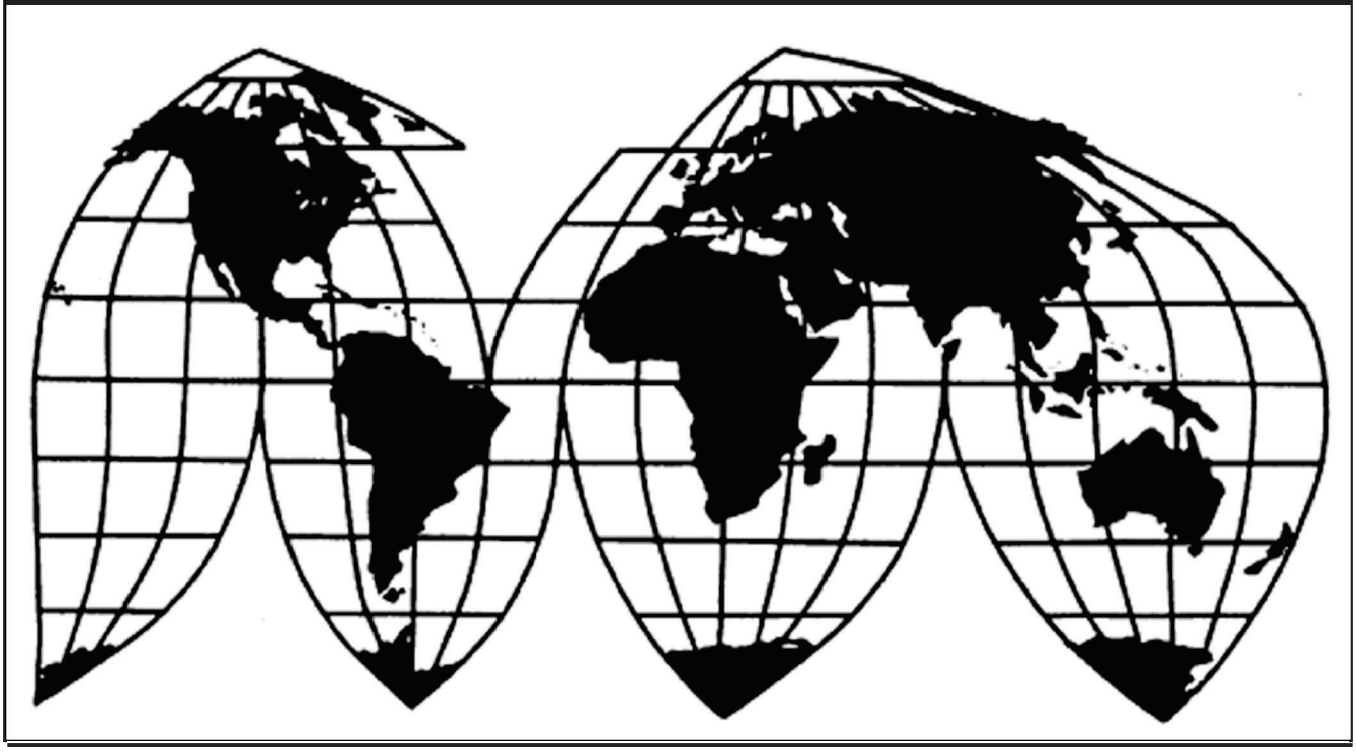
*In the Matter of*

# CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME

Investigation No. 337-TA-1119

**Publication 5253** **February 2022**

**U.S. International Trade Commission**



**Washington, DC 20436**

# U.S. International Trade Commission

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# U.S. International Trade Commission

Washington, DC 20436
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**February 2022**

**UNITED STATES INTERNATIONAL TRADE COMMISSION**
**Washington, D.C.**

| **In the Matter of** | |
|---|---|
| **CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** | **Investigation No. 337-TA-1119** |

# NOTICE OF A COMMISSION DETERMINATION FINDING NO VIOLATION OF SECTION 337; TERMINATION OF THE INVESTIGATION

**AGENCY**: U.S. International Trade Commission.

**ACTION**: Notice.

**SUMMARY**: Notice is hereby given that the U.S. International Trade Commission has determined to affirm, with modified reasoning, the final initial determination's ("FID") finding that no violation of section 337 has occurred. The investigation is terminated.

**FOR FURTHER INFORMATION CONTACT**: Lynde Herzbach, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-3228. Copies of non-confidential documents filed in connection with this investigation may be viewed on the Commission's electronic docket (EDIS) at https://edis.usitc.gov. For help accessing EDIS, please email EDIS3Help@usitc.gov. General information concerning the Commission may also be obtained by accessing its Internet server at https://www.usitc.gov. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal, telephone 202-205-1810.

**SUPPLEMENTARY INFORMATION**: On June 12, 2018, the Commission instituted this investigation based on a complaint filed by Broadcom Corporation ("Broadcom") of San Jose, California. 83 FR 27349 (June 12, 2018). The complaint alleged a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337 ("section 