Grodzinski renders the asserted claims obvious.

5. Secondary Considerations of Nonobviousness

Objective indicia of nonobviousness play a critical role in the obviousness analysis. They are "not just a cumulative or confirmatory part of the obviousness calculus but constitute[ ] independent evidence of nonobviousness." *Ortho–McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1365 (Fed. Cir. 2008). Objective indicia "can be the most probative evidence of nonobviousness in the record, and enables the court to avert the trap of hindsight." *Crocs, Inc. v. Int'l Trade Comm'n*, 598 F.3d 1294, 1310 (Fed. Cir. 2010) (internal quotation marks omitted).

As discussed above, Respondents have not put forward a serious obviousness case. However, Avago has offered evidence of objective considerations of nonobviousness and the ALJ must consider it. Specifically, Avago has contended that: (a) products embodying the invention of the '595 Patent have met commercial success and (b) the inventions of the '595 Patent have been adopted by others in the industry. The ALJ finds that they have not proven these objective considerations.

First, Avago bases its commercial success argument on its sales of the [redacted] VCSEL. Avago bears the initial burden of showing that there is a nexus between the commercial success and patented inventions. *See Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311-12 (Fed. Cir. 2006). While the ALJ finds that Avago has shown that the [redacted] VCSEL practices the claimed inventions, Avago has not shown that it was the claimed inventions that drove the commercial products' success. *See, e.g., Abaxis, Inc. v. Cepheid*, No. 10-CV-02840-LHK, 2012 WL 2979019, at *4 (N.D. Cal. July 19, 2012) (excluding testimony of technical expert on the ultimate conclusion of commercial success because of lack of expertise in marketing and sales).

Second, Avago argues that "[a]ll VCSEL suppliers who supply Respondents—[redacted]—have incorporated the patented technology . . . into their VCSELs." (CIB at 65.) Moreover, Avago argues that "[o]ther leading VCSEL suppliers have also sought and taken licensees to the '595 patented technology." These two sentences are the extent of Avago's arguments regarding adoption by others. The ALJ finds that they are insufficient to prove, by a preponderance of the evidence, that there has been adoption of the patented technology by others.

6. Indefiniteness

Respondents argue that there are at least two specific instances where adopting Complainants' proposed constructions would render the claims invalid as indefinite: (1) the manner in which Dr. Deppe proposes to contort Complainants' formal proposed construction for "a current-spreading layer"; and (2) the manner in which Dr. Deppe construes "approximately equal to." Respondents assert that "without the type of specificity offered by Respondents' proposed construction for the term "approximately equal to," Complainants' proposal will entirely read the thickness limitations out of the claims." (RIB at 76.) Respondents' argue that

"[i]f Complainants' construction using Dr. Deppe's understanding is adopted, then the claims are necessarily invalid." (RIB at 76.)

Respondents continue that the same is true for Complainants' interpretation of "current-spreading layer." Respondents argue that under Avago's construction, where multiple layers can be grouped together under the umbrella of "a current-spreading layer" so long as the layers all have indices of refraction that are not too different from one another, then those of ordinary skill will have no way of deciding how similar adjacent layers would need to be to qualify for grouping. (RIB at 76-77.)

Avago responds that a person of ordinary skill would understand the meaning of the claims and Respondents have not shown that the claims would be indefinite. (CIB at 65-66.) In particular, Avago argues that the claims can be understood without a 1% limitation. (*Id.*) As for layer, Avago argues that a person of ordinary skill would understand the limits of this term because the patent informs the skilled artisan of the critical attributes of the current spreading layer. (CIB at 67.) For example, Avago notes that the layer must be "substantially optically transparent," electrically conductive, and it has to spread current. (CIB at 67.) Avago contends that "[a]s Dr. Deppe explained using his simulations, it is easy in practice to distinguish mirror layers from current spreading layers." (CIB at 67.)

Staff agrees with Avago that Respondents have not shown that these claims are insolubly ambiguous by clear and convincing evidence. (SIB at 55.)

The ALJ finds that Respondents have failed to prove by clear and convincing evidence that these claims terms of the '595 Patent are indefinite. As discussed, *supra*, Respondents' objections appear to be to Dr. Deppe's particular testimony and not that a person of ordinary skill could not discern what approximately equal to means in the context of the intrinsic evidence.

Respondents have simply failed to prove a person of ordinary skill could not understand what approximately equal to means in the context of the patent. The ALJ finds that the same holds true for current spreading layer. Avago offered evidence that based on the various requirements for the current-spreading layer, that simulations are possible to determine whether the current spreading layer is present. (CX-2223C at Q/A 188-190.) Moreover, as discussed, *supra*, Section VI.B.1.b, the ALJ has found that Dr. Deppe offered a persuasive methodology for interpreting the claims. The fact that the methodology is complex that does not render the claims indefinite. *See Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1346 (Fed. Cir. 2010) ("Although determining whether claimed movement was present in the accused packages required an expert using detailed computer simulations, this alone does not indicate that the claims are indefinite."). Accordingly, the ALJ finds that Respondents have failed to prove by clear and convincing evidence that the claims are indefinite.

C. '456 Patent

1. Anticipation

Respondents contend that three references anticipate various asserted claims of the '456 Patent.

a) Bruensteiner (JX-0682) (Claims 1, 6, 7, 21-23)

The article Bruensteiner, et al., "3.3.-V CMOS Pre-Equalization VCSEL Transmitter for Gigabit Multimode Fiber Links," *IEEE Photonics Tech. Letters*, Vol. 11, No. 10 (October 1999) ("Bruensteiner") (JX-0682) published in October 1999 and is prior art to the '456 Patent under at least 35 U.S.C. § 102(b). (JX-0682.)

Bruensteiner generally discloses a VCSEL-based system in which pre-equalization is performed in order to compensate for bandwidth limitations. (*See, e.g.*, JX-0682, Abstract.) Specifically, "[a]n additional equalizing current I_{Eq} is added in each bit that is preceded by a '0' bit. The result is that leading '1's', and leading '0's' in a run receive a smaller current than trailing '0's', as illustrated in Fig. 1." (*Id.* at MLX00003804.) Figure 1 of Bruensteiner is set forth below:

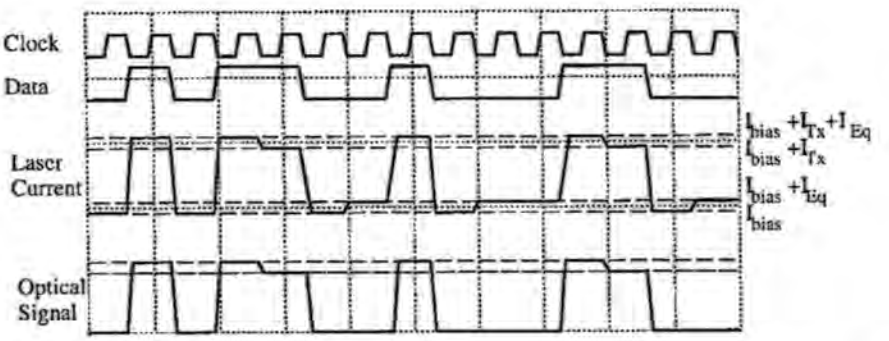


Fig. 1. Clock, input, and output waveforms of transition filter pre-equalization circuit and optical power output of laser diode operated with below threshold prebias.

Id.

Respondents contend that Bruensteiner discloses every element of claims 1, 6, 7, and 21-23. Respondents argue this despite the fact that Bruensteiner was the central reference before the examiner in the reexamination of the '456 Patent. (RIB at 109-112.) The principal dispute between the parties is whether Bruensteiner disclose a "negative peak(ing) portion" as recited in the claims. (RIB at 111-112; CRB at 47-48.) This is unsurprising because this was one of the principal arguments that Avago made to the examiner during the reexamination and one of the reasons the examiner found the claims allowable. (RIB at 84-86 (discussing reexamination), 111.) To overcome the PTO's determination in the reexamination, Respondents contend that Avago argued that the claims required that the negative peak portion must be less than a bit

width as shown in RDX-215 and RDX-216. (RIB at 111.) Respondents assert Avago then proceeded to argue that the negative peak portions of the drive waveform of Figure 1 of Bruensteiner were equal to a bit width. (RIB at 111.)

However, Respondents argue that the Bruensteiner driver circuit is not limited to operating at 1 Gb/s or 1 bit per clock cycle. (RIB at 111.) For example, Respondents assert that it could operate at 0.5 Gb/s or 1 bit for every two clock cycles. (RIB at 111 (citing Tr. 1287:21-24.) Respondents assert that "[s]ince the optical communication standards require that every generation of drivers be backward compatible, it is perfectly understandable that a high speed driver would be used at the slower data rates of prior generations. (RIB at 111.)

Avago argues that Bruensteiner discloses optical pre-equalization to compensate for bandwidth limitations not negative peaking. (CRB at 47.) Avago rejects Respondents' contention that Bruensteiner can be modified to change the clock rate with respect to the data to produce a variable negative peak width or duration. (CRB at 47.) Avago argues that Bruensteiner does not suggest changing the clock rate with respect to the data rate. Avago asserts that Respondent's modifications would go against the entire design of the circuit in Bruensteiner and cause serious problems with its operation. (CRB at 48-49.) Thus, Avago argues that Bruensteiner fails to disclose, either expressly or inherently, any asserted claim of the '456 Patent. (CRB at 49.)

Staff submits that the claims are not invalid as anticipated by Bruensteiner because Bruensteiner does not disclose a "negative peak portion" as contended by Respondents based on the reasons put forward by Avago. (SIB at 96.)

The ALJ finds that Respondents have failed to prove by clear and convincing evidence that Bruensteiner anticipates claims 1, 6, 7, and 21-23. Respondents have failed to meet the

heavy burden of proving invalidity based on a reference that was considered in depth by the examiner in the reexamination. *See Impax Labs., Inc. v. Aventis Pharm., Inc.*, 468 F.3d 1366, 1378 (Fed. Cir. 2006) ("When the prior art was before the examiner during prosecution of the application, there is a particularly heavy burden in establishing invalidity."). Specifically, Respondents have failed to prove that Bruensteiner discloses "a negative peak(ing) portion." Specifically, it is undisputed that Avago traversed the examiner's rejection based on Bruensteiner during the reexamination because Avago argued that the claims required that the negative peak portion must be less than a bit width. (RX-0827; RDX-215; RDX-216.) Respondents only argument to overcome this Avago's argument and the examiner's finding is that Bruensteiner could hypothetically be operated at different data rates other than 1 Gb/s. (RIB at 111.) Specifically, Respondents argue that Bruensteiner could be operated at 0.5 Gb/s and that under those operating conditions the negative peaking portion would be less than the bit width. (*Id.*) However, there is problem with this argument; nowhere in the reference does Bruensteiner disclose or discuss operating at less than 1 Gb/s, let alone 0.5 Gb/s. Indeed, Avago presented evidence that Bruensteiner teaches that the clock signal and the data signal are produced by a single external component (a bit-error-rate test device) and both signals have the same rate. (CX-2222C Q/A 53; JX-0682 at 3805 ("The drive circuit data and clock are provided by a bit-error-rate test (BERT) set producing a 1-Gb/s pseudorandom bit sequence (PRBS) of length 27-1 bits.").) Thus, the ALJ finds that there is no explicit teaching in Bruensteiner to support Dr. Lebby's hypothesized version of Bruensteiner and certainly nothing to support finding so by clear and convincing evidence.

In addition to the lack of explicit support in Bruensteiner for Dr. Lebby's "modified" version of Bruensteiner, there is no inherent disclosure of it either. If a prior art reference does

not expressly set forth a particular claim element, it still may anticipate the claim if the missing element is inherently disclosed by said reference. *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002); *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Inherent anticipation occurs when "the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Id.* In other words, inherency may not be established by probabilities or possibilities. *See Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991). Thus, "[t]he mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Id.* The critical question for inherent anticipation is whether, as a matter of fact, practicing an alleged prior art reference necessarily features or results in each and every limitation of the asserted claim at issue. *See, e.g., Toro Co. v. Deere & Co.*, 355 F.3d 1313, 1320 (Fed. Cir. 2004). The ALJ finds that the moment this legal standard is set out, it becomes apparent that Respondents' anticipation arguments are meritless. Indeed, their theory for overcoming the reexamination result is that Bruensteiner "could operate" (RIB at 111) in a different way and that such operation "is perfectly understandable" (*Id.*). This is the language of probabilities and possibilities and as matter of law is not the stuff of anticipation.

The law is clear that even if there are "slight differences" between separate elements disclosed in a prior art reference and the claimed invention, those differences "invoke the question of obviousness, not anticipation." *NetMoneyIN*, 545 F.3d at 1071; *see also Trintec*, 295 F.3d at 1296 (finding no anticipation and stating that "the difference between a printer and a photocopier may be minimal and obvious to those of skill in this art. Nevertheless, obviousness is not inherent anticipation."); *Connell*, 722 F.2d at 1548 ("Statements such as "one of ordinary skill may, in reliance on the prior art, complete the work required for the invention," and that "it is sufficient for an anticipation if the general aspects are the same and the differences in minor

matters is only such as would suggest itself to one of ordinary skill in the art," *actually relate to obviousness*, not anticipation. ") At bottom, Respondents' argument, even though they try to avoid the words in their brief, is that one of ordinary skill would know to modify Bruensteiner to operate in a manner not explicitly or inherently disclosed in the reference and that would practice the claimed invention. This argument, at best, is one of obviousness and not anticipation. Accordingly, the ALJ finds that Respondents have not proved that Bruensteiner anticipates any claim of the '456 Patent.

b) AMCC S7022 Driver (Claims 1, 6, 7, 21-23)

The key dispute regarding the AMCC S7022 Driver is whether Respondents have proved that it is prior art to the '456 Patent under 35 U.S.C. § 102(a). Respondents argue that Mr. John Stronczer testified that the AMCC S7022 Driver was available to the public prior to December 2000. (RIB at 111.) Respondents assert that Complainants had the opportunity to cross examine Mr. Stronczer regarding the availability of the S7022 Driver, but chose not to do such that his testimony stands "undisputed." (RIB at 111.) Respondents contend that Mr. Stronczer's testimony regarding the availability of the AMCC S7022 Driver is also confirmed by inventor Robert Elsheimer's Laboratory Notebook and "other publications," which consists of an EETimes article from August 1, 2000 that includes pricing and quantity information. (RIB at 111.) Respondents argue that "[t]hese documents clearly validate Mr. Stronczer's testimony that the S7022 was available to the public prior to December 2000." (RRB at 58-59.)

Avago argues that the AMCC S7022 datasheet that Dr. Lebby relies upon is dated June 11, 2001—about six months after the December 12, 2000 filing date of the '456 Patent and is not prior art. (CIB at 112.) Avago contends that Dr. Lebby admitted that this datasheet is the only document he relies on to support of his opinion that the AMCC S7022 driver satisfied the claim

limitations reciting a negative peak portion and that he also admitted that the other AMCC documents regarding the S7022 driver that he considered contained "nothing about the waveform shape." (CIB at 112.) Thus, Avago asserts that Dr. Lebby's opinion that the S7022 driver had a negative peak portion rests upon a single document, the June 2001 datasheet, RX-1266. (CIB at 112.) Avago contends that the laboratory notebook page and press release fall short of corroborating evidence. (CRB at 50-51.)

Staff submits that while Respondents have presented additional evidence that allegedly relates to the state of the S7022 Driver prior to 2001, this evidence is insufficient to clearly and convincingly establish that the AMCC S7022 Driver included this "Boost Level" capability as of December 2000 or that the driver provided a negative peaking parameter and was known and/or in public use by that time. (SIB at 97.) Staff argues that Mr. Stronczer's testimony requires corroboration, and such corroboration is particularly important where Mr. Stronczer is essentially testifying that AMCC itself invented what is claimed in the '456 Patent. (SIB at 97-98.) Staff submits that Respondents have failed to present sufficient corroboration to support the testimony by Mr. Stronczer that the S7022 Driver satisfied all of the limitations of the asserted claims of the '456 Patent as of December 2000 and was known or in public use by that time. (SIB at 98.)

Whether there is sufficient evidence to corroborate Mr. Stronczer's testimony requires a "[a] 'rule of reason' analysis involve[ing] an assessment of the totality of the circumstances including an evaluation of all pertinent evidence." *Adenta GmbH v. Orthoarm, Inc.*, 501 F.3d 1364, 1372 (Fed. Cir. 2007). The ALJ finds that Respondents have fallen far short of meeting their burden of demonstrating by clear and convincing evidence that the AMC S7022 that satisfied all of the limitations of the asserted claims of the '456 Patent was available by December 2000. The best Respondents have been able to prove is that it is likely that some type

of S7022 VCSEL driver existed by December 2000. However, on the key point of the actual disclosure of what the AMCC S7022 VCSEL driver could do in December 2000, there is no evidence in the record.

This is confirmed by looking at the two pieces of evidence on which Respondents rely. First, Respondents rely on the August 1, 2000 press release. (RX-0003C at Q/A 266/) However, there is nothing in the August 1, 2000 press release that refers to a device satisfying each limitations of the asserted claims, such as a parameter for affecting the negative peak portion, or that negative peaking is present in the VCSEL drive waveform during less than a full bit width of the logical '0' part of the current drive waveform. (CX-2222C Q/A 77.)

As for the page from inventor Robert Elsheimer's notebook (JX-0256C at AVITC30000089), that Dr. Lebby asserts shows that the S7022 driver was available as samples prior to the filing date of the '456 patent, (RX-0003C at Q/A 267, 268), that corroborates almost nothing. The ALJ agrees with Avago that at most, it suggests that Mr. Elsheimer thought that "samples" of some unidentified AMCC product might be available in February or March 2000 (months in the future when authored on October 29, 1999). (CX-2222C at Q/A 76.) The ALJ finds that it does not disclose the identity of the samples, much less identify them as samples of the AMCC S7022 VCSEL driver. (JX-0256C at AVITC30000089.) This simply cannot amount to clear and convincing evidence that the subsequently produced samples were produced, and met the claim limits.

Thus, the ALJ finds that Respondents have proffered no document adequate to corroborate Mr. Stronczer's testimony and prove by clear and convincing evidence that a product matching the description in the June 2001 S7022 datasheet was in existence prior to the December 12, 2000 filing date of the '456 patent. Accordingly, Respondents cannot establish

that the AMC S7022 is prior art. *See, e.g.*, *Juicy Whip v. Orange Bang, Inc.*, 292 F.3d 728, 743 (Fed. Cir. 2002); *Finnigan Co. v. Int'l Trade Comm'n*, 180 F.3d 1354, 1367 (Fed. Cir. 1999); *Woodland Trust v. Flowertree Nursery*, 148 F.3d 1368, 1373 (Fed. Cir. 1998).

c) AMCC S7011 Datasheet (JX-0681) (Claims 1, 6, 7, 21-23)

The datasheet "S7011 1.0/1.25 Gbps VCSEL Driver," Revision 3, dated June 7, 1999 (the "AMCC S7011 Datasheet") (JX-0681) is prior art as a printed publication under 35 U.S.C. §§ 102(a) & (b). The AMCC S7011 is described in the specification of the '456 Patent and was considered by the examiner during the prosecution of the application that issued as the '456 Patent. (JX-0471 at 2:11-24 & cover.) As such, Respondents bear an especially heavy burden in proving that the asserted claims of the '456 Patent. *See Impax Labs.*, 468 F.3d at 1378 ("When the prior art was before the examiner during prosecution of the application, there is a particularly heavy burden in establishing invalidity."). Avago argues that the AMCC S7011 Datasheet fails to disclose at least the following limitations of the asserted claims: (1) a drive waveform parameter for affecting the negative peak portion of the drive waveform; (2) a memory or storage that stores a negative peak(ing) parameter; (3) a temperature sensor; and, (4) the use of an aging factor to affect any waveform control parameter. (CIB at 114.) In particular, Avago asserts that although S7011 discloses an undershoot on the current waveform's falling edge, it fails to disclose any drive waveform parameter that affects the undershoot. (CIB at 115.) Avago also contends S7011 also fails to disclose or suggest, either expressly or inherently, any capability or need for adjustment of the undershoot, any parameters that affect the negative peak portion of a drive waveform, or a memory for storing such parameters. (*Id.*)

Respondents do not directly respond to any of these arguments. Respondents argue that the AMCC S7011 Datasheet discloses the "parameter for affecting the negative peak portion of

the drive waveform," Respondents point to RDX-259, asserting that the S7011 Datasheet discloses that the VCSELTrac technology is implemented to create an undershoot shown in Figure 3. (RIB at 119.) Thus, Respondents contend that "at least one of the disclosed programmable parameters, *e.g.*, IBIAS or IMOD is designed and selected for the purpose of affecting the negative peak portion, or undershoot, of the drive waveform." (*Id.*) Respondents also attempt to rely on the testimony Mr. Stronczer to establish this element. (*Id.*) Respondents conclude "the S7011 Datasheet explains that the undershoot is one of the features of the VCSELTrac technology and that the purpose of the VCSELTrac technology is to be able to shape and control the drive waveform, i.e., the undershoot or negative peak portion." (*Id.*)

The ALJ finds that once again Respondents have fallen far short of carrying their heavy burden of proving that the asserted claims are invalid over a reference that is discussed in the specification and was before the examiner both in the original examination and the reexamination. The ALJ finds that Respondents have failed to prove that the AMCC S7011 Datasheet discloses a drive waveform parameter for affecting the negative peak portion of the drive waveform. As an initial matter, the ALJ rejects Respondents' efforts to supplement the AMCC S7011 Datasheet with Mr. Stronczer's testimony about what the S7011 could actually do. If it is not disclosed in the datasheet, it is not relevant to whether the datasheet anticipates. *See NetMoneyIN*, 545 F.3d at 1071. The ALJ further finds that although the AMCC S7011 Datasheet discloses an undershoot on the current waveform's falling edge, it fails to disclose any drive waveform parameter that affects the undershoot. (CX-2222C at Q/A 89-93.) The ALJ further finds that the AMCC S7011 Datasheet also fails to disclose or suggest, either expressly or inherently, any capability or need for adjustment of the undershoot. (CX-2222C Q/A 91-92.) Thus, the ALJ finds that the AMCC S7011 Datasheet does not disclose or suggest any

parameters that affect the negative peak portion of a drive waveform. (CX-2222C Q/A 91-92.) Accordingly, the ALJ finds that the AMCC S7011 Datasheet does not anticipate the asserted claims.

2. Obviousness

a) Bruensteiner (JX-0682) (Claims 2, 4, 8, 11-13)

Respondents argue that it would have been obvious to combine the Bruensteiner Reference with either of U.S Patent Nos. 6,624,917 and 5,844,928 to render claims 2, 4, 8, 11-13 obvious. Respondents' entire analysis consists of the following paragraph:

> Like claim 1, Dr. Lebby testified why Bruensteiner alone and in combination with Paschal and/or Shastri renders claims 2, 4, 8, 11-13, and 15 of the 456 Patent obvious (RX-3C Lebby St. Q346-426). Other than disputing the motivation to combine, Complainants have not provided any reasons, other than those provided for claim 1, why of these claims would not be obvious (CPRE at ¶¶626-629). Regarding the motivation to combine, Dr. Lebby provided specific reasons why one would be motivated to combine the teachings of Bruensteiner with Pascal and/or Shastri (RX-3C Lebby St. Q361, 377-378, 383-384, 388-389). Accordingly, if the ALJ agrees with Dr. Lebby that claim 1 is anticipated by Bruensteiner, then the ALJ should also find claims 2, 4, 8, 11, 12, 13, and 15 obvious (Ground Rule 8.1(f)).

(RIB at 119-120 (footnotes omitted).)

Setting aside how completely inadequate this analysis is because it provides no description of the scope and content of the art, the motivation to combine, or any other *Graham* factor, the ALJ finds that it is entirely conditioned on a finding that Bruensteiner anticipates claim 1, which the ALJ rejected, *supra* VII.C.1.a. Accordingly, the ALJ finds that Respondents have failed to prove by clear and convincing evidence that Bruensteiner in combination with any prior art renders claims 2, 4, 8, 11-13 obvious.

b) Siegel (JX-0692) (Claims 1, 2, 4, 6-8, 11-13, 15, 21-23)

U.S. Patent No. 5,132,553, entitled "LED Pulse Shaping Circuit," to Siegel (JX-692) issued in July 1992, and therefore qualifies as prior art under 35 U.S.C. § 102(b).

Respondents argue that Siegel in combination with: (i) Forsberg[8] or Sanchez[9]; or (ii) Forsberg or Sanchez, and King[10] renders claim 1 (and hence the other claims) obvious. (RIB at 121.)

Avago disputes whether Siegel renders the asserted claims obvious. As an initial matter, Avago disputes whether Respondents have provided any motivation to combine these references. (CRB at 53.) Avago also argues that none of these references even disclose the essential element of the claims upon which the examiner relied in the reexamination for allowing these claims: "a parameter for affecting the negative peak portion." (CRB at 53.) Avago argues that "[e]ach of these references is silent as to any parameter that could affect the portion of the waveform that dips below the logic '0' level." (CRB at 53.) Avago argues that "[w]hat the PTO twice has deemed patentable is not simply the creation of a negative peak portion, but rather doing so using 'a parameter for affecting the negative peak portion of the drive waveform.'" (CRB at 54.) Avago also argues that there are a number of problems with obviousness combinations based on Siegel that Respondents propose:

- Siegel is directed to a pulseshaping circuit used to drive a light-emitting diode (LED), not a VCSEL. Avago argues that the electrical and performance characteristics of LEDs differ significantly from VCELs and thus, the circuit of

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[8] U.S. Patent No. 6,049,175 "Arrangement Relating to Light Emitting Devices" issued on April 11, 2000 ("Forsberg") (JX-697), and thus qualifies as prior art under 35 U.S.C. § 102 (a). (*Id.*).

[9] U.S. Patent No. 6,629,638 "Electro-Optic System Controller and Method of Operation" issued on October 7, 2003 and was filed November 28, 2000 ("Sanchez") (JX-685). Sanchez qualifies as prior art under 35 U.S.C. 102 § (e). (*Id.*)

[10] U.S. Patent No. 5,812,572 "Intelligent Fiberoptic Transmitters and Methods of Operating and Manufacturing the same" issued on September 22, 1998. ("King") (JX-686), and qualifies as prior art under 35 U.S.C. 102 § (b). (*Id.*)

Siegel could not be used with a VCSEL without substantial modifications. And such modifications would render the circuit in Siegel unfit for its original purpose. (CRB at 56.)

- There is testimony that the named inventors did not consider LEDs analogous and Mr. Lysdal of IPtronics admitted that "there is a distinction in the industry between VCSELs and LEDs." (CRB at 56.)

Avago also contends that a person of ordinary skill would not have been motivated to combine Siegel with Forsberg or Sanchez or King. (CRB at 56-58.) Avago also argues that Siegel fails to disclose the following limitations: (1) a memory or storage; (2) a memory or storage that stores a negative peak(ing) parameter; (3) a temperature sensor, or any use of temperature to affect any waveform control parameter; (4) the use of an aging factor to affect any waveform control parameter; and, (5) any parameter for affecting the negative peak portion of the drive waveform. (CRB at 56-57.)

Avago further argues that Siegel does not inherently disclose a memory simply because it discloses transistors as Respondents contend. (CRB at 57.) Avago asserts that nothing in Siegel suggests that memory for storing waveform control parameters is necessarily present in the device and Respondents' proposed structure would require counters operating at clock frequencies potentially two or more times greater than the data rate to generate the waveforms that are disclosed in Siegel, depending on the peaking duration. (CRB at 57.) Avago further asserts that Siegel also does not disclose how to synchronize the four counters Dr. Lebby added with the incoming data signal. (Id.)

Staff agrees with Avago that Respondents have failed to show why a person of ordinary skill in the art would be motivated to adapt an LED driver circuit to drive a VCSEL. (SRB at 21.) Moreover Staff agrees with Avago that there are significant hurdles to combining the Sanchez, King, and Forsberg references with Siegel to yield the claimed invention. (SRB at 22-23.)

Respondents admit that "an LED is not the same as a laser," but contend that "it would be

obvious to use the LED driver that controls the over and undershoot of the drive waveform with a laser ...." (RIB at 121.) Respondents assert that "lasers and LEDs are both semiconductor devices that emit light . . . in response to electrical stimulation..." and "they emit light with an intensity that varies with the degree of electrical stimulation in order to transmit signals consisting of 1's and 0's." (RIB at 121.) Respondents further assert that "[i]n both system, higher electrical current or voltage results in a more intense light output for the 1, and a smaller electrical current or voltage for the 0...." Respondents conclude that "[i]f one having skill in the art was looking to improve the 1-0 and 0-1 transition of a laser, they would naturally investigate circuits that operate LEDs as well because . . . both suffer from ringing and optical tail problems...." (RIB at 121-122.) Respondents argue that "[t]he resulting optical signal has the same issue, namely maintaining an eye opening that is as big as possible to be able to reliably transmit data as fast as possible...." (RIB at 122.)

Respondents also argue that there are similarities between LEDs and VCSELs. Namely, VCSELs historically grew out of LEDs, were an improvement on them for fiber optical transmitters, were originally driven by LED drivers, and have the same light, except VCSEL light is more adept at traveling over greater distances while maintaining coherency. (RIB at 122.)

Respondents assert that the incompatibilities put forward by Avago are "easily solved with the obvious addition of a minor DC voltage to Siegel's drive circuit...." Thus, Respondents argue it would have been obvious to use the circuit disclosed in Siegel with a laser to "achieve the successes that Siegel's circuit has with LEDs." (RIB at 122.) Specifically, Respondents contend "[t]he goal of controlling and improving the transition between logical '1' and '0' state for either light source would have motivated this person...." (RIB at 122.)

Respondents also contend that Forsberg and Sanchez provide a further motivation to

combine Siegel with a laser instead of a VCSEL by disclosing that their circuits can be used with an LED or laser. (RIB at 122-123.)

The ALJ finds that Respondents have failed to show that Siegel either alone or in combination with Forsberg, Sanchez, or King renders the asserted claims obvious for a number of reasons.

First, the ALJ finds that Respondents have failed to show that it would have been obvious to a person of ordinary skill to modify Siegel to operate with a VCSEL versus an LED. Avago presented cogent evidence that the electrical and performance characteristics of LEDs are significantly different from those of VCSELs and so a person of skill in the art would have known that an unmodified LED driving circuit could not drive a VCSEL with acceptable performance. (CX-2222C at Q/A 114-115.) For example, Avago's expert testified that such modifications would have rendered Siegel inoperative for its original purpose and may have even required a change in the operating principal for the circuit. (CX-2222C at Q/A 114.) In addition, Mr. Miller testified that Siegel does not provide a bias level above the threshold needed to operate a VCSEL with acceptable performance. (*Id.*) Even more problematic though are Siegel's teachings of reversing the direction of the current through the LED, which if done on a VCSEL would severely degrade performance. (*Id.* at Q/A 120-122.)

Moreover, the inventors of the '456 Patent, Jesse Chin and Robert Elsheimer testified that VCSELs are more complicated to drive than LEDs and LED drivers were incapable of being used with VCSELs. (CX-2091C at Q/A 111-114; CX-2097C at Q/A 52.) Mr. Lysdal, from IPtronics, also admitted that IPtronics does not promote the accused products for use with LEDs, and "that there is a distinction … between VCSELs and LEDs." (Tr. 833:23-824:22.) This is reinforced by the ten year gap between the filing of Siegel and the filing of the '456 Patent. If

the use of LED circuits to drive VCSEL circuits was so similar, it seems unlikely that the solution of Siegel would not have been applied earlier. *See Leo Pharm. Prods., Ltd. v. Rea*, 726 F.3d 1346, 1357 (Fed. Cir. 2013) (noting the number of years (14 and 22) between the publication of the references and filing of the patent weighed against a motivation to combine).

Second, the ALJ rejects Respondents' arguments that Siegel inherently discloses a memory or that it would be obvious to combine it with other references to include a memory. The ALJ finds that the evidence shows that the mere fact that it uses transistors does not mean that Siegel necessarily uses a memory. (CX-2222C at Q/A 116-118.) As was discussed *supra*, inherency requires that the something be necessarily present not probably or possibly present. Indeed, the disclosure of Siegel suggests the use of resistors, not parameters stored in a memory to tailor the shape of the waveform:

> It is an advantage of the present invention that the degree of pulse shaping may be easily controlled by utilizing variable resistors and adjusting their values and/or timing of the delay between the activation of the pair of pulse shaping transistors. Further, the variable resistor values may be adjusted to tailor the current peaking and charge extraction abilities to the characteristics of the particular LED coupled to the pulse shaping circuit.

(JX-0692 at col. 2, ll. 21-29.)

Thus, the ALJ finds that the Respondents have failed to show by clear and convincing evidence that Siegel inherently discloses a memory. (CX-2222C at Q/A 118.) The ALJ further finds that Respondents have also failed to show that it would have been obvious to combine Siegel with the other reference(s) to incorporate a memory. The ALJ finds that Avago presented evidence that such a modification would require significant changes that are not taught or suggested by Siegel. (CX-2222C at Q/A 118.)

Accordingly, the ALJ finds that Respondents have failed to prove by clear and convincing evidence that Siegel, either alone or in combination with the other references

Respondents rely upon, render claim 1 of the '456 Patent obvious and as a result the dependent claims as well.

c) Heilman (JX-0690) (Claims 1, 2, 4, 6-8, 11-13, 15, and 21-23)

Respondents argue that U.S. Provisional Patent Application No. 60/246,407, entitled "Method and System of Controlling the Turn Off Characteristics of a Vertical Cavity Surface Emitting Laser Diode," to Heilman (JX-690) ("Heilman") renders the asserted claims obvious. Staff argues that Heilman is not prior art and cannot serve as the basis for an obviousness. (SIB at 101-102; SRB at 23.) Respondents never responded to Staff's argument. The ALJ agrees with Staff that, on the record evidence cited in their brief, Respondents have failed to prove Heilman is prior art under 35 U.S.C. § 102(e). 35 U.S.C. 102(e) provides (under the pre-Leahy-Smith America Invents Act version):

> "A person shall be entitled to a patent unless (e) the invention was described in — (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the inter-national application designated the United States and was published under Article 21(2) of such treaty in the English language;"

Thus, in order to qualify as prior art under 35 U.S.C. § 102(e) as Respondents contend, an application claiming priority to the Heilman provisional must have either (i) published under section 122(b) or (ii) issued as a patent. *See, e.g.*, *In re Giacomini*, 612 F.3d 1380 (Fed. Cir. 2010) (finding patent to be prior art as of the date of its provisional application under § 102(e)). Respondents have failed to show that Heilman ever resulted in a published application under § 122(b) or a granted patent. In such a circumstance, Heilman cannot be prior art under 102(e) and cannot form the basis for an obviousness analysis. *See, e.g.*, *Pfizer, Inc. v. Teva Pharm., Inc.*,

518 F.3d 1353, 1366 (Fed Cir. 2008) (finding abandoned unpublished patent application not material for inequitable conduct because it was not prior art). Accordingly, the ALJ finds that Respondents have not proved that Heilman renders the claims obvious because they have failed to show that it is even prior art.

d) Wang Article (JX-0696) (Claim 1)

Respondents contend that the article by Wang et al., "Integrated Laser-Diode Voltage Driver for 20 Gb/s Optical Systems Using 0.3 μm Gate Length Quantum Well HEMT's," *IEEE Journal of Solid-State Circuits*, vol. 28, No. 7, pp. 829-34 (July 1993) ("Wang") (JX-0696) either alone or in combination with Sanchez (*see supra* Section VI.C.2.b) renders claim 1 of the '456 Patent invalid as obvious. (RIB at 132-135.) The ALJ finds that Wang is prior art because it is a printed publication under 35 U.S.C. § 102(b).

Avago argues that Wang does not render claim 1 obvious, either alone or in combination for several reasons. (CRB at 60-61.) First, Avago asserts that Wang fails to disclose a negative peak(ing) transient present in the VCSEL drive waveform during less than a full bit width of the logical '0' part of the current drive waveform. (CRB at 60.) Avago asserts that the only basis for Respondents' contention that this is disclosed is their expert's misunderstanding of Figure 4 of Wang. Second, Avago contends that Wang teaches away from the '456 Patent. (CRB at 60-61.) Specifically, Avago argues that Wang distinguishes between a laser diode current driver (LCDC), such as disclosed in the '456 Patent and a laser current voltage driver (LCVD) disclosed in Wang. (JX-0696 at MLX00003886; CX-2222C at Q/A 168.) Third, Avago argues that Wang does not inherently disclose a parameter for affecting the negative peaking portion. (CRB at 61.) Finally, Avago argues that Wang away teaches away from combining with an LCDC such as Sanchez. (*Id.*)

Staff argues that a parameter that merely ***enables*** undershoot to occur, such as that of the Wang Article, does not constitute a parameter with the purpose of affecting a negative peak portion of the drive waveform, as required by claim 1 of the '456 Patent. (SRB at 24.) Accordingly, Staff submits that Respondents have failed to show by clear and convincing evidence that the Wang Article, alone or in combination with the Sanchez Patent, renders claim 1 invalid as obvious. (*Id.*)

The ALJ finds that Respondents have failed to show that Wang renders the '456 Patent obvious either alone or in combination. The ALJ finds that Wang expressly teaches away from the modifications that Respondents suggest for several reasons. First, Wang teaches that the design of laser diode driver circuits is "very challenging," (JX-0696 at MLX00003886) which undermines Respondents' suggestion that it would "strictly the practice of combining an analog system with a digital system to address known problems" (CIB at 133). Wang explains why the problems with designing such a circuit are not trivial. Wang explains that the requirements of high speed and high current are "contradictory" and the elements that are needed to achieve them are "unfavorable" and "a series of optimization steps are necessary" to create a suitable device. (JX-0696 at MLX00003886.) Wang also explains even if you can design an appropriate circuit, that the connection of the designed laser driving circuit and the laser diode "becomes a difficult problem when the [laser diode] cannot be integrated on the same chip." (*Id.*) Respondents address none of these difficulties in their analysis. But even if they did, Wang explains why it would be futile. The circuit in Wang was designed for a laser diode where "only its anode can be connected to the driver," and thus, a laser diode current driver (LDCD) such as disclosed in the '456 Patent (CX-2222C at Q/A 168), is "unusable" with the laser diode in Wang. (JX-0696 at MLX00003886.) Instead, one must use a laser diode voltage driver (LDVD). (*Id.*) Wang

then explains that a laser diode voltage driver has "certain advantages over a LDCD in some cases...." (*Id.*) Indeed, Wang goes on to explain that the LDVD offers significant advantages including smaller drain current for the same output current, greater flexibility in use because the current can be adjusted over a much larger range, and the ability to be used with other devices. (*Id.* at MLX00003888-89.) Given these teachings, Avago's expert testifies a person of ordinary skill in the art would not be motivated to modify the circuit disclosed in Wang to be a LDCD circuit as disclosed in the '456 Patent. (CX-2222C at Q/A 168.) Avago's expert also testified that the Wang circuit is designed to be used with a laser device with a load of 20 to 25 Ω, which is only 1/3 or ½ the resistance of a VCSEL. (*Id.*) The ALJ agrees there is simply no evidence why a person of ordinary skill (which all agree is a B.S. in Electrical Engineering with 3-5 years of experience) would ignore all of the teachings of Wang on why not to use a LDCD and then modify the circuit to be used with a device with 2 to 3 times the load of the original device. The reference itself suggests that this would not be a trivial exercise. Accordingly, the ALJ finds that Respondents have failed to overcome this substantial teaching away to show by clear and convincing evidence that it would have been obvious to modify Wang to create the circuit disclosed in the '456 Patent. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.").

e) Secondary Considerations of Nonobviousness

Objective indicia of nonobviousness play a critical role in the obviousness analysis. They are "not just a cumulative or confirmatory part of the obviousness calculus but constitute[ ] independent evidence of nonobviousness." *Ortho–McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520

F.3d 1358, 1365 (Fed. Cir. 2008). Objective indicia "can be the most probative evidence of nonobviousness in the record, and enables the court to avert the trap of hindsight." *Crocs, Inc. v. Int'l Trade Comm'n*, 598 F.3d 1294, 1310 (Fed. Cir. 2010) (internal quotation marks omitted).

Avago offers evidence of two objective consideration of nonobviousness: (1) commercial success and (2) long-felt need/adoption by others in the industry.

Commercial Success

Avago contends that the sales of its domestic industry products for the '456 Patent constitute evidence of commercial success of the patented inventions of claim 1 of the '456 Patent. (CRB at 120.) Avago bears the initial burden of showing that there is a nexus between the commercial success and patented inventions. *See Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311-12 (Fed. Cir. 2006). However, as discussed, *infra*, Section IX.B.2, the ALJ has found that Avago has not proven that domestic industry products practice the claimed inventions of claim 1 of the '456 Patent. Accordingly, the ALJ finds that Avago has not proven that a nexus exists between the claimed inventions of claim 1 of the '456 Patent and the commercial success of the domestic industry products for the '456 Patent.

Long-Felt Need and Adoption by Others in the Industry

Avago argues that there was long-felt need for the invention of claim 1 of the '456 Patent, as evidenced by the fact that once Agilent commercialized the invention it was the first company to achieve significant commercial success in the parallel optics market, and it had a very large share of the market for many years. (CIB at 120-121.) Avago asserts that Agilent and Avago's use of the inventions resulted in their products comprising 80% or more of the parallel optics market for almost a decade, during the time period of approximately 2001 to 2010. (CIB at 120-

121.) Avago contends that "[n]one of the patents and products that Respondents claim anticipate or render obvious the '456 patent enjoyed such adoption by others in the industry." (CIB at 121.)

As with commercial success, the ALJ finds that Avago has failed to show a nexus between the '456 Patent and the commercial success that achieved, so there is no evidence that Avago's success in that market demonstrates a long-felt need for the inventions of the '456 Patent. Accordingly, the ALJ finds that Avago has failed to show long-felt need or adoption by others in the industry support objective indications of nonobviousness.

3. Indefiniteness

Respondents argue that the limitation "wherein the drive waveform includes a negative peak(ing) portion" is also invalid as indefinite unless that limitation is construed to be "wherein the drive waveform includes a negative peaking portion for every logic 1 to logic 0 transition." (RIB at 136.) Respondents assert that Avago took this position to distinguish the claimed subject matter from Bruensteiner, arguing that the "shorter than its associated data bit" requirement was inherent to the limitation "negative peak portion" and that this was the basis for allowance over Bruensteiner. (RIB at 136.) Respondents admit that while it is correct that Bruensteiner's driver includes a negative peak portion for the entire bit when the data rate is 1 bit/clock cycle, they argue that it does not hold true when the data rate is 1 bit for every two clock cycles, as Dr. Lebby explained when referring to Bruensteiner's Figure 2. (RIB at 136 (citing RX-830 at MLX00003805).) Respondents assert that at a data rate of one bit for every two clock cycles, the negative peak portion is less than a bit width and Bruensteiner anticipates. (RIB at 136.) Thus, Respondents contend that unless there is a negative peak portion for every transition from a 1 to a 0, *i.e.*, regardless of the data rate, one of ordinary skill in the art would not be able to determine

whether a circuit like Bruensteiner's infringes or not and the claims would be indefinite. (RIB at 136.)

Avago responds that this limitation is not indefinite as one of ordinary skill would have no trouble determining whether an electrical drive waveform includes a negative peak portion. (CIB at 121.) Avago argues that Dr. Lebby's allegations of indefiniteness for this limitation are based upon his improper modifications of the Bruensteiner reference, as explained by Mr. Miller in his testimony. (CIB at 121 (citing CX-2222C at Q/A 179.) Avago asserts that under its construction one of skill in the art would have no trouble discerning the scope of the claims because all that is required is that the drive waveform include "a" negative peaking portion. (CIB at 121.) Moreover, Avago asserts that the evidence shows that a person of ordinary skill could understand this limitation. (CIB at 121-122.)

Staff submits that Respondents are actually rearguing their view that the asserted claims are invalid as anticipated or rendered obvious by the Bruensteiner Article. (SIB at 104-105.) Staff argues that the plain and ordinary meaning of the phrase "wherein the drive waveform includes a negative peak portion" requires that the drive waveform include "a" negative peak portion. Moreover, Staff notes that Dr. Lebby testified that he agreed with the Respondents' proposed construction, which reflects his understanding of what the words of the asserted claims mean, and that he used that construction in forming his opinions. (Tr. at 1161:3 – 1163:4.) Thus, Staff argues that the evidence does not show that this claim phrase is so vague or ambiguous as to render the asserted claims invalid as indefinite.

The ALJ agrees with Avago and Staff that Respondents have failed to show by clear and convincing evidence that the claims are indefinite. The ALJ finds that Respondents' indefiniteness arguments are merely a rehashing of the arguments that the Bruensteiner article

renders the claims invalid under 35 U.S.C. §§ 102, 103. Respondents' hypothetical arguments regarding Bruensteiner do not prove that the claims cannot be interpreted. Indeed, Avago submitted evidence from its expert that the claims were amenable to construction and that a person of ordinary skill would understand them. (CX-2222C at Q/A 177-79.) Accordingly, the ALJ finds that Respondents have failed to show by clear and convincing evidence that the claims are indefinite.

VIII. LICENSE DEFENSES

A. Applicable Law

A license under a patent, whether express or implied, is generally a complete defense to a charge of infringement, as long as the patent or invention is used in accordance with the license agreement." *Certain Flash Memory Controllers, Drivers, Memory Cards, and Media Players and Products Containing Same*, Inv. No. 337-TA-619, Initial Determination at 37 (April 10, 2009 (unreviewed in relevant part) (citing *Glass Equip. Dev., Inc. v. Besten, Inc.*, 174 F.3d 1337 (Fed. Cir. 1999). Although a defendant has the burden to prove the affirmative license defense, it must only establish such a defense by a preponderance of the evidence. *Certain Lens-Fitted Film Packages*, Inv. No. 337-TA-406, Comm'n Op. at 4 (June 1999) (citing *Technical Develop Corp. v. United States*, 597 F.2d 733, 746 (Ct. Cl. 1979)).

B. '595 Patent

The FCI and Mellanox Respondents assert affirmative licensing defenses as to the '595 Patent. They rely on two agreements: (1) the Agilent/HP Master Agreement (JX-0161C) and (2) the [redacted] (JX-0263).

1. Agilent/HP Master Patent Ownership and License Agreement

At the time of its spinoff from Hewlett-Packard Co. ("HP") (*see* Order No. 12), on November 1, 1999, Agilent Technologies, Inc. ("Agilent") and HP executed a Master Patent Ownership and License Agreement ("HP Master License"). (*See* JX-0161C.) [redacted]

[redacted]

Mellanox and FCI assert that Agilent subsequently transferred all patent licenses and assignments to Complainants. (RIB at 77.) Mellanox and FCI assert that they each sell to the Hewlett-Packard Company ("HP") certain of their accused products, [redacted]. (RIB at 77.) Mellanox and FCI assert that those products are licensed to the '595 Patent. (RIB at 77.)

Avago argues that Respondents cannot have a license for the HP products because the license grant is [redacted]. (CIB at 71.) Avago contends that Respondents should have sought a sublicense from HP. (*Id.*) Avago also asserts that FCI and Mellanox failed to show that the HP Master License was even transferred or assigned to Avago. Avago argues that the documents Respondents do cite, JX-0021C and JX-0261C, contain no provisions that provide that Agilent assigned or transferred the HP/Agilent Master Patent Ownership and License Agreement to Avago. (*Id.* at 71-72.)

Avago asserts that while FCI and Mellanox contend that their products sold to HP are "HP Products," HP does not sell VCSELs and neither FCI or Mellanox make VCSELs. (CIB at 72.) Instead, Avago notes that all VCSELs in the accused products sold to Hewlett Packard are instead made by third parties [redacted] (*Id.*) Avago contends that HP does not specify the VCSEL design or performance, and there is no evidence that the VCSELs are even binned for HP requirements. (CIB at 72.) Instead, Avago argues that HP only purchases Active Optical Cables ("AOCs"). (CIB at 72.) Avago asserts that the products sold by FCI and Mellanox to HP are off-the-shelf products on which marketing labels are affixed,

whether by an adhesive-backed film or electronically such that when it is plugged in, the computer screen reads an HP product number. (CIB at 72.) Avago argues that [redacted] (CIB at 72.)

Avago further contends that under the HP Master License Agreement, Respondents' products that are sold to HP are not "private label" because they sell the same products, albeit with different part numbers, to others. (CIB at 73.) Avago argues that Respondents cannot rely on the Master Agreement to shield them from infringement liability simply because HP allegedly purchases the accused products from them.

Staff submits that Mellanox and FCI have presented evidence sufficient to show that certain of their accused products [redacted] branded as HP products, such that those products are licensed OEM versions of HP products [redacted] (SIB at 74.) Accordingly, Staff asserts that Mellanox and FCI have shown that certain of their accused products that are sold to HP are licensed to the '595 Patent pursuant to the Master Patent Ownership and License Agreement. (SIB at 74-75.)

The ALJ finds that Respondents have shown by a preponderance of the evidence that the products they sell to HP are licensed. *First*, the ALJ finds that the '595 Patent, the application for which was filed on June 8, 1995, [redacted] (JX-161 at AV-ITC40529964 (§1.2); JX-162; JX-163; JX-164; JX-165; JX-166).

Second, the ALJ rejects Avago's argument that Respondents have failed to prove that they are licensed under the HP Master Agreement because they have failed to prove that the HP Master Agreement was assigned or transferred to Avago. Respondents do not have to show that the HP Master Agreement was transferred because the '595 Patent remained subject to the license granted to HP regardless of whether or not the HP Master Agreement was assigned to Avago. This is because an assignee of a patent takes title to the patent subject to existing licenses. *Armstrong Pump, Inc. v. Hartman*, 745 F. Supp. 2d 225, 233 (W.D.N.Y. 2010) (citing *Boehringer Ingelheim Vetmedica, Inc. v. Merial, Ltd.*, 2010 WL 174078 (D. Conn. Jan. 14, 2010); *see also In re Cybernetic Servs., Inc.*, 252 F.3d 1039, 1052 (9th Cir. 2001) ("It had long passed into the text-books that ... an assignee acquired title subject to prior licenses of which the assignee must inform himself as best he can, and at his own risk.") (citing *Keystone Type Foundry v. Fastpress Co.*, 272 F. 242, 245 (2d Cir. 1921)); *L.L. Brown Paper Co. v. Hydroiloid, Inc.*, 118 F.2d 674, 677 (2d Cir. 1941); *Jones v. Berger*, 58 F. 1006, 1007 (C.C.D.Md. 1893) ("A subsequent assignee takes title to the patent subject to such [unrecorded] licenses, of which he must inform himself as best he can at his own risk."). Thus, by HP retains a license to the '595 Patent and Avago has not shown otherwise.

Third, the ALJ finds the accused Mellanox and FCI products sold to HP [redacted] (*See* JX-161 at 1.10.) The ALJ finds that the accused Mellanox products sold to HP include [redacted] The ALJ finds that the accused Mellanox products [redacted]

now engaged. Specifically, the ALJ finds that per HP's specific request and specifications, the accused products sold to HP by Mellanox (i) have a customized part number and label, (ii) have a modified EEPROM, (iii) are subjected to "additional testing" for performance and quality control, and (iv) are used by HP "to provide system solutions to [HP's] customers" (RX-0001C at Q/A 46-54; Tr. 722:1-6, 731:20-732:12; JX-442C). Similarly, the ALJ finds that the accused FCI transceivers sold to HP are "HP Products" because they too are products of the business in which HP is now engaged and have a custom label and part number, and the content of the EEPROM and the firmware are customized for HP, which allows the HP equipment to recognize FCI customized transceivers as HP-approved and qualified. (RX-11C at Q/A 11-18; JX-427 lines 188-198, 201-202, and 209.) Further, the ALJ finds that Complainants presented no evidence that the Mellanox and FCI products sold to HP are used by HP within the excepted fields of use of Exhibit B of JX-161. The Mellanox and FCI products are "HP Products" within the meaning of sections 1.10 and 3.1.

Fourth, the ALJ finds that [redacted] "A "license to produce, use and sell 'is not restricted to production by the licensee personally or use by him personally or sales by him personally. It permits him to employ others to assist him in the production, and in the use and in the sale of the invention. Nor need he take any personal part in the production." *Corebrace LLC v. Star Seismic LLC*, 566 F.3d 1069, 1073 (Fed. Cir. 2009) (quoting *Carey v. United States*, 326 F.2d 975, 979 (Ct. Cl. 1964)). A patent licensee's "license permits him to engage others to do ***all the work connected with the production of the article for him.***" *Id.* (quoting *Carey*, 326 F.2d at 979 (emphasis added)). Thus, in light of the factual findings above [redacted]

[redacted] *See Carnegie Mellon Univ. v. Marvell Tech. Group*, 890 F. Supp. 2d 602 (W.D. Penn. 2012) ("Where a licensee commissions the work, a third party's acts do not infringe.").

Fifth, as for Avago's arguments regarding *Intel Corp. v. Broadcom Corp.*, 173 F. Supp. 2d 201 (D. Del. 2001), the ALJ finds them to be the most meritorious by far, but still unavailing. In *Intel*, the defendant Broadcom argued that it was licensed for certain sales to Intel licensees under "have made" rights granted by Intel in its licenses with these licensees. The court in *Intel* denied cross motion for summary judgment on the "have made" defense finding that there were genuine issues of material fact "whether Broadcom *made* the products pursuant to a request from the licensee, in which case the making and selling would be authorized to the extent that licensee's license allows it to be, or whether Broadcom simply *sold* allegedly infringing off-the-shelf products to parties that happen to be Intel licensees." *Intel*, 173 F. Supp. 2d at 233. Here, the ALJ has found that these products [redacted] (RX-0001C at Q/A 46-54; Tr. 722:1-6, 731:20-732:12; JX-442C; RX-11C at Q/A 11-18; JX-427 lines 188-198, 201-202, and 209). Thus, Respondents have shown that these are not "off-the-shelf" technologies and thus would be authorized even under *Intel*. 173 F. Supp. 2d at 233; *see also Asetek Holdings, Inc. v. CoolIT Sys., Inc.*, No. C-12-4498 EMC, 2013 WL 5640905, at *3-*5 (N.D. Cal. Oct. 11, 2013).

Finally, Avago's arguments [redacted]

[redacted]

[redacted] *CoreBrace*, 566 F.3d at 1073 ("a right to have made is not a sublicense, as the contractor who makes for the licensee does not receive a sublicense from the licensee."), so [redacted] *See DCV Holdings, Inc. v. ConAgra, Inc.*, 889 A.2d 954, 961 (Del. 2005) ("Specific language in a contract controls over general language, and where specific and general provisions conflict, the specific provision ordinarily qualifies the meaning of the general one.") (citations omitted).

In sum, the ALJ finds that the Mellanox and FCI products sold to HP are subject to the HP/Agilent license.

2. [redacted] Licenses (or both)

[redacted] The [redacted]

[redacted]

Mellanox and FCI assert that they have either an express or implied license to practice the '595 Patent through an agreement between [redacted] (RIB at 80-81.) [redacted] (RIB at 80.) [redacted] Mellanox and FCI submit that the ALJ should reject "the self-serving, lay opinion testimony of Complainants' own witness on the legal interpretation of [redacted] not only improperly intrudes on the province of the ALJ . [redacted]

[redacted] (RRB at 33-34 (citations omitted).) Respondents also argue that the cases Avago cites are distinguishable because they do not involve similar language as is at issue here.

Avago argues that a license is not automatically transferred when the licensee is acquired by another company. (CIB at 68 (citing *Meso Scale Diagnostics, LLC v. Roche Diagnostics, GMBH,* 62 A.3d 62 (Del. Ch. 2013); *PPG Indus., Inc. v. Guardian Indus. Corp.*, 597 F.2d 1090 (6th Cir. 1979)).) [redacted]

[redacted] (CIB at 69.)

[redacted] Staff suggests that if the ALJ concludes there ambiguity in the Agreement, the full evidentiary record, including any evidence as to the parties' intent, may be taken into consideration, and considering that evidence there does not appear to any evidence that [redacted] believes that it is licensed to the '595 Patent. (SIB at 76-77.) Thus, the Staff respectfully submits that Mellanox and FCI have failed to show that they have an express or implied license based on the [redacted] Agreement. (SIB at 77.)

"[A] license agreement is a contract governed by ordinary principles of state contract law[.]" *Power Lift, Inc. v. Weatherford Nipple–Up Sys., Inc.*, 871 F.2d 1082, 1085–86 (Fed. Cir. 1989). New York law, which governs the [redacted] Agreement, has "long adhered to the sound rule in the construction of contracts, that where the language is clear, unequivocal and unambiguous, the contract is to be interpreted by its own language[.]" R/S Assoc. v. N.Y. Job Dev. Auth., 771 N.E.2d 240, 242 (N.Y. 2002) (quotation marks and citations omitted).)

The ALJ finds that Mellanox and FCI have failed to prove that their products are licensed under the [redacted] Agreement. [redacted]

[redacted] The law is clear that language such as this creates a license that cannot be automatically assigned. *See, e.g.*, *Cincom Sys., Inc. v. Novelis Corp.*, 581 F.3d 431, 436 (6th Cir. 2009) (explaining patent and copyright licenses are generally "personal" meaning they are non-transferrable); *Ulead Sys., Inc. v. Lex Computer & Mgmt. Corp.*, 351 F.3d 1139, 1147 (Fed. Cir. 2003) ("[A] non-exclusive licensee of a patent has only a personal and not a property interest in the patent.") (quoting *In re CFLC, Inc.*, 89 F.3d 673, 679 (9th Cir.1996)); *Rhone Poulenc Agro, S.A. v. DeKalb Genetics Corp.*, 284 F.3d 1323, 1328 (Fed. Cir. 2002) (recognizing the "need for a uniform national rule that patent licenses are personal and non-transferable in the absence of an agreement authorizing assignment," contrary to the common law rule that contracts are freely assignable); *PPG Indus., Inc. v. Guardian Indus. Corp.*, 597 F.2d 1090 (6th Cir. 1979) (holding patent licenses are non-transferrable unless expressly provided). [redacted] This unambiguous language governs. *See R/S Assoc.*, 771 N.E.2d at 242. [redacted]

[redacted] New York law does not permit such straining to create an ambiguity in the contract where there is a perfectly reasonable reading that does not create one. *See, e.g.*, *Flynn v. Timms*, 606 N.Y.S.2d 352, 354 (N.Y. App. Div. 3d Dep't 1993) ("A court will not strain to find an ambiguity where words have a definite and precise meaning, nor will it create policy terms by implication to rewrite a contract…"); *Stolt-Nielson SA v. AnimalFeeds Int'l Corp.*, 435 F. Supp. 2d 382, 387 (S.D.N.Y. 2006) (noting "New York's historically narrow view of what can be read into a contract by implication." (collecting cases)). [redacted] Thus, Respondents' arguments fail.

Finally, the ALJ notes that even if Section 4.7 is given the reading that Respondents seek, Respondents' defense would still fail. [redacted] part [redacted] Accordingly, the ALJ finds that for at least these reasons, Mellanox's and FCI's license defense under the [redacted] Agreement fails.

C. '456 Patent

In December 2008, Avago sued Emcore for patent infringement in the Northern District of California, asserting infringement of U.S. Patent Nos. 5,359,447 ("the '447 patent") and 5,761,229 ("the '229 patent"). (JX-0022C.) Before discovery began, that case was stayed pursuant to 28 U.S.C. § 1659(a) pending finality of Investigation No. 337-TA-669 in which the '447 and '229 patents were asserted. (Civil No. 3:08-cv-05394-SI.) After the Federal Circuit affirmed the Commission's Final Determination finding a violation of Section 337, the district court held a scheduling conference, and ordered the parties to mediate settlement prior to taking any discovery. (*Id.*) Avago and Emcore settled the California Emcore Action [redacted]. (JX-0022C.)

[redacted]

[redacted]

The [redacted] Agreement also provides that:

[redacted]

The [redacted] Agreement is governed by California law. (JX-022C at § 3.6.)

[redacted]

Respondents argue that in a [redacted] Agreement [redacted] Complainants agreed to [redacted] (RIB at 137.) [redacted]

"When a contract is reduced to writing, the intention of the parties is to be ascertained from the writing alone, if possible...." Cal. Civ. Code § 1639. "In the construction of a statute or instrument, the office of the Judge is simply to ascertain and declare what is in terms or in substance contained therein, not to insert what has been omitted, or to omit what has been inserted...." Cal. Code Civ. Proc., § 1858. However, "[a] contract must be interpreted so as to give effect to the mutual intention of the parties, and the whole of a contract is to be taken together, so as to give effect to every part, if reasonably practicable, each clause helping to interpret the other." *El Dora Oil Co. v. Gibson*, 256 P. 550 (Cal. 1927). Under California law:

> The test of admissibility of extrinsic evidence to explain the meaning of a written instrument is not whether it appears to the court to be plain and unambiguous on its face, but whether the offered evidence is relevant to prove a meaning to which the language of the instrument is reasonably susceptible. To determine whether offered evidence is relevant to prove such a meaning the court must consider all credible evidence offered to prove the intention of the parties. If the court decides, after considering this evidence, that the language of a contract, in the light of all the circumstances, is fairly susceptible of either one of the two interpretations contended for . . ., extrinsic evidence to prove either of such meanings is admissible.

Delta Dynamics, Inc. v. Arioto, 446 P.2d 785, 787 (Cal. 1968) (Traynor, C.J.) (citations and quotation marks omitted).

The ALJ finds that Mellanox and FCI have failed to show that their products have a license to the '456 Patent [redacted] Agreement. Considering the entire agreement as California law requires, it is impossible to read the [redacted] as broadly as Mellanox and FCI request. Most importantly, a reading of the phrase [redacted] that would release all patent claims by Avago against anyone

using or selling any [redacted] product would eviscerate [redacted] by effectively granting a license on all [redacted] products for all of Avago's U.S. patents. A fairer reading of the [redacted] in light of the fact that [redacted] had closed the sale of its VCSEL business two days earlier, is that [redacted] received a [redacted] It would be highly unusual indeed for a party to sign an agreement with the former owner of a business releasing the new owner of the business from liability without mentioning the new owner at all. Thus, there are no prospective rights to the '456 Patent granted by that agreement. [redacted] This is also consistent with the extrinsic evidence that Avago submitted. -(*See* CX-2220C at Q/A 19-22; CX-2221C at Q/A 17-22; JX-0186C at 51-52; RX-143C.) [redacted] but considering the entire agreement and the extrinsic evidence submitted, it is clear that the language [redacted] was not intended to grant a future license to [redacted] for the '456 Patent. *See Baseload Energy, Inc. v. Roberts*, 619 F.3d 1357, 1363-64 (Fed. Cir. 2010) (finding similar broad [redacted] language did not bar future patent infringement claims); *Howmedica Osteonics Corp. v. Wright Medical Technology, Inc.*, 540 F.3d 1337 (Fed. Cir. 2008) (finding under New Jersey law that [redacted] language did not bar future infringement suit under a previously unasserted patent when read in light of the totality of the circumstances).

IX. DOMESTIC INDUSTRY

A. Applicable Law

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." *Certain Data Storage Systems and Components Thereof*, Inv. No. 337-TA-471, Initial Determination Granting EMC's Motion No. 471-8 Relating to the Domestic Industry Requirement's Economic Prong (unreviewed) at 3 (Public Version, October 25, 2002) The "economic prong" of the domestic industry requirement is satisfied when the economic activities set forth in subsections (A), (B), and/or (C) of subsection 337(a)(3) have taken place or are taking place with respect to the protected articles. *Certain Printing and Imaging Devices and Components Thereof*, Inv. No. 337-TA-690, Commission Op. at 25 (February 17, 2011) ("*Printing and Imaging Devices*"). With respect to the "economic prong," 19 U.S.C. § 1337(a)(2) and (3) provide, in full:

> (2) Subparagraphs (B), (C), (D), and (E) of paragraph (1) apply only if an industry in the United States, relating to the articles protected by the patent, copyright, trademark, mask work, or design concerned, exists or is in the process of being established.
>
> (3) 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.

Id.

Given that these criteria are in the disjunctive, satisfaction of any one of them will be sufficient to meet the domestic industry requirement. *Certain Integrated Circuit Chipsets and Products Containing Same*, Inv. No. 337-TA-428, Order No 10 at 3, Initial Determination (Unreviewed) (May 4, 2000), citing *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, Commission Op. at 15, USITC Pub. 3003 (Nov. 1996). The Commission has embraced a flexible, market-oriented approach to domestic industry, favoring case-by-case determination "in light of the realities of the marketplace" that encompass "not only the manufacturing operations" but may also include "distribution, research and development and sales." *Certain Dynamic Random Access Memories*, Inv. No. 337-TA-242, USITC Pub. 2034, Commission Op. at 62 (Nov. 1987) ("*DRAMs*").

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 and Components Thereof*, Inv. No. 337-TA-524, Order No. 40 (April 11, 2005). The test for claim coverage for the purposes of the technical prong of the domestic industry requirement is the same as that for infringement. *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003); *see also Certain Doxorubicin and Preparations Containing Same*, Inv. No. 337-TA-300, Initial Determination at 109 (U.S.I.T.C., May 21, 1990) ("*Certain Doxorubicin*"), *aff'd*, Views of the Commission at 22 (October 31, 1990). "First, the claims of the patent are construed. Second, the complainant's article or process is examined to determine whether it falls within the scope of the claims." *(Id.)* As with infringement, the first step of claim construction is a question of law, whereas the second step of comparing the article to the claims is a factual determination. *Markman,* 52 F.3d at 976. The technical prong of the domestic industry can be satisfied either literally or under the

doctrine of equivalents. *Certain Excimer Laser Systems for Vision Correction Surgery and Components Thereof and Methods for Performing Such Surgery*, Inv. No. 337-TA-419, Order No. 43 (July 30, 1999). The patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent. *See Bayer*, 212 F.3d at 1247.

Avago argues that it meets the domestic industry requirement based on the activities of its wholly-owned subsidiary, Avago Technologies U.S. Inc. Specifically, Avago asserts that it has made (a) significant investment in plant and equipment; (b) significant employment of labor and capital; and (c) substantial investment in research and development with respect to the domestic industry products.

Congress enacted 19 U.S.C. § 1337(a)(3) in 1988 as part of the Omnibus Trade and Competitiveness Act. *See Certain Plastic Encapsulated Integrated Circuits*, Inv. No. 337-TA-315, USITC Pub. No. 2574 (Nov. 1992), Initial Determination at 89 (October 16, 1991) (unreviewed in relevant part). The first two sub-paragraphs codified existing Commission practice. *See id.* at 89; *see also Certain Male Prophylactic Devices*, Inv. No. 337-TA-546, Commission Op. at 39 (June 29, 2007). Under Commission precedent, these requirements could be met by manufacturing the articles in the United States, *see, e.g.*, *DRAMs*, Commission Op. at 61, or other related activities, *see Schaper Mfg. Co. v. U.S. Int'l Trade Comm'n*, 717 F.2d 1368, 1373 (Fed. Cir. 1983) ("[I]n proper cases, 'industry' may encompass more than the manufacturing of the patented item. . . .").

In addition to subsections (A) and (B), there is also subsection (C). "In amending section 337 in 1988 to include subsection (C), Congress intended to liberalize the domestic industry requirement so that it could be satisfied by all 'holders of U.S. intellectual property rights who are engaged in activities genuinely designed to exploit their intellectual property' in the United

States." *Certain Multimedia Display and Navigation Devices and Systems and Components Thereof, and Products Containing Same*, Inv. No. 337-TA-694, Commission Op. at 7 (August 8, 2011) (quoting *Certain Digital Processors and Digital Processing Systems, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-559, Final Initial Determination at 93 (unreviewed in relevant part) (May 11, 2007). Thus, "[u]nlike sub-parts (A) and (B), sub-part (C) of section 337(a)(3) 'does not require actual production of the article in the United States if it can be demonstrated that substantial investment and activities of the type enumerated are taking place in the United States.'" *Certain Personal Data and Mobile Communications Devices and Related Softwares*, No. 337-TA-710, Order 102: ID on Economic Prong at 4 (April 6, 2011) (unreviewed in relevant part) ("*Personal Data and Mobile Communications Devices*") (quoting H.R. Rep. No. 100-40, pt. 1, at 157 (1987)).

In *Printing and Imaging Devices*, the Commission held that "under the statute, whether the complainant's investment and/or employment activities are 'significant' is not measured in the abstract or absolute sense, but rather is assessed with respect to the nature of the activities and how they are 'significant' to the articles protected by the intellectual property right." *Printing and Imaging Devices*, Commission Op. at 26. The Commission further stated that:

> the magnitude of the investment cannot be assessed without consideration of the nature and importance of the complainant's activities to the patented products in the context of the marketplace or industry in question . . . . whether an investment is 'substantial' or 'significant' is context dependent. (*Id.* at 31.)

Indeed, the Commission has emphasized that "there is no minimum monetary expenditure that a complainant must demonstrate to qualify as a domestic industry under the 'substantial investment' requirement" of section 337(a)(3)(C). *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Commission Op. at 25 (May 16, 2008). Moreover,

the Commission has stated that the complainant need not "define or quantify the industry itself in absolute mathematical terms." *Id.* at 26.

Section 337(a)(3)(C) provides for domestic industry based on "substantial investment" in the enumerated activities, including licensing of a patent. *See Certain Digital Processors and Digital Processing Systems, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-559, Initial Determination at 88 (May 11, 2007) ("*Certain Digital Processors*"). Mere ownership of the patent is insufficient to satisfy the domestic industry requirement. *Certain Digital Processors* at 93. (citing the Senate and House Reports on the Omnibus Trade and Competitiveness Act of 1988, S.Rep. No. 71). However, entities that are actively engaged in licensing their patents in the United States can meet the domestic industry requirement. *Certain Digital Processors* at 93. In establishing a domestic industry under Section 337(a)(3)(C), the complainant does not need to show that it or one of its licensees is practicing a patent-in-suit. *See Certain Semiconductor Chips with Minimized Chip Package Size and Products Containing Same*, Inv. No. 337-TA-432, Order No. 13, at 11, (January 24, 2001) ("*Certain Semiconductor Chips*"). The complainant must, however, receive revenue, *e.g.* royalty payments, from its licensing activities. *Certain Digital Processors,* at 93-95 ("Commission decisions also reflect the fact that a complainant's receipt of royalties is an important factor in determining whether the domestic industry requirement is satisfied . . . [t]here is no Commission precedent for the establishment of a domestic industry based on licensing in which a complainant did not receive any revenue from alleged licensing activities. In fact, in previous investigations in which a complainant successfully relied solely on licensing activities to satisfy section 337(a)(3), the complainant had licenses yielding royalty payments.") (citations omitted). *See also Certain Video Graphics Display Controllers and Products Containing Same*, Inv. No. 337-TA-412,

Initial Determination at 13 (May 14, 1999) (*"Certain Video Graphics Display Controllers"*); *Certain Integrated Circuit Telecommunication Chips and Products Containing Same Including Dialing Apparatus*, Inv. No. 337-TA-337, U.S.I.T.C. Pub. No. 2670, Initial Determination at 98 (March 3, 1993) (*"Certain Integrated Circuit Telecommunication Chips"*); *Certain Zero-Mercury-Added Alkaline Batteries, Parts Thereof and Products Containing Same*, Inv. No. 337-TA-493, Initial Determination at 142 (June 2, 2004) (*"Certain Zero-Mercury-Added Alkaline Batteries"*); *Certain Semiconductor Chips*, Order No. 13 at 6 (January 24, 2001); *Certain Digital Satellite System DSS Receivers and Components Thereof*, Inv. No. 337-TA-392, Initial and Recommended Determinations at 11 (December 4, 1997) (*"Certain Digital Satellite System DSS Receivers"*).

B. Technical Prong

1. '595 Patent

Avago asserts that it has satisfied the technical prong of the domestic industry requirement through its [redacted] VCSEL, which its asserts practice claims 14 and 19 of the '595 Patent. (CIB at 48-50.)

Claims 14 and 19 recite "A surface-emitting laser comprising." The ALJ finds that Avago [redacted] VCSELs are surface-emitting lasers. (CX-2086C at Q/A 249-51; JX-0057C.) Claim 14 recites "a top mirror and a bottom mirror on opposed sides of said optical cavity, said top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction" and Claim 19 recites "a top mirror and a bottom mirror on opposed sides of said optical cavity." Avago products including a [redacted] VCSEL meet this limitation. (CX-2086C Q/A 257-58; JX-0057C.)

Claims 14 and 19 recite "a bottom electrode on a side of said bottom mirror opposite to said optical cavity." Avago products including a [redacted] VCSEL meet this limitation. (CX-2086C at Q/A 270-72; JX-0060C.) The remaining limitations are discussed below.

Respondents argue that the Avago [redacted] VCSEL fails to meet four limitations of the asserted claims of the '595 Patent, including: (1) the current-spreading layer thickness; (2) the "top electrode formed on a side of said current spreading layer opposite to said top mirror"; (3) ¼ wavelength thick mirror layers with alternating indices of refraction; and (4) "optical cavity having an active layer." (RIB at 59-62.) The remaining limitations of the claims are undisputed. (RIB at 59-60.)

Staff submits that the only contested limitation that Avago has failed to meet is the first limitation. (SIB at 50-53) Staff notes that some of the other limitations might not be met, but that is only to the extent they depend or relate to the current-spreading layer limitation. (SIB at 51, 53-54.) Staff respectfully submits that Avago has failed to present sufficient evidence to establish that the identified collection of layers in the [redacted] VCSEL satisfy the "current-spreading layer" limitations of the asserted claims based on its construction. (SIB at 52-53; SRB at 8.)

As with the accused products, the ALJ finds that Avago has proven that the [redacted] VCSEL meets the limitations of the asserted claims of the '595 Patent.

a) "current-spreading layer"

Dr. Deppe testified that, in his opinion, the "current-spreading layer" of the [redacted] VCSEL comprises [redacted]

(CX-2086C at Q/A 262; JX-0057C at AV-ITC50032162.) As Staff described it, put another way, the [redacted] (*See id.*) The relevant portion of the epitaxial recipe is reproduced below:

(JX-00057C.)

By contrast, Dr. Chang-Hasnain testified that rather than identify a "current-spreading layer" within the meaning of claim 14, in her view Dr. Deppe has instead identified a combination of numerous layers with different compositions and different doping levels, which are grown at different temperatures. (*See* RX-0006C at Q/A 242-51.) According to Dr. Chang-Hasnain, if this collection of layers were a single "layer," it would not have such varying compositions and grown processes. (*Id.* at Q/A 249.) Dr. Chang-Hasnain further notes that while one row of the [redacted] epitaxial recipe is [redacted] Dr. Deppe does not assert that [redacted] constitutes the claimed current-spreading layer. (*See id.* at Q/A 242.)

The ALJ finds Avago has shown by a preponderance of the evidence that this limitation is met. The document identified [redacted] However, the ALJ finds the testimony of Dr. Deppe persuasive in regards to the actual physical analysis. He testified in regard to this product:

Q262.	What is the basis of your opinion?
A.	The Avago VCSEL epi recipe shows that the VCSELs have a current-spreading layer as defined in the 595 patent includes all of the rows in the section labeled AV-ITC50032165-68. The current-spreading layer is located on the side of the top mirror structure located opposite to the optical cavity. The physical thickness of the current-spreading layer is μm, plus the graded region labeled in the recipe. The optical thickness, however, already accounts for Taking the plus the optical thickness of the as wavelength, and the combined Al Ga As optical thicknesses as wavelengths minus the accounting for the grade between the Al Ga As and Al Ga As of the upper mirror, half of the is accounted for as part of the current spreading layer. Using the refractive index of 3.243 for the half the optical thickness is equal to optical wavelengths. The total optical thickness of the current spreading layer of the product according to the 595 definition is therefore optical wavelengths. This

	gives an integer multiple of a quarter-wavelength of to an accuracy of It is important to note that the Avago VCSEL actually calls out a slightly shorter wavelength on page 6, which taking the GP (gain peak) wavelength as nm and the FP (Fabry-Perot) offset as nm, gives nm as the fixed lasing wavelength. Accounting for the actual designed lasing wavelength, the current spreading layer is designed to be an integer multiple of times a quarter wavelength.
	In each of the Avago VCSEL products, the epi recipe's show a similar design for the current spreading layer, except that This is true for the VCSEL. The Avago VCSEL epi recipe shows that the VCSELs have a currentspreadinglayer as defined in the '595 patent includes AV-ITC50032162. The current spreading layer is located on the side of the top mirror structure located opposite to the optical cavity. The physical thickness of the current-spreading layer is μm, plus the in the recipe. The optical thickness, however, already accounts for this Taking the plus the optical thickness of the as wavelength and the combined Al Ga As optical thicknesses as wavelengths minus the accounting for: half of the is accounted for as part of the current spreading layer. Using the refractive index of 3.26 for the optical thickness is equal to optical wavelengths. The total optical thickness of the current spreading layer of the product according to the '595 definition is therefore optical wavelengths. This gives an integer multiple of a quarter-wavelength of to an accuracy of It is important to note that the Avago VCSEL actually calls out a slightly shorter wavelength on page 6, which taking the GP (gain peak) wavelength as nm and the FP (Fabry-Perot) offset as nm, gives nm as the fixed lasing wavelength. Accounting for the actual designed lasing wavelength, the current spreading layer is designed to be an integer multiple of times a quarter wavelength. It should be noted that while the is clearly designed to produce an odd integer value of quarter-wave optical thickness in its current spreading layer, many of the Avago VCSEL products have an increased wavelength thickness to account for of the current spreading layer. Furthermore, in each of the current spreading layers of each of the Avago products, in the current spreading layer, and the use of the makes the current spreading layer substantially optically transparent for the designed fixed wavelength of the VCSEL. In addition, in

each of the Avago VCSEL products the

(CX-2086C at Q/A 262.)

Accordingly, for similar reasons to those discussed above with regard to the [redacted] VCSELs, the ALJ finds that Avago has presented sufficient evidence to show that the Avago [redacted] VCSELs satisfy the "current-spreading" limitations of the asserted claims. (CX-2086C at Q/A 262; JX-0057C at AV-ITC50032162.) Specifically, claim 14 recites "a current-spreading layer on a side of said top mirror opposite to said optical cavity, said current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an integer multiple greater than one, said current-spreading layer being substantially optically transparent and being electrically conductive" and claim 19 recites "a current-spreading layer on a side of said top mirror opposite to said optical cavity, said current-spreading layer being substantially optically transparent and being electrically conductive, said current-spreading layer having a thickness that is approximately equal to one-quarter of said wavelength times an odd integer multiple greater than one wherein said current-spreading layer and layers of said top mirror establish a consistent pattern of alternating indices of refraction." Avago products including a [redacted] VCSEL meet these limitations. (CX-2086C at Q/A 261-62, 284-86; JX-0057C.)

b) "top electrode formed on a side of said current-spreading layer"

Dr. Deppe testified that, in his opinion, Avago's [redacted] VCSEL satisfies the "top electrode" limitation of claim 14. (CX-2086C at Q/A 264-67.) Respondents' arguments regarding the "top electrode" limitation are similar to those presented in the context of the VCSELs of the accused products. (*See* RIB at 138-39; *see also* RX-0006C at Q/A 239-41.) This is substantially similar to the arguments presented *supra* regarding the accused products. The

ALJ rejected Respondents' claim construction for this term, and based on the claim construction adopted and the findings above that Avago has met the current spreading layer limitation, the ALJ finds that Avago has shown that this limitation is met. (CX-2086C at Q/A 262.)

c) "top mirror and said bottom mirror each having a plurality of quarter wavelength thick layers having alternating indices of refraction"

Dr. Deppe testified that, in his opinion, the "quarter wavelength thick layers having alternating indices of refraction" limitation of claim 14 is satisfied by the [redacted] VCSEL, as shown the [redacted] epitaxial recipe. (CX-2086C at Q/A 258; JX-0057C.) In Dr. Chang-Hasnain's view, the [redacted] VCSEL does not satisfy this limitation because it includes [redacted] (*See* RX-0006C at Q/A 259-62.) The ALJ finds that Dr. Deppe explained, however, how the epitaxial recipe shows that the [redacted] VCSEL includes a top and bottom mirror that each have a plurality of quarter wavelength thick layers with alternating indices of refraction. (*See* CX-2086C at Q/A 258.) Respondents' position appears to rest with their very restrictive view of "layer" and for the reasons set forth above with respect to infringement Avago has shown that the mirror layers include [redacted]. (*See supra* Section VI.B.1.a.) Accordingly, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSEL satisfies this limitation of claim 14.

d) "optical cavity"

Dr. Deppe testified that, in his opinion, the [redacted] VCSEL satisfies the "optical cavity" limitation of claim 14. (CX-2086C at Q/A 254-55; JX-0057C.) Respondents contend, however, that the [redacted] epitaxial recipe identifies [redacted] none of which are located between two spacer/cladding layers. (RIB at 61-62; *see also* RX-0006C at Q/A 267-71.) The ALJ finds Respondents' arguments are similar to those presented with regard to non-

infringement by the [redacted] VCSEL. For the reasons discussed above in the context of that VCSEL, *see supra*, Section VI.B.1.d, the ALJ finds that Avago has presented sufficient evidence to show that the [redacted] VCSEL satisfies this limitation of the '595 Patent. (CX-2086C at Q/A 254-55, 278-79; JX-0057C at AV-ITC50032160-64.)

a) Summary

The ALJ has found that each of the claim limitations of claims 14 and 19 are met for the [redacted] VCSEL Products. (CX-2086C Q/A 249-93; JX-0057C.) Accordingly, the ALJ finds that Avago has proved infringement of claims 14 and 19 for these products.

2. '456 Patent

In seeking to establish that it satisfies the technical prong of the domestic industry requirement with respect to the '456 Patent, Avago asserts that its VCSEL driver circuits—[redacted]

(collectively, "domestic industry products"), each of which contains one of six Avago VCSEL driver circuits, practice claim 1 of the '456 Patent.[11] Avago's technical expert for the '456 Patent, Mr. Miller, testified that, in his opinion, each of the six Avago VCSEL driver circuits satisfies all of the limitations of claim 1. (*See* CX-2085C at Q/A 619-759.) In general, Mr. Miller testified that datasheets for each of Avago's VCSEL drivers support his opinion that those drivers meet each limitation of claim 1. (CIB at 100-108; *See e.g.*, JX-0444C; JX-0268C; JX-0445C; JX-0259C; JX-0388C; JX-0269C.)

Respondents contend that the evidence of record fails to show that Avago's products containing its own VCSEL drivers satisfy either the "negative peak portion" or "parameter for

[11] With regard to the technical prong, Avago's domestic industry contentions are limited to claim 1 of the '456 Patent. *See* Order No. 13 (April 23, 2013).

affecting" limitations of claim 1 of the '456 Patent. (RIB at 102-03; RRB at 52-57.) Staff agrees and submits that Avago has failed to prove that its domestic industry products meet the technical prong. (SIB at 90-93; SRB at 17-20.) The ALJ agrees with Respondents and Staff.

a) The "Negative Peak Portion" Limitation

With regard to whether Avago's products satisfy the "negative peak portion" limitation of claim 1, Avago's expert, Mr. Miller, testified that:

> In order to achieve the product performance that we needed, and that was demanded by customers, in terms of high data rates at low error rates, I had determined during my work at Avago and Agilent that the use of ***negative peaking*** as claimed in claim 1 of the '456 patent was the best way to achieve those requirements for these products, including for the reasons described in the '456 patent.

(CX-2085C at Q/A 16.)[12] But the ALJ finds that as discussed above in the context of the accused products, ***negative peaking*** was a technique known in the art and does not establish that a VCSEL drive waveform will include a negative peak portion within the meaning of claim 1. (*See, e.g.*, JX-212C at 341:17 – 342:7.)

Avago further relies on certain simulations for developmental versions of its VCSEL drivers as evidence to support its assertion that those drivers output a waveform that includes a "negative peak portion" within the meaning of claim 1. (*See* CIB at 101-107.) In this regard, Mr. Miller testified regarding certain simulation test results for one Avago VCSEL driver, and opined that "a negative peaking portion is clearly visible in the waveforms." (CX-2085C at Q/A 705 (citing CX-0775C at AV-ITC50003821).) The depicted waveforms are set forth below:

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[12] In its post-hearing briefs, Avago attempts to buttress Mr. Miller's expert testimony with his alleged knowledge from his prior work as an employee of Avago. (CIB at 101.) None of this was contained in his expert report or direct witness statement. The ALJ ruled at the hearing that such undisclosed new factual support for his expert testimony was not allowed and so the ALJ disregards it. (Tr. 666:15-670:12.)

(CX-0775C at AV-ITC50003821.) Avago also presented testimony from certain of its fact witnesses, who testified that in various simulations of developmental versions of Avago's VCSEL drivers, the electrical waveform drops below the logic '0' level for certain parameter settings. (*See, e.g.*, CX-2094C at Q/A 33 (discussing CX-0775C); CX-2097C at Q/A 179 (discussing CX-0775C); CX-2089C at Q/A 328, 330 (discussing CX-1460C at AV-ITC50257467-68); *id.* at Q/A 382 (discussing CX-1464C at AV-ITC50257681).) Setting aside, as Respondents correctly note any effort to offer expert testimony through these fact witnesses (*see* RRB at 53-54), this evidence fails for several reasons.

As the ALJ discussed above, however, a VCSEL drive waveform does not necessarily satisfy the "negative peak portion" of claim 1 simply because the waveform passes below the logic '0' level at times. The ALJ finds that the testimony from Avago's fact witnesses is insufficient to establish that Avago's domestic products satisfy the "negative peak portion" requirement — as the ALJ found above, in order to show that its products satisfy this limitation,

Avago must establish that a "portion of the negative peak transient part of the drive waveform that has values below the value the waveform has at the instant in time immediately before the logical '0' to the logical '1' transition begins" is present in the VCSEL drive waveforms of its products. (*See supra* Section VI.C.1.) These witnesses, at best, only established that there might be some negative peaking in the products. However, as discussed above, Complainants acknowledge that the use of negative peaking does not mean that the drive waveform will include a negative peak portion. (JX-212C at 341:17–342:7; RX-0004C at Q/A 312.)

In addition, the ALJ finds that CX-0775C is not reliable evidence of the waveforms of the commercial products. CX-775C includes three pages of waveform images, AV-ITC50003819-21. First, the ALJ notes that the waveforms on pages -3819-20 are optical waveforms, which Avago's expert admitted cannot be relied on to show the claimed details of the electrical waveform (Tr. 591:17-594:21). Second, the ALJ finds that the waveforms on page -3821, while electrical, are simulations and not measured results with an actual VCSEL connected to the driver, as is required by the claims. The ALJ finds that the evidence demonstrates that this can make a significant impact on the shape of the waveform. (Tr. 594:22-595:2. 596:16-598:19, 645:2-653:14; RX-0004C at Q/A 293; see JX-212C at 344:2-15, 346:4-12, 350:12-25; RX-0009C at Q46). Moreover, these waveforms are for the "beta" version of the [redacted] which may or may not be the same version released to Avago's customers. (Tr. 599:6-600:24, 669:15-670:12.) Finally, the ALJ notes Mr. Miller made no attempt to measure or evaluate the waveforms in CX-775C with respect to the constructions for negative peak portion, negative peaking, and negative peak duration (CX-2085C at Q/A 704-705). Without such an analysis, there is no proof of a negative peak portion. In stark contrast, Dr. Lebby's analyses applied these agreed constructions consistently throughout his non-infringement and invalidity opinions.

Beyond this evidence, the ALJ further finds that Mr. Miller relied primarily on Avago's VCSEL driver datasheets, which reference parameters related to "peaking" as support for his opinion that the drive waveforms include a "negative peak portion." (*See, e.g.*, CX-2085C at Q/A 642-64.) Both Dr. Lebby and Avago's own corporate witness testified, however, that the datasheets alone are insufficient to establish whether or not the claimed negative peak portion is present in the drive waveforms. (*See, e.g.*, RX-0004C at Q/A 312; JX-212C at 346:4-12, 347:8 – 348:15.) For example, Mr. Robinson testified that:

17 So my question is – an Avago
18 representative, is – is it your contention that
19 whenever you have negative peaking in a laser
20 driver, the output waveform necessarily has a
21 negative peak portion?
~
25 THE WITNESS: So if you – to have a
1 negative peak portion of the drive waveform – I
2 believe you could come up with circuits without a
3 negative peak portion of the drive waveform that
4 had negative peaking. I'm thinking of a resident
5 circuit, like an RLC, that could have negative
6 peaking, even though the drive waveform did not
7 have negative peaking – a negative peak portion.

(JX-212C at 341:17–342:7.)

Thus, the ALJ finds that Avago has failed to present sufficient evidence to establish that the VCSEL drive waveforms in its products satisfy the "negative peak portion" limitation of claim 1 of the '456 Patent.

b) The "Parameter for Affecting" Limitation

Avago contends that all of its VCSEL drivers contain a parameter ("IPEAK") that "affects the magnitude of the negative peak portion," and most of them provide a second parameter ("IDELAY") for "controlling the duration of the peaking charge." (CIB at 107.) Avago asserts the IPEAK parameter satisfies the "parameter for affecting" limitation of claim 1

"because it is for affecting the negative peak portion of the drive waveform." (*Id.* at 108.) Staff's view is that Avago failed to present sufficient evidence to show that Avago's VCSEL drivers include a parameter for affecting the negative peak portion of the drive waveform as required by claim 1. (SIB at 92-93; SRB at 19-20.)

The ALJ agrees with Respondents and Staff. As discussed above, all of the parties agree that the phrase "parameter for affecting" should be construed as "a parameter with the purpose of digitally affecting the feature of the drive waveform mentioned in the claim." (CIB at 74; RIB at 106.) Respondents contend that Avago has failed to present any evidence to show that the parameters in the Avago VCSEL drivers are ***for the purpose of*** affecting the negative peak portion. (RIB at 106-108.) In this regard, the ALJ finds that Avago's technical expert, Mr. Miller, only testified that, in his view, the purported negative peak portions in the drive waveforms were "responsive" to the stored parameters. (*See, e.g.*, CX-2085C at Q/A 638, 661, 685, 708, 731, 755.) The ALJ agrees with Respondents' expert Dr. Lebby and finds that nothing in the datasheets referenced by Mr. Miller suggests that the parameters are actually for the purpose of affecting a negative peak portion or how those parameters affect a negative peak portion. (RX-0004C at Q/A 359.) Moreover, the ALJ finds that Avago FOPD's senior research and development manager, Mr. Michael Robinson, testified that the settings for the parameters at issue are selected in order to optimize system performance, by controlling such characteristics as extinction ratio, light output, fall time, mask margin, and bit error rate. (CX-2089C at Q/A 436, 447, 451, 498.) The ALJ also finds persuasive Dr. Lebby testimony that the "peaking" parameters in Avago's VCSEL drivers are for implementing negative peaking, not for the purpose of affecting the "negative peak portion," as required by claim 1. (*See* RX-0004C at Q/A

360-62.) Accordingly, the ALJ finds that that Avago has failed to establish that Avago's products satisfy the "parameter for affecting" limitation of claim 1 of the '456 Patent.

c) Summary

Accordingly, the ALJ finds that because Avago has failed to prove that its domestic industry products meet the "negative peak portion" and the "parameter for affecting" limitations of the '456 Patent, Avago has failed to prove that it meets the technical prong of the domestic industry requirement.

C. Economic Prong

To meet the economic prong of the domestic industry requirement, Avago relies on its investments in plant and equipment; employment of labor and capital; and investments in domestic research and development. (CIB at 124-138.) Specifically, Avago asserts that it relies on expenditures related to the development of its QSFP line of transceivers (the AFBR-79 product line) that contain [redacted] VCSELs, which it contends are covered by claims 14 and 19 of the '595 Patent. (CIB at 125.) As for the '456 Patent, Avago relies on expenditures related to the development of its [redacted] products, each of which contain VCSEL drivers that are covered by claim 1 of the '456 Patent. (CIB at 125.) These products include transceiver modules, transmitter components of the transceiver modules, and active optical cables that incorporate a transceiver at the end of the cable. (CIB at 125.) Avago argues that it has made substantial and significant investments in its domestic industry through its Fiber Optics Products Division ("FOPD") in San Jose, California. (CIB at 125.)

Respondents argue that Avago failed to provide any testimony that correlated Avago's domestic expenditures to the correct subset of allegedly covered products for each asserted

patent. (RIB at 139.) Respondents assert that because of this failure, Avago cannot satisfy its burden of demonstrating substantial investments in the articles alleged to practice the asserted patents. (RIB at 139.) Respondents contend that Avago submitted no evidence establishing the list of purportedly covered products each witness relied upon in gathering information on supposed domestic industry investments. (RIB at 139.)

Respondents further argue that even if this evidentiary hurdle could be overcome, other inadequacies plague Avago's domestic industry evidence. (RIB at 140.) First, Respondents assert that Avago has failed to allocate out foreign expenditures from the domestic investments on which they rely. (RIB at 140.) For example, Respondents contend that Avago relies on expenditures for equipment that while initially used in the United States, was subsequently transferred overseas for use in manufacturing or post-manufacturing testing. (RIB at 140.) In addition, Respondents argue that it is unclear what the extent of domestic research work versus foreign research work actually is. (RIB at 140.) Respondents argue that absent reliable information allocating out foreign research and development expenditure from domestic ones, it is impossible to determine whether the domestic expenditures are substantial. (RIB at 140.) Second, Respondents contend that Avago has also failed to properly allocate its expenditures between domestic industry products and non-domestic industry products. (RIB at 140.) Third, the activities at the San Jose FOPD facility include non-domestic industry products and non-research and development activities. (RRB at 64-65.) Finally, Respondents argue that Avago has failed to "demonstrate a nexus between their purported domestic industry expenditures and the covered products." (RIB at 141.) Respondents assert that there is a "timing issue" with the purported expenditures because many of the expenditures Avago relies upon date back to 2009 or even earlier. (RIB at 141.) Thus, Respondents argue that at the time the complaint was filed,

the expenditures Avago cited were directed to future products and not the domestic industry products. In addition, Respondents assert that Avago did not provide any context for the relied upon expenditures, such as the relationship of the expenditures to the patented technology to enable a determination that Avago's domestic investments are "substantial." (RIB at 141.)

Staff submits that Avago has presented sufficient evidence to show that a significant portion of its FOPD research and development expenditures are properly attributable to Avago's VCSEL driver products, which Avago alleges are covered by the '456 Patent. (SIB at 110-111.) Moreover, Staff argues that the expenditures of [redacted] in research and development with revenues of [redacted] are substantial within meaning of 19 U.S.C. § 1337(a)(3)(C). (SIB at 111.) Thus, Staff agrees that Avago has met the economic prong of the domestic industry requirement for the '456 Patent. (SIB at 111.)

Staff submits that the '595 Patent presents a closer question because it is less clear what research and development expenditures may be fairly attributable to Avago's [redacted] VCSEL. (SIB at 111.) Staff argues that Avago's evidence that it spent approximately [redacted] to develop the [redacted] VCSEL, required the efforts of 35 people over 15 months to develop, and has generated approximately [redacted] in revenue from 2009 through the first three quarters of 2012 demonstrates, by a preponderance of the evidence, that the investment was substantial. (SIB at 111.) Staff also submits that the development of the [redacted] VCSEL took place in San Diego, California and Avago contains to develop, sell, and offer technical support for products that contain the [redacted] VCSEL. (SIB at 112.)

The ALJ finds Respondents' complaints about the allocation methods unpersuasive. Respondents' overarching complaint that Avago has not "provided a list of purportedly covered products each domestic industry fact witness relied upon in gathering information on supposed

domestic industry investments…" and that "[w]ithout such a list, there is no way to even begin to evaluate the propriety of any figures offered by these witnesses" is so vague as to be meritless. There is no per se requirement each witness must produce a list of products before their testimony can even be considered. If there were errors in the methodology by which the evidence was collected, those errors could have been explored on cross examination. Instead, Respondents seem to suggest that this vague broadside against the testimony is sufficient to negate it. However, a review of Avago's brief shows that it does break down the revenue by product. Thus, the ALJ sees no merit in Respondents' argument that there is an "evidentiary gap." As for Respondents' allegations that Avago "simply chose not to conduct the required analysis," the ALJ also disagrees with that conclusion. While Respondents' raise some fair complainants about some of the specific investments and types of investments, the ALJ sees no threshold problem with Avago's analysis and so the ALJ will consider the specific investments below.

1. Significant Investment In Plant And Equipment

As an initial matter, Staff argues that because the vast majority of Avago's relevant domestic activity with regard to VCSELs, VCSEL drivers, and products containing those components relates to research and development, as opposed to production, the Staff respectfully submits that for purposes of the economic prong analysis, 19 U.S.C. § 1337(a)(3)(C) should govern instead of 19 U.S.C. §§ 1337(a)(3)(A) & (B). The ALJ disagrees. Staff does not cite any cases nor is the ALJ aware of any cases that limit investments under (A) and (B) to production. Indeed, the precedents have embraced a far broader interpretation of section (A). *See Certain Mobile Devices and Related Software*, Inv. No. 337-TA-750, Order No. 14: ID Granting SD on Economic Prong, at 12-13 (September 15, 2011) (unreviewed).

The ALJ finds that Avago Technologies has made a significant investment in plant and equipment. Avago relies on investments in a domestic R&D location in San Jose, California dedicated to the FOPD group that develops the domestic industry products for the '595 and '456 Patents. (CX-1750C at ¶ 12-13; CX-2254C; CX-2084C Q/A 113-120; JX-0202C at 69:4-70:8; JX-0206C at 26:1-10, 32:12-14; 36:1-22, 41:18-42:17.) Avago contends that these U.S. facilities include significant amounts of land, buildings, and equipment. (*Id.*) The headquarters in San Jose, California includes Avago Technologies' U.S. R&D centers and a Technical Response Center, as well as facilities for marketing and sales of the Covered Domestic Industry Products. (*Id.*) Avago asserts that approximate value and size of the buildings where are conducted are [redacted]. (*Id.*) While the ALJ agrees this could be a domestic industry investment, Avago made no effort to quantify how much of this investment should be allocated to the domestic industry products. As Respondents correctly point out, the evidence shows that this facility develops many different products beyond the domestic industry products and supports many activities. (RRB at 64; CX-2084C at Q/A 60-61 (stating that non-R&D activities such as marketing, sales, and finance activities take place at the FOPD facility); JX-202C at 62:8-13 (explaining that not all products developed in FOPD's San Jose facility contain a VCSEL); CDX-1963C (reflecting non-[redacted] VCSELs).) Without a clearer allocation of what percentage of this facility is dedicated to the different domestic industry products, it is impossible to credit this investment towards the domestic industry. (RX-0008C at Q/A 27-28, 30, 129.)

Avago asserts it significantly invested in capital equipment, at an approximate value of [redacted] for fiscal years 2007-2012 for the equipment used in the R&D lab at Avago's San Jose, California location, for R&D of the FOPD products. (CX-1750C at ¶¶ 17-24, 26; CX-

2088C at Q/A 22, 77-83, 85-90, 157-68, 179-90, 341-45l; JX-0090C; JX-0275C; JX-0277C; JX-397C; JX-0281C; CX-2087C at Q/A 75-77, 80, 82-109.) Avago asserts it expended approximately [redacted] on capital equipment for R&D in San Jose during fiscal years 2007 through 2012, respectively. (CX-1750C ¶¶ 17-23, 26; CX-2088C at Q/A 22, 79-83, 90; JX-0090C.) Respondents note that these expenditures are for all FOPD rather than specifically allocated for (1) the percentage of use for the lab equipment to directly support the '595 Patent domestic industry products; (2) the percentage of use for the lab equipment to directly support the '456 Patent domestic industry products; and (3) the percentage of lab equipment that is not used to support either set of domestic industry products. (RRB at 65.) The ALJ agrees. These capital expenditures are for the entire facility. Avago has provided no allocation for these data that would allow the ALJ to determine the amount of the investment in the domestic industry products for each patent. (RX-0008C at Q/A 27-28, 30.)

Next, Avago offers evidence that it asserts tracks R&D capital expenditures on a project basis. (CX-2088C Q/A 231-246, 255-272, 353-373; JX-0373C at 12, 19, 26; CX-2023C; CX-2019C; CX-1135C at 37; CX-1417C at 20; CX-2087C Q/A 219-31, 357-58; CX-1376C at 41.) These data are derived from planning documents produced for the various projects related to the domestic industry products. (CX-2088C at Q/A 41.) Avago contends it incurred the following capital expenditures for each product:

Product	Cap Ex Spending
QSFP ('595 Covered Product)	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
CXP	[redacted]

Respondents complain that these documents are insufficient to show a significant investment in plant and equipment. (RRB at 66.) Respondents note that these numbers are contained amid dozens of pages of non-financial material and provide no explanation as to the types of equipment purchased, how such equipment is supposedly used in the development of the product, when the expenditures were made, and whether the equipment was or is being used to develop other products. (RRB at 66.)

The ALJ finds that Avago has failed to show what exactly these expenditures are, when they were made, and how they relate to the domestic industry products. As an initial matter, the ALJ notes that there is a significant discrepancy between the figures in the table above and figures for capital equipment investment for the FOPD facility in San Jose that Avago provided. The total investment presented in the table is nearly [redacted]. The total capital equipment investment that Avago listed out by year above (without breaking it down by product) is [redacted] over the period of 2007 to 2012. Avago provides no explanation for how the amount of capital equipment investment doubles between the two paragraphs in its brief. Without some explanation, it appears that the per-project allocation may contain expenditures either other than equipment or outside of the United States. Either of these possibilities makes it impossible for the ALJ to say with any certainty that the investments in plant and equipment for the domestic industry products are significant.[13] Accordingly, Avago has failed to show that it meets the domestic industry requirement under 19 U.S.C. § 1337(a)(3)(A).

[13] This is not to say that Avago's investments in the United States are not significant. Unfortunately, simply investing in the United States is not enough, they must be investments related to the articles protected by the patent. Here, there is simply no evidence that shows the portion of these investments in plant and equipment that are related to the domestic industry products.

2. Significant Investments in Labor And Capital

Avago also asserts that it has made significant investments in labor and capital. (CIB at 141-143.) Respondents raise several objections to Avago's claims. First, Respondents assert that Avago relies on the total headcount of their FOPD facility and the salaries and benefits for that headcount to prove the economic prong. (RRB at 67.) Respondents argue that Avago failed to allocate the employees to the products properly. (RRB at 67.) Respondents contend that Avago fails to provide sufficient information on the responsibilities of those employees' time was spent on activities with a direct nexus to the '595 Patent or '456 Patent. (RRB at 67.) In any event, Respondents argue that the evidence shows that, at most, only four engineers at the FOPD facility worked on the [redacted] VCSEL, which they contend is insufficient to meet the economic prong for the '595 Patent. (RRB at 67.)

Respondents further assert that there are employees whose jobs involve non-R&D activities like marketing, and other employees whose jobs involve handling products located outside the United States. (RRB at 67 (citing (CX-2084C Q/A 63-65; CIB at 142 (reflecting that a number of employees devote time to non-technical sales and marketing)).) Respondents argue that the portion of time in which these employees engaged in such activities cannot be counted toward establishing the economic prong. (RRB at 67 (citing *Certain Kinesiotherapy Devices and Components Thereof*, Inv. No. 337-TA-823, Initial Determination, at 77 (January 8, 2013) (finding sales and marketing labor not relevant to domestic industry).) Thus, Respondents contend that because Complainants fail to separate the expenditures for these non-covered activities, the total headcount numbers cannot be used to prove domestic industry.

The ALJ finds that Avago has shown that it employs a significant number of personnel in the U.S. who devote substantial man-hours toward the domestic research and development of the

Avago Domestic Industry Products, including various R&D personnel such as R&D Engineers, Design Support Engineers, and R&D Managers. (CX-0334C; CX-2084C at Q/A 145-51, 157; CX-1750C at ¶¶ 28-34; JX-0474C; CX-2088C at Q/A 341-41; JX-0397C at 24; JX-0815C at 22:6-11.) The ALJ further finds that as of the filing of Avago's complaint, Avago employed approximately [redacted] R&D personnel in the United States. (CX-0334C; CX-2084C at Q/A 145, 157; CX-1750C at ¶¶ 28-30.) As of the filing date of Avago's complaint, Avago also employed [redacted] persons that performed technical marketing functions, *i.e.*, field sales support, whose duties are not solely related to sales and marketing. (CX-0334C; CX-1750C at ¶ 33.) According to July 2012 data, Avago paid [redacted] in salary and benefits for the [redacted] R&D employees in the U.S., and [redacted] for the [redacted] technical marketing personnel in the U.S. (CX-0334C; CX-1750C at ¶ 34.) Thus, the ALJ finds that Avago Technologies' FOPD R&D "people" R&D expenses in the United States from 2007 through the first nine months of 2012 exceeded [redacted]

respectively. (JX-0152C; CX-2088C at Q/A 23, 95-103.)

The ALJ finds that while Avago R&D engineers do not officially track time worked on projects, (CX-2088C at Q/A 69-76), Avago, as part of its formal product review process, does keep track of the various FOPD employees who worked on the projects, both by group and by location. The ALJ finds that the following table provides the number of FOPD R&D engineers who worked on research and development of the Avago Domestic Industry Products. (JX-0373C; CX-2023C; CX-2019C; CX-1135C; CX-1417C.)

Product	**Total R&D/Marketing Headcount in U.S.**
QSFP	[redacted] Module R&D, [redacted] IC R&D, [redacted] III-V R&D
[redacted]	[redacted] Module R&D, [redacted] IC R&D
[redacted]	[redacted] Module R&D, [redacted] IC R&D, [redacted] III-V R&D
[redacted]	[redacted] Module R&D, [redacted] IC R&D, [redacted] III-V R&D

CXP	[redacted] Module R&D, [redacted] IC R&D, [redacted] III-V R&D

As for Respondents' arguments regarding the allocation of the employees' time, the ALJ finds that Avago has sufficiently quantified its investment to demonstrate that its investment was substantial. The Commission has repeatedly emphasized that establishment of an economic domestic industry is not dependent on any "minimum monetary expenditure"; nor is there a "need to define or quantify the industry itself in absolute mathematical terms." *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Comm'n Op. at 25-26 (U.S.I.T.C., December 2009) ("Stringed Instruments"). In the same vein, there is no need to show that large quantities of representative products must be involved to show an investment is "substantial." *Certain Video Displays, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-687, Order No. 20 at 5 (U.S.I.T.C., May 20, 2010) (unreviewed) ("Video Displays"). "A precise accounting is not necessary, as most people do not document their daily affairs in contemplation of possible litigation." *Stringed Instruments*, at 26. Rather, a complainant must demonstrate a sufficiently focused and concentrated effort to lend support to a finding of a "substantial investment." *Id.* Here, even though it has not calculated to mathematical precision its investment in labor and capital, Avago has demonstrated that it has made significant investments in labor and capital with respect to the domestic industry products. Each domestic industry product has involved the efforts of between [redacted] of the [redacted] employees Avago employs in San Jose. Even if these employees may not have devoted their entire time to these projects, this type of sufficiently focused and concentrated effort demonstrates for each product that a substantial investment, even if it has not been precisely quantified, has been made. Accordingly, the ALJ finds that Avago has shown that it meets the economic prong under 19 U.S.C. § 1337(a)(3)(B) for the '595 Patent and the '456 Patent.

3. Substantial Investments In Domestic Research And Development

Avago also contends that it made a substantial investment in research and development under 19 U.S.C. § 1337(a)(3)(C). Respondents make several arguments against Avago's assertions. First, Respondents argue that Avago failed to allocate its R&D expenditures to the '456 and '595 Patents. (RRB at 68.) Second, Respondents assert that Avago's figures double count some expenditures. (RRB at 69.) Third, Respondents contend that Avago's figures include foreign investments. (RRB at 69.) Fourth, Respondents argue that there is a "temporal disconnect" between thee R&D expenditures figures and the time period in which the purported R&D related to the asserted patents took place. (RRB at 69.) In particular, Respondents note that the [redacted] VCSEL was released to the market in 2009, and thus, most of the expenditures on R&D after that time were directed to projects for yet-to-be-released products, not to any of the '595 domestic industry products. Respondents assert that simply selling products containing the [redacted] VCSEL does not establish their continued R&D investments in the product. (RRB at 69-70.) Respondents argue that similar problems exist for the alleged '456 Patent investments. (RRB at 70.) Respondents also dispute that the project specific figures are accurate and that Avago has shown a nexus to the patented technology at issue. (RRB at 70.)

The ALJ finds that Avago FOPD's Research and Development Director, Dr. Chung-yi Su, testified that Avago employed [redacted] research and development personnel as of 2012, for which Avago paid over [redacted] in wages and benefits. (CX-2094C at Q/A 47; CX-0334C.) Avago further presented evidence that FOPD's total research and development expenditures from 2007 through 2012 totaled approximately [redacted]. (*E.g.*, CX-2094C at Q/A 42-46; JX-0152C.) With regard to VCSELs, Dr. Keever testified that Avago FOPD's "III-V" team in San Jose has the major responsibility for the research and development of Avago's VCSELs, and there are [redacted] employees assigned to that group. (CX-2090C at Q/A 39-42.) Similarly, Mr. Robinson

testified that for the last few years, the "IC" team in San Jose works on VCSEL driver research and development. (CX-2089C at Q/A 467-78.)

The ALJ finds that Avago tracks overall project R&D expenses and people based R&D expenses for the FOPD group in the U.S. (CX-2088C at Q/A 27-38, 40-46, 48-49, 157-68, 177-90, 206, 208-09, 212-22, 277-78; JX-0212C at 292:20-293:6; JX-0275C, JX-0277C; JX-0281C; JX-0333C at 26; CX-0997C; CX-0830C at 29]. "Project expenses" include items like materials and equipment purchased during development as well as tooling and repair associated with product development. (CX-2088C at Q/A 29-35, 37, 48.) Avago FOPD has invested the following amounts on total R&D in the United States for the past 5 fiscal years. (JX-0152C; CX-2088C at Q/A 23, 61-64, 95-103].

	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses						
Project Expenses						
Total R&D						

Avago tracks R&D spending by group. Total R&D spending in the U.S. broken down by R&D group is as follows. (JX-0411C; CX-2088C at Q/A 56-64.)

Module R&D	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses						
Project Expenses						
Total R&D						

IC R&D	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses						
Project Expenses						

Total R&D	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

III-V R&D	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total R&D	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The ALJ further finds that the total worldwide R&D spending broken down by IC R&D and III-V R&D is as follows. (JX-0271C; CX-2088C at Q/A 61-64, 69-76.)

IC R&D	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total R&D	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

III-V R&D	FY07	FY08	FY09	FY10	FY11	FY12
People Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Expenses	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total R&D	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Avago also tracks, on an ad hoc basis, R&D spending for products. (CX-2088C Q/A 29, 31-35, 65-68, 107-08, 124-30. Those R&D figures are tracked throughout development and reported when a product is released for manufacturing. (CX-2084C at Q/A 179-182.) The ALJ finds that Avago has invested the following in R&D to develop each of the Avago covered products. (CX-2088C at Q/A 52-53, 76-78, 231-246, 255-272, 353-373; JX-0373C at 197, 212, 219, 226, 229; CX-2023C at 144, 152; CX-2019C at 38, 56, 78; CX-1135C at 09-10, 25, 37; CX-1417C at 20, 92-93, 98; CX-2087C at Q/A 209-14, 219-31, 257-58, 272-74, 279-80; CX-1297C at 89; CX-0830C at 29; CX-1376C at 41; CX-0775C; CX-2084C at Q/A 282; CX-1435C; CX-2094C at Q/A. 52-53, 76-78; *see also* JX-0391C at 277; JX-0397C at 934-35.)

Product	**R&D spending**
QSFP (all '595 Covered Products)	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
CXP	[redacted]

The ALJ also finds that Avago presented evidence that all R&D conducted by Avago's IC group on VCSEL drivers in the Covered Avago Products is conducted in the United States at Avago's San Jose facility. (CX-2084C at Q/A 59, 89, 173, 183; CX-2089C at Q/A 473-74, 484, 510-12, 520-22, 697, 703-05; JX-0144C; CX-1376C.) The IC R&D group routinely works with the Module R&D group in San Jose as well to develop the VCSEL drivers that are incorporated into the FOPD products. (CX-2089C at Q/A 91-94, 130-135, 166-171, 203-207, 237-242, 285-292, 294-295.) The ALJ finds that Avago's IC R&D group designs and develops each VCSEL driver (*e.g.*, [redacted] etc.) independently. (CX-2089C at Q/A 165, 201-02, 268-70, 296-301, 714-16.)

The ALJ finds that the III-V group is split between U.S. and Singapore, and Avago presented evidence that the primary responsibility for VCSEL R&D resides with the San Jose engineers. (CX-2090C at Q/A 13, 39-41; CX-0830C; JX-0205C at 11:19-15:5.) The San Jose R&D engineers work directly with the IC and Module R&D groups in San Jose in designing VCSELs consistent with IC and module design. (CX-2090C at Q/A 39.) The San Jose R&D III-V engineers also provide technical assistance and troubleshooting assistance to the Singapore engineers. (CX-2090C at Q/A 13; CX-2094 Q/A 41.) The III-V R&D includes design of the particular layers in the VCSEL as part of the overall design process, along with consideration of how the design affects VCSEL performance. (CX-2094C at Q/A 36, 43, 51; CX-2090C at Q/A 37; JX-0264C; JX-0205C at 62:12-63:19, 65:1-66:5, 66:15-25.)

The ALJ finds that the III-V R&D efforts are ongoing and unique to each new VCSEL incorporated into a particular product line. (CX-2094C at Q/A 41, 51.) The [redacted] VCSEL was released in 2009, with a [redacted] design that took about [redacted] months to complete. (CX-2090C at Q/A 35.) [redacted] replaced [redacted] more recently to enable extend range applications and the two VCSELs are used interchangeably. (CX-2090C Q/A 35; JX-0264C.) The ALJ finds that at least [redacted] III-V R&D engineers in San Jose worked on development of the [redacted] VCSELs for the QSFP product line. (JX-0373C at 197; CX-0830C at 529; CX-2088C at Q/A 216-219; JX-0333C.) The III-V R&D group in San Jose has two lab facilities. (CX-2094C at Q/A 34; CX-2090C at Q/A 43-44; CX-2087C at Q/A 121.) One of the III-V R&D labs in San Jose is used to test VCSEL reliability and performance. (CX-2094C at Q/A 34; CX-2090C at Q/A 43-44; CX-2087C at Q/A 121.) The ALJ finds that the initial acquisition costs for the equipment in this San Jose lab was approximately [redacted]. (CX-2094C at Q/A 35.) All Avago VCSELs are extensively tested in this San Jose III-V lab by III-V R&D engineers in San Jose. (CX-2094C at Q/A 35.) The second III-V R&D lab in San Jose is a fabrication facility. (CX-2094C Q/A 36.) San Jose III-V R&D engineers use photolithography, etching and sputtering deposition equipment in this lab to fabricate VCSEL DBR mirrors, active regions, isolation regions, current spreading layers, and other layers of the VCSELs. (CX-2094C at Q/A 36.) The ALJ finds that the initial acquisition cost for equipment in this San Jose III-V R&D lab was approximately [redacted]. (CX-2094C Q/A 36.)

Based on the facts above, the ALJ finds that Avago has presented sufficient evidence to show that a significant portion of its FOPD research and development expenditures are properly attributed to Avago's VCSEL driver products, which Avago alleges are covered by the '456 Patent. For example, Mr. Shore testified that Avago invested [redacted] in research and

development expenditures and [redacted] in capital expenditures to develop the [redacted] transceiver, which contains a VCSEL driver that purportedly practices claim 1 of the '456 Patent. (*See, e.g.*, CX-2088C at Q/A 366-73; CX-2023C.) Furthermore, Avago FOPD's Customer Marketing Manager, Kirti Thakkar, testified that from 2007 through 2012, Avago has had revenues of over [redacted] from products containing the VCSEL drivers at issue and which were designed by its San Jose research and development facility. (CX-2087C at Q/A 70.) The ALJ further finds that the evidence demonstrates that the Module R&D engineers conduct experiments and make recommendations to the IC R&D group as to optimal settings for negative peaking in the VCSEL drivers in the Avago DI Products. (CX-2089C at Q/A 91-94, 130-35, 166-71, 203-07, 237-42, 285-92, 294-295, 314-27, 340-49, 437-45, 446-61, 467-68; CX-1460C; CX-1461C; CX-1474C; CX-1466C.) The ALJ finds that Avago's reliance on expenditures dating back to 2009 is proper. Avago's IC group continues to develop new VCSEL drivers, including [redacted], which was not released until late 2012. (CX-2089C at Q/A 165, 491, 697-702, 711-16; CX-1376C.) The IC group continued to develop VCSEL drivers after splitting from the Module group. (CX-2089C Q/A 467-78.) The ALJ also finds that IC R&D work in the U.S. on the VCSEL drivers involves measuring optical mass margins, rise times and fall times, bit error rates, and to assess whether negative peaking is working as designed. (CX-2089C at Q/A 504-505.) The ALJ finds that Avago has shown by a preponderance of the evidence that those allocated expenditures are "substantial" within the meaning of 19 U.S.C. § 1337(a)(3)(C). Specifically, the ALJ finds that the investments of over [redacted] account for about [redacted] of Avago's total research investments. Contrary to Respondents' argument, Avago has shown that these investments occurred in the United States. Moreover, relative to the total investments in R&D and the [redacted] in revenue resulting from the products, the ALJ finds that these

investments are substantial. Accordingly, the ALJ finds that Avago has shown that the economic prong of the domestic industry requirement is satisfied with respect to the '456 Patent.

The ALJ agrees with Staff that the '595 Patent, however, presents a closer question, as it is less clear what research and development expenditures may fairly be attributed to Avago's [redacted] VCSEL, the sole product upon which Avago may rely in order to establish that the economic prong is met. Avago presented evidence that it spent approximately [redacted] to develop the [redacted] VCSEL, which is found in its QSFP line of products, based on the efforts of approximately [redacted] research and development personnel. (CX-2088C at Q/A 255-72; JX-0373C.) Moreover, Dr. Keever testified that the original [redacted] VCSEL design took approximately [redacted] months and was released in 2009. (CX-2090C at Q/A 35.) The design of the [redacted] VCSEL took [redacted] months to complete. (*Id.*) In addition, Ms. Thakkar testified that Avago has had revenues of approximately [redacted] from 2009 through the first three quarters of 2012 from the sale of products containing the [redacted] VCSEL. (CX-2087C at Q/A 68.) Moreover, Ms. Hall testified Avago's development of the [redacted] VCSEL occurred in its San Diego facility, and Avago continues to develop, sell, and offer technical support for products that contain a [redacted] VCSEL. (*E.g.*, Tr. at 339:4-20, 340:13 – 342:9; CX-2084C at Q/A 191; CDX-1963C; CX-2090C at Q/A 26, 48-51, 111-19.) The ALJ also finds that R&D on the [redacted] VCSELs in San Jose includes testing of VCSEL DBR mirrors, active regions, and current spreading layers, measurement of VCSEL optical and electrical performance characteristics and how light is distributed laterally across the aperture. (CX-2094C at Q/A 36; CX-2090C at Q/A 37, 43.) The ALJ notes that the fact that R&D may have occurred prior to filing of the complaint (or even before the patent issues) does not preclude consideration of those R&D expenses in support of domestic industry. *See, e.g.*, *Certain Video Game Systems and Controllers*, Inv. No.

337-TA-743, Comm'n Op., 2011 ITC LEXIS 717 at *8-9 (April 14, 2011); *Certain Battery-Powered Ride-On Toy Vehicles and Components Thereof*, Inv. No. 337-TA-314, Initial Determination, 1990 ITC LEXIS 393 at *26-30 (December 5, 1990) ("As long as Kransco is still replacing any of these units, all of the prior costs relating to the development and exploitation of the patent should be considered along with the current expenditures . . . ."). This is particularly the case where, as here, Avago also continues to develop, sell, and offer technical support for products containing the [redacted] VCSEL. (Tr., 339:4-20, 340:13-342:9; CX-2084C at Q/A 191; CX-2090C at Q/A 26, 48-51, 111-19.) Such ongoing activities are properly considered for domestic industry. *See, e.g.*, *Certain Automated Media Library Devices*, Inv. No. 337-TA-746, Remand ID, 2013 ITC LEXIS 550 at *82 (March 26, 2013) (considering ongoing technical support, sales and marketing expenses for DI); *Certain Personal Computers and Digital Display Devices*, Inv. No. 337-TA-606, Order No. 20, 2008 ITC LEXIS 141 at *9-10 (January 11, 2008) (considering ongoing "sales and customer support activities" after R&D process completed).

Accordingly, the ALJ finds that Avago has shown, just barely, by a preponderance of the evidence that Avago's research and development expenditures directed to the [redacted] VCSEL are sufficient to satisfy the economic prong of the domestic industry requirement with respect to the '595 Patent.

X. CONCLUSIONS OF LAW

1. The Commission has personal jurisdiction over the parties and subject-matter and *in rem* jurisdiction over the accused products.
2. The importation or sale requirement of section 337 is satisfied.
3. The Accused Products do not infringe the '456 Patent.
4. The Accused Products infringe the '595 Patent.
5. The '595 and '456 Patents are not invalid under 35 USC § 102 for anticipation.
6. The '595 and '456 Patents are not invalid under 35 USC § 103 for obviousness.
7. The '595 and '456 Patents are not invalid as indefinite.
8. Respondents do not have a license to the '595 Patent under the [redacted] Agreement.
9. Respondents do have a license to the '595 Patent to sell products to HP under the HP Master License Agreement.
10. Respondents do not have a license to the '456 Patent.
11. The technical prong of the domestic industry requirement has not been satisfied for the '456 Patent.
12. The technical prong of the domestic industry requirement has been satisfied for the '595 Patent.
13. The economic prong of the domestic industry requirement under 19 U.S.C. § 1337(a)(3) (B) and (C) has been satisfied.
14. It has not been established that a violation exists of section 337 for the asserted claims of the '456 Patent.

15. It has been established that a violation exists of section 337 for the asserted claims of the '595 Patent subject to Respondents' HP license defense.

XI. INITIAL DETERMINATION AND ORDER

Based on the foregoing, it is the INITIAL DETERMINATION of this ALJ that no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same that infringe one or more of claims 1, 2, 4, 6-8, 11-13, 15, and 20-24 of U.S. Patent No. 6,947,456 patent

It further the INITIAL DETERMINATION of this ALJ that a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain optoelectronic devices for fiber optic communications, components thereof, and products containing the same that infringe claims 14 and 19 of U.S. Patent No. 5,596,595.

Further, this Initial Determination, together with the record of the hearing in this investigation consisting of:

(1) the transcript of the hearing, with appropriate corrections as may hereafter be ordered, and

(2) the exhibits received into evidence in this investigation, as listed in the attached exhibit lists in Appendix A,

are CERTIFIED to the Commission. In accordance with 19 C.F.R. § 210.39(c), all material found to be confidential by the undersigned under 19 C.F.R. § 210.5 is to be given *in camera* treatment.

The Secretary shall serve a public version of this ID upon all parties of record and the confidential version upon counsel who are signatories to the Protective Order (Order No. 1.) issued in this investigation.

RECOMMENDED DETERMINATION ON REMEDY AND BOND

I. Remedy and Bonding

The Commission's Rules provide that subsequent to an initial determination on the question of violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, the administrative law judge shall issue a recommended determination containing findings of fact and recommendations concerning: (1) the appropriate remedy in the event that the Commission finds a violation of section 337, and (2) the amount of bond to be posted by respondents during Presidential review of Commission action under section 337(j). *See* 19 C.F.R. § 210.42(a)(1)(ii).

A. Public Interest Findings

In connection with this Recommended Determination, and pursuant to Commission Rule 210.50(b)(1), 19 C.F.R. § 210.50(b)(1), the Commission ordered the presiding administrative law judge:

> [S]hall take evidence or other information and hear arguments from the parties and other interested persons with respect to the public interest in this investigation, as appropriate, and provide the Commission with findings of fact and a recommended determination on this issue, which shall be limited to the statutory public interest factors set forth in 19 U.S.C. 1337(d)(1), (f)(1), (g)(1);

77 Fed. Reg. 65713 (October 30, 2012).

Before issuing a remedy for a violation of Section 337, the Commission must consider the effect of the remedy on the following public interest factors: (1) the public health and welfare, (2) competitive conditions in the United States economy, (3) production of like or directly competitive articles in the United States, and (4) United States consumers. 19 U.S.C. §§ 1337(d)(1), (f)(1). The Commission considers the fact that the public interest favors the protection of United States intellectual property rights by excluding infringing products. *See,*

e.g., *Certain Two-Handle Center Set Faucets and Escutcheons and Components Thereof*, Inv. No. 337-TA-422, Comm'n Op. at 9 (July 21, 2000).

Historically, the Commission interpreted the legislative history of Section 337 to mean that exclusionary relief should only be denied when the adverse effect on the public interest factors would be greater than the interest in protecting the patent holder. *Certain Battery-Powered Ride-On Toy Vehicles and Components Thereof*, Inv. No. 337-TA-314, Comm'n Op. at 11 (April 9, 1991). The Commission has concluded that the public interest considerations outweighed the need to protect the intellectual property rights of complainant in only three investigations, all of which were decided prior to the 1988 legislative amendments to Section 337 that removed the requirement that patentees show irreparable harm in order to obtain relief. *See Spansion Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1360 (Fed. Cir. 2010) (discussing the history of public interest at the ITC). These three instances include one investigation involving hospital burn beds where the complainants unable to meet demand if the imports were excluded *Certain Fluidized Supporting Apparatus and Components*, Inv. No. 337-TA-182/188, Comm'n Op. (October 1984); another investigation involving basic atomic research where the domestic supply was inferior to the imported supply, *Certain Inclined-Field Acceleration Tubes and Components*, Inv. No. 337-TA-67, Comm'n Op. (December 1980); and finally, an investigation during the second oil shock following the Iranian revolution involving technology necessary for increasing fuel efficiency of vehicles where the domestic industry was unable to meet the demand, *Certain Automatic Crankpin Grinders*, Inv. No. 337-TA-60, Comm'n Op. (December 1979).

More recently, the Commission has applied the public interest factors to not necessary deny a remedy, but rather to tailor the remedy to minimize the impact on the public interest. *See,*

e.g., *Certain Personal Data*, Inv. No. 337-TA-710, Comm'n Op. at 83 (delaying the effective date of an exclusion order based on competitive conditions in the U.S. economy); *Certain Baseband Processor Chips and Chipsets, Transmitter and Receiver (Radio) Chips, Power Control Chips, and Products Containing Same, Including Cellular Telephone Handsets*, Inv. No. 337-TA-543, USITC Pub. No. 4258, Comm'n Op., 148-54 (October 2011) (grandfathering certain existent mobile telephone models from the scope of the exclusion order); *Certain Automated Mechanical Transmission Systems for Medium-Duty and Heavy-Duty Trucks, and Components Thereof*, Inv. No. 337-TA-503, Comm'n Op. at 5 (May 9, 2005) (exempting from the scope of the exclusion order replacement parts for existing truck transmissions); *Certain Sortation Systems, Parts Thereof and Products Containing Same,* Inv. No. 337-TA-460, Comm'n Op. at 18-20 (February 19, 2003) (exempting from the scope of the exclusion order replacement parts for a UPS hub facility).

Mellanox argues that it is against the public interest to impose any exclusion or cease and desist order, or at a minimum should tolerate an exemption for warranty and replacement parts. (RIB at 142-148.) Mellanox contends that the accused InfiniBand products "offer unparalleled transfer rates, energy efficiency, and density, and, thus, are essential to growth of a high performance network connectivity infrastructure in the U.S." (RIB at 142.) Mellanox asserts that these products are ubiquitous in environments where large amounts of data are processed at high speeds and, thus, are heavily utilized in at least the financial, healthcare, education, oil and gas, supercomputing, and defense industries (RIB at 142.) Mellanox argues that the consumers of these products range from the government, to large U.S. corporations, to small startups (RIB at 142.) Mellanox contends that it is a pioneer of InfiniBand, and there are no viable substitutes available in a reasonable time frame in commercial quantities. (RIB at 142-143.)

Avago submits that given the nature of the fiber optic communications device market, the number of different options available to consumers, and the number of component suppliers in the market that sell products that compete with the accused FCI and Mellanox products, the requested relief would not have an adverse impact on public hear, safety or welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, or on United States consumers. (CIB at 140.) Avago also argues that Respondents have failed to show that demand for the accused products cannot be satisfied by Avago and its licensees or by non-infringing alternatives. (CIB at 140.)

Staff submits that Mellanox has failed to present sufficient evidence to establish that excluding Mellanox's accused products would result in supply shortages or otherwise affect the public health and welfare, competitive conditions, or U.S. consumers. (SIB at 119.) Staff argues that to the extent that Mellanox contends that various entities with high-speed computer systems (*i.e.*, Mellanox-supplied systems operating at FDR data rates) would be unable to maintain, upgrade, or repair their systems were Mellanox FDR cables subject to an exclusion order, this appears to result as much from Mellanox's decision to implement a firmware key that restrict the cables that can be used with its devices, as opposed to the lack of alternative FDR cables. (SIB at 119.) Moreover, Staff asserts that Avago has licensed at least one other supplier of VCSEL-based products, Finisar, there are other non-infringing products that employ different technology, and the limited exclusion order would not exclude products from any of the other suppliers of similar products. (SIB at 119-120.) Staff contends that the evidence of record is insufficient to preclude entry of an exclusion order or cease and desist order as to Mellanox should a violation of Section 337 be found. (SIB at 120.)

The ALJ agrees with Avago and Staff that the evidence presented regarding the public interest does not warrant denying Avago relief nor does it warrant tailoring the remedy in any way. The crucial issue in assessing the public interest for these products is the availability of substitutes. There is no dispute between the parties that the accused products are used in extremely important and sensitive applications because of their crucial role in providing high bandwidth solutions for High Performance Computing (HPC) systems. The accused products include fiber optic communications devices such as active optical cables (AOCs) and transceivers, as well as the VCSEL driver components in those devices. (CIB at 141.) The accused and Avago AOCs and transceivers are typically used in large data centers to connect equipment within the centers and outside of the centers, such as servers, storage devices, and switches. (CX-2084C at Q/A 245.) The accused products are primarily used with two competing standards: Ethernet and InfiniBand. (CX-2084C Q/A 194, 196.) Compared to the competing Ethernet market, the InfiniBand market is relatively small. (CX-2084C Q/A 194.) The InfiniBand market comprises approximately 10% of the market for fiber optic communications devices such as those at issue in this Investigation. (CX-2084C at Q/A 194.)

1. Impact on Competitive Conditions in the U.S. Economy and on U.S. Consumers

Contrary to Respondents' contentions, the ALJ finds that the evidence presented fails to demonstrate that alternatives to the accused products are not available and capable of filling the demand that would result if the accused products are excluded. The ALJ bases this finding on several reasons.

First, Avago has offered evidence that it services both the Ethernet and InfiniBand markets including HPC applications. (CX-2084C at Q/A 94, 192-193; JX-0216C at 14:25-15:23, 19:3-8.) The ALJ finds that Avago sells fiber optic communications devices in the United States

that are compatible with both InfiniBand and Ethernet applications, as well as for Fiber Channel storage solutions. (CX-2084C Q/A 192-193; JX-0216C at 14:25-15:23, 19:3-8; CX-1126C; CX-2087C Q/A 197-201; CX-1300C.) Recently, Avago re-entered the market for AOCs. (CX-2084C at Q/A 90-93, 242-243, 281-82.) The ALJ further finds that the evidence shows that Avago plans to participate in the next Plugfest (an industry testing event) with its new InfiniBand QSFP and CXP AOCs. (CX-2084C at Q/A 210, 239-41; JX-0202C at 105:14-16, 106:2-5.) The ALJ finds that Avago now sells 14 Gb/s SFP+ and QSFP transceivers (AFBR-57F5 and AFBR-79F4) and 10 Gb/s SFP+, QSFP+ and CXP AOC devices (AFBR-7CERxxZ, AFBR-7QERxxZ and AFBR-71ERxxZ). (CX-2084C at Q/A 242-243.) Thus, the ALJ finds that the evidence shows that Avago sells comparable 10 and 14 Gbps products to what Mellanox sells. In addition, the ALJ finds that Avago recently re-entered the AOC market in late 2012 with its new 10 Gbps [redacted]-based product. (CX-2089C at Q/A 697-702 (noting that the first [redacted] product released in late 2012).) The ALJ also finds that Avago sells commercial quantities of 14 Gbps transceiver modules (AFBR-57F5 and AFBR-79F4) that can be used in place of 14 Gbps AOCs for InfiniBand networks. (CX-2084C at Q/A 242-43 (noting Avago is in full volume production for 14 Gbps solutions that "provide a higher density solution than an active optical can at lower power consumption and lower cost. . . . These are alternative solutions for the InfiniBand marketplace. They absolutely meet the InfiniBand specs.").) The ALJ finds that Avago sold [redacted] units of AFBR-57F5 from FY10 through the 3Q FY12, generating [redacted] in revenue. (RX-1098C (at FY10 and FY12 tabs).) Avago sold [redacted] units of AFBR-79 in the first three quarters of FY12, generating [redacted] in revenue. (*See id.* at FY12 tab.) Moreover, the ALJ finds that because Avago works with a number of contract manufacturers who manufacture Avago's AOC and transceiver products on behalf of Avago, it is

likely that Avago has capacity to replace the infringing products should an exclusion order be entered. (CX-2084C at Q/A 242-243; JX-0216C at 19:17-24.)

Second, the evidence suggests that even though Mellanox touts itself as a provider of end-to-end solutions, the availability of individual components of the larger systems suggests that even without an "end-to-end solution" there would be alternatives for consumers. For example, even Mellanox markets and sell the individual components of its systems separately as well. (Tr. 710:7-25; CX-0382C at 59:1-5, 215:16-22; CX-0417C at 37:17-20.) Moreover, the ALJ finds that there are a number of suppliers in the U.S. market that sell AOCs and transceivers separately from other network components demonstrates that the fiber optic communications market is diversified and does not solely look for "end to end solutions." (CX-2084C Q/A 197, 202, 208, 216-217, 222-35; JX-0073; CX-0417C at 68:3-11; CX-0382C at 64:19-65:8, 68:13-72:2, 170:19-171:10; Tr. 713:14-716:17.)

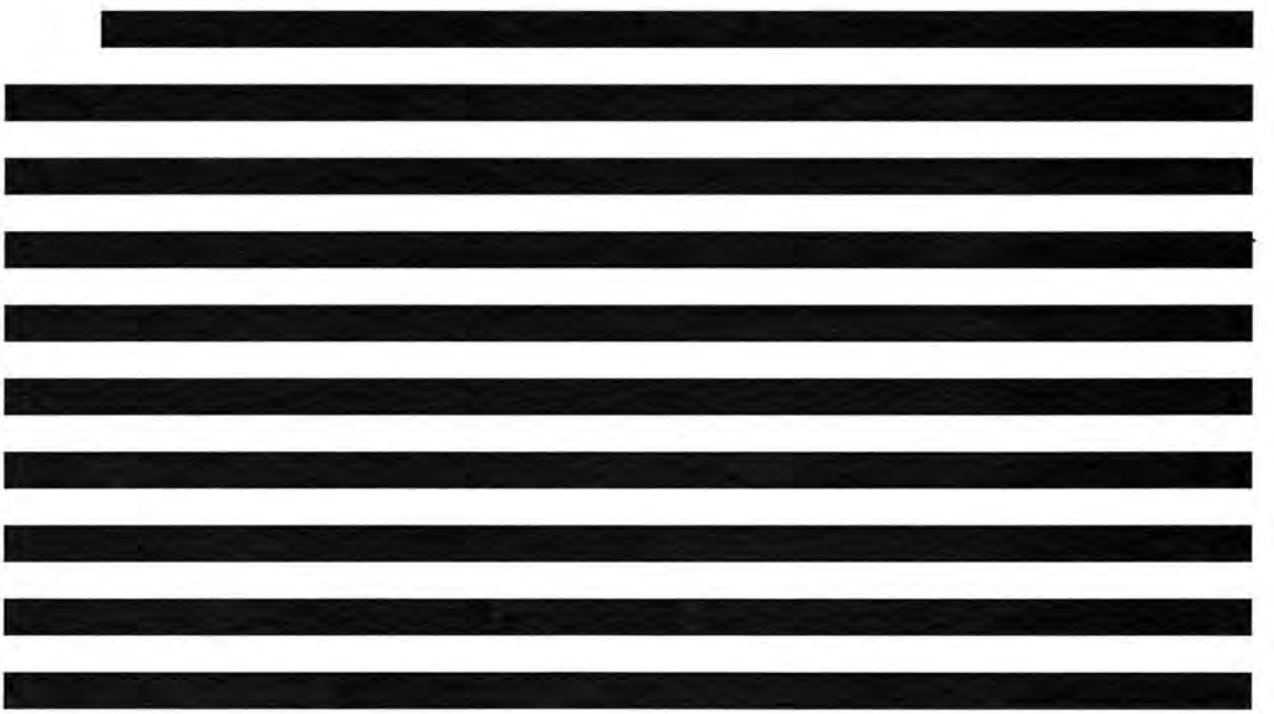
Third, the ALJ finds that InfiniBand is an open standard that encourages the interoperability of different components from different suppliers, which suggests that the loss of one supplier will not eliminate the availability of standard compliant hardware for customers. For example, the importance of individual component suppliers to the InfiniBand area is demonstrated by Plugfest, an event held twice a year by the InfiniBand Trade Association. At this event, component suppliers are invited to test their cables for compliance with the InfiniBand standard and interoperability with other InfiniBand equipment (*e.g.*, Mellanox switches and host channel adapters). (CX-2084C Q/A 208, 216-217, 222-35; CX-0382C at 64:19-65:8, 68:13-72:2; CX-1447; JX-0073 at 1337-43, 1344-46, 1347-54, 1355-59; Tr. 712:17-25, 713:5-8, 713:14-716:17.)

Fourth, the ALJ finds that a number of companies have products that have been certified at Plugfest and would be possible alternatives to the Mellanox products. For example, The ALJ notes that Avago sells products designed to work with InfiniBand-based network solutions. (CX-2084C Q/A 192-193, 210; JX-0216C at 14:25-15:23, 105:14-16, 106:2-5.) The ALJ finds that further examples of suppliers whose QDR active optical cables were certified through Plugfest in 2012 include FCI, Finisar, Mellanox, Fujikura, Molex, Samtec, Siemon and Tyco Electronics (TE Connectivity). (CX-2084C at Q/A 228, 234-235; JX-0073; CX-0382C at 68:13-72:2.) FDR AOC cable suppliers who were certified in 2012 include 3M, Advanced Photonics, FCI, Fujikura, Mellanox, Samtec, Siemon and Tyco (Te Connectivity). (*Id.*) The ALJ finds that Avago has participated in Plugfest in the past and has had several of its products that are covered by the asserted patents included on the Integrator List. (CX-2084C at Q/A 209-15; CX-1447.) In addition, the ALJ finds that a number of InfiniBand certified FDR active optical cables are currently marketed and available for sale to consumers, including through 3M, Advanced Photonics, FCI, Mellanox, Samtec and Tyco. (CX-2084C at Q/A 229-230.) The ALJ also finds that other suppliers, such as Luxtera/Molex, Finisar and Sumitomo have also developed and are marketing InfiniBand FDR active optical cables. (CX-2084C at Q/A 231-232; JX-0106.) As for Mellanox's contentions that costs of switching to these alternatives would be substantial, there is evidence in the record that suggests that this would not be the case. For example, there is testimony that OEMs typically qualify backup suppliers in case there are supply disruptions. (CX-2084C at Q/A 252 ("OEMs commonly qualify multiple fiber optic suppliers for this precise reason, in case there are issues with supply with their primary supplier").) Thus, the ALJ finds that it is likely that the time and expense to qualify alternative suppliers would already have been

incurred by OEMs and any downtime will be minimized. *Id.* ("Qualifying multiple suppliers would allow for a more seamless and quick substitution of other fiber optic products.")

Fifth, the ALJ finds that not only are there a number of alternative suppliers, at least some of those alternative suppliers offer products that undoubtedly are non-infringing alternatives. For example, the ALJ finds that the evidence shows that the active optical cables sold by Luxtera/Molex are based on silicon photonics technology, do not incorporate VCSELs and thus, are noninfringing alternatives. (CX-2084C Q/A 197. 202; CX-2087C Q/A 216; CX-0417C at 68:3-11; CX-0382C at 170:19-171:10.) Moreover, the ALJ notes that one of the alternative AOC suppliers, Finisar, has a license to the asserted patents. (*See* Complaint, Ex. 6.)

Sixth, to the extent that government customers rely on HPC systems using Mellanox products, those imports would be exempt from the exclusion order under 19 U.S.C. § 1337(l). Thus, the governmental users Mellanox cites in its briefs will be largely unaffected by any exclusion order.



[redacted] (CX-2084C at Q/A 252-53.)

In sum, the ALJ finds that the evidence does not demonstrate that there will necessarily be a shortage of cables and high speed data systems should an exclusion order issue and so there has been no showing that there will be a substantial adverse impact on competition or U.S. consumers should an exclusion order issue.

2. Impact on Public Health, Safety, and Welfare

The ALJ notes that the Commission determined in a prior investigation that exclusion of similar VCSEL-based optoelectronic devices would not harm the public health, safety or welfare. *See Certain Optoelectronic Devices, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-669, Comm'n Op. at 4, 7-8 (July 12, 2010). While some time has passed since this determination and different parties are involved in this investigation, that prior decision does suggest that the public health, safety, and welfare would not be harmed.

Mellanox claims that its products are sold to key industry segments in the United States, such as for supercomputing applications, hospitals, universities, defense institutions and financial institutions. (RIB at 145-146.) However, Mellanox has not established harm to the public health,

safety, or welfare sufficient to outweigh the substantial interest in protecting intellectual property owners' rights for several reasons. First, Mellanox only identifies a handful of customers in each of these industries and has not established the use of its products beyond those few examples. (Tr. 716:23-717:11; CX-0382C at 196:2-5.) In addition, Avago presented evidence that its products are used by similar customers. (CX-2221C at Q/A 33-37.) Second, the ALJ finds that Avago supplies products to those very same industries and customers, including [redacted]. (CX-2084C at Q/A 94, 199-200, 225, 261-68; CX-1126C; JX-0202C at 22:2-22; RX-0001C at Q/A 18, 44-45; Tr. 343:24-344:11, 345:12-346:5; Tr. 716:18-22.)

3. Impact on the Production of Like or Directly Competitive Articles in the United States

Mellanox claims that an exclusion order would have a negative impact on one of its suppliers, [redacted] (RIB at 147.) However, Mellanox has failed to establish the magnitude of any such impact for several reasons. First, the ALJ finds that the only component that [redacted] Second, the ALJ notes that [redacted] is not the only company that makes VCSELs in the United States. In fact, there is a second supplier (Finisar), who is licensed under the '595 patent. (Complaint, Ex. 6.) Thus, any exclusion order would not impact all VCSEL operations in the United States, as Finisar is licensed. Third, Mellanox claims that if its [redacted] are found to infringe, than [redacted] customers will be hesitant to purchase VCSELs from [redacted] (RIB at 147.) The ALJ finds, however, that any such harm to [redacted] would be created as a result of the finding of infringement, not entry of an exclusion order.

Finally, the ALJ notes that some evidence in the record suggests that the potential harm to [redacted] in the United States, may be overstated. Avago adduced evidence that the products made by [redacted] Thus, if Mellanox's products are excluded, [redacted] will be able to continue selling its comparable products to other customers. Whether [redacted] customers will be "hesitant" to purchase products found to infringe Avago's patents turns on the issue of infringement, not remedy.

B. Limited Exclusion Order

Under Section 337(d), the Commission may issue either a limited or a general exclusion order. A limited exclusion order directed to respondents' infringing products is among the remedies that the Commission may impose, as is a general exclusion order that would apply to all infringing products, regardless of their manufacturer. *See* 19 U.S.C. § 1337(d).

Avago seeks a limited exclusion order that bar from entry into the United States all products of Mellanox, FCI, and IPtronics that infringe the Asserted Patents. (CIB at 138.) Avago argues that the exclusion order should not be limited to any particular part or model numbers of Respondents. (CIB at 138-139.) Avago asserts that no exemption for replacement parts or warranty repairs is warranted. (CRB at 69.) Avago contends that Respondents point to no contracts with customers, let alone any contracts requiring replacement with identical parts. (CRB at 69.) Avago argues that Respondents appear to intend to use the exemption to import new, replacement parts, rather than refurbished parts, which is inconsistent with a narrow exemption. (CRB at 69.)

Respondents argue that that the LEO should be "narrow in scope and should contain an exemption for warranty and replacement parts for the Accused Products." (RIB at 141.)

Respondents argue that the public interest evidence shows "that denying access to such replacement parts would wreak havoc on the high performance network connectivity infrastructure in the U.S. by forcing consumers to use non-optimized components." (RIB at 141.)

Staff argues that only Mellanox has presented any public interest evidence and IPtronics and FCI have not presented any evidence or argument that a limited exclusion order should not issue as to their products in the event that they are found to have violated Section 337. (SIB at 113.) Staff submits that if a violation of Section 337 is found, then the appropriate remedy will include a limited exclusion order directed at the infringing products of the named Respondents. (SIB at 113.) Staff agrees with Avago that any LEO should not contain the exemption for replacement and warranty parts that Respondents seek. (SRB at 26.) Staff submits that there has been no showing that Respondents' customers would expect any replacement parts be the same and not just comparable to the part that is subject to the exclusion order. Thus, Staff argues that any LEO issued in this investigation should not have an exemption for replacement parts.

Should the Commission find a violation, the ALJ recommends that the Commission issue a LEO without any exemption for replacement parts. As Avago and Staff correctly note, there is no evidence in the record that Respondents' customers expect any replacement or warranty parts be the same part and not just a comparable part. Without such evidence, there is no basis for carving an exemption out for warranty or replacement parts in the LEO.

C. Cease and Desist Order

Section 337 provides that in addition to, or in lieu of, the issuance of an exclusion order, the Commission may issue a cease and desist order as a remedy for violation of section 337. *See* 19 U.S.C. § 1337(f)(1). The Commission generally issues a cease and desist order directed to a domestic respondent when there is a "commercially significant" amount of infringing, imported

product in the United States that could be sold so as to undercut the remedy provided by an exclusion order. *See Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, USITC Pub. 2391, Comm'n Op. on Remedy, the Public Interest and Bonding at 37-42 (June 1991); *Certain Condensers, Parts Thereof and Products Containing Same, Including Air Conditioners for Automobiles*, Inv. No. 337-TA-334, Comm'n Op. at 26-28 (Aug. 27, 1997).

Avago seeks a cease and desist order against FCI and Mellanox as well as their U.S.-based affiliate companies, parents, subsidiaries, or other related business entities, or their successors or assigns that would prohibit the importation, sale, marketing, advertising, solicitation, use, distribution, or warehousing inventory for distribution of products into and in the United States that infringe one or more of the asserted claims of the Asserted Patents. Avago argues that a cease and desist order is necessary because FCI and Mellanox each have imported or are importing into the U.S. products that infringe the asserted claims of the Asserted Patents and maintain commercially significant inventory of those products in the U.S. (CIB at 139.) Avago asserts that the evidence demonstrates that as of April 2013 FCI had at least [redacted] of the accused products in inventory in the United States. (CRB at 69.) Avago also points to evidence that Mellanox had [redacted] of the accused products in the United States. (CRB at 70.)

Respondents argue that a cease and desist order should not issue because Avago has not established that any Respondent maintains a commercially significant U.S. inventory of accused products. (RIB at 142; RRB at 72-73.)

Staff submits that Avago has offered evidence that some of the Respondents maintain commercially significant inventories of the accused products in the United States. (SIB at 113-115.)

The ALJ agrees with Avago and recommends to the Commission that it issue a cease and desist order against Mellanox and FCI. The ALJ finds that the evidence demonstrates that in April 2013, FCI had [redacted] of TRX10GVP2010C1 in inventory [redacted] (CX-0492C at No. 24; CX-0424C at 50:15-20; CX-0437C at 42:12-43:11.) The ALJ further finds that in the context of the total volume of units of TRX10GVP2010C1 imported since January 2012, this number is significant. (RX-01590C.) The ALJ further finds that as of April 2013 Mellanox had [redacted] of MC2206310 cable, [redacted] of MC2207310 cable, and [redacted] of the MC210310 cable in inventory in [redacted] (CX-0510C at No. 24.) While Mellanox's witness did testify that Mellanox endeavors to maintain a "minimum level of inventory," Mellanox's subjective belief regarding the level of inventory is not sufficient to overcome Avago's showing that a commercially significant amount of product is maintained by the Respondents in the United States. Thus, the ALJ recommends that the Commission issue a cease and desist order against Mellanox and FCI as requested by Avago should a violation of Section 337 be found.

D. Bond During Presidential Review Period

The Administrative Law Judge and the Commission must determine the amount of bond to be required of a respondent, pursuant to section 337(j)(3), during the 60-day Presidential review period following the issuance of permanent relief, in the event that the Commission determines to issue a remedy. The purpose of the bond is to protect the complainant from any injury. 19 C.F.R. § 210.42(a)(1)(ii), § 210.50(a)(3).

When reliable price information is available, the Commission has often set the bond by eliminating the differential between the domestic product and the imported, infringing product. *See Certain Microsphere Adhesives, Processes for Making Same, and Products Containing Same,*

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

Avago seeks a bond based on patent royalty rates of no less than [redacted] of the entered value of the infringing products based on royalty rates paid by Avago Fiber U.S. to Avago Fiber IP under various inter-company licensing and distributorship agreements. (CIB at 147-150.)

Respondents argue that Avago has failed to prove that a bond is necessary. (RIB at 148-149.) Respondents do not compete with Avago because they no longer sell AOCs and do not offer FDR products. (RIB at 148-149.) Respondents further argue that even if a bond is necessary, Avago has failed to prove that a [redacted] bond is appropriate. (RIB at 149.) Respondents note that the [redacted] rate is based on inter-company licensing and distribution agreements between various Avago subsidiaries. (RIB at 149.) Respondents argue that such agreements are not an appropriate basis for a bond and should be rejected. (RIB at 149.)

Staff agrees that Respondents and Avago are not competitors. Thus, Staff submits that it is impossible to determine a bond based on price differentials. (SIB at 116.) However, Staff

agrees with Avago that a bond is appropriate and the intra-company agreements provide a good basis for such a bond. (*Id.*)

Should the Commission find a violation, the ALJ recommends that the Commission set a bond at a reasonable royalty rate of the entered value of the accused products based on previous Avago license agreements with unaffiliated companies, if such evidence is available. The ALJ finds that while Avago competes to some extent with some of the accused products it does not compete with all of the accused products. Moreover, it not clear even for the products where there may be some competition whether those products actually compete head-to-head. Thus, the ALJ recommends that a 100% bond would not be appropriate. As for the royalty rate, the ALJ agrees with Respondents that the inter-company license agreements between Avago U.S. Inc., Avago International Sales, Avago Trading, and Avago Fiber IP do not represent the most probative evidence of what that royalty would be. Such agreements are not arm's length transactions and may not be premised on the actual value of the IP, but rather on tax concerns and internal business goals. *See Certain Polyimide Films, Prods. Containing Same, and Related Methods*, Inv. No. 337-TA-772, Initial Determination at 327 (May 10, 2012.). Thus, a royalty rate based on agreements with third parties not commonly owned or controlled by Avago or its parent companies would be the most appropriate basis for determining such a royalty rate, if such evidence exists in the record. If they have not been provided (Avago has not identified them in its brief and the ALJ is not aware of them), then the royalty rate should be set at 0%.

II. Conclusion

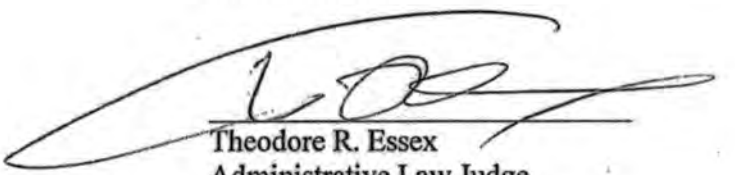
In accordance with the discussion of the issues contained herein, it is the RECOMMENDED DETERMINATION ("RD") of the ALJ should the Commission find a violation, then it should issue a limited exclusion order against Respondents. The ALJ further recommends that the Commission issue a cease and desist order against the Mellanox and FCI Respondents. The ALJ recommends that the Respondents post a bond based on reasonable royalty rate based on royalty rates contained in license agreements with Avago's third party licensees, to the extent that evidence has been submitted, during the Presidential review period. If such evidence has not been provided, then the bond should be set at 0%. Finally, the ALJ recommends based on the evidence and findings contained herein that the impact of a remedy on the public interest is not sufficient to warrant not issuing a remedy or limiting the remedy.

Within seven days of the date of this document, each party shall submit to the office of the Administrative Law Judge a statement as to whether or not it seeks to have any portion of this document deleted from the public version. The parties' submissions must be made by hard copy by the aforementioned date.

[redacted]

Any party seeking to have any portion of this document deleted from the public version thereof must submit to this office (1) a copy of this document with red brackets indicating any portion asserted to contain confidential business information by the aforementioned date and (2) a list specifying where said redactions are located. The parties' submission concerning the public version of this document need not be filed with the Commission Secretary.

SO ORDERED.



Theodore R. Essex
Administrative Law Judge

CERTAIN OPTOELECTRONIC DEVICES FOR FIBER OPTIC COMMUNICATIONS, COMPONENTS THEREOF, AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-860

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **INITIAL DETERMINATION** has been served by hand upon the Commission Investigative Attorney, Matthew N. Bathon, Esq., and the following parties as indicated, on **January 9, 2014.**

Lisa R. Barton, Acting Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants Avago Technologies General IP (Singapore) Pte. Ltd. and Avago Technologies U.S. Inc.:

Liane M. Peterson, Esq.
FOLEY & LARDNER LLP
3000 K Street NW, Suite 600
Washington, DC 20007

( ) Via Hand Delivery
(✓) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents FCI USA, LLC, FCI Deutschland GmbH and FCI SA:

Tom M. Schaumberg, Esq.
ADDUCI, MASTRIANI & SCHAUMBERG LLP
1133 Connecticut Avenue, NW, 12th Floor
Washington, DC 20036

( ) Via Hand Delivery
(✓) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

On Behalf of Respondents Mellanox Technologies, Inc., Mellanox Technologies Ltd., IPtronics A/S (n/k/a Mellanox Technologies Denmark ApS) and IPtronics Inc.:

Jamie D. Underwood, Esq.
ALSTON & BIRD LLP
950 F Street NW
Washington, DC 20004

( ) Via Hand Delivery
(✓) Via Express Delivery
( ) Via First Class Mail
( ) Other:_____

Public

Lori Hofer, Library Services
LEXIS-NEXIS
9473 Springboro Pike
Miamisburg, OH 45342

( ) Via Hand Delivery
( ) Via Express Delivery
(✓) Via First Class Mail
( ) Other:_____

Kenneth Clair
THOMSON WEST
1100 13th Street, NW, Suite 200
Washington, DC 20005

( ) Via Hand Delivery
( ) Via Express Delivery
(✓) Via First Class Mail
( ) Other:_____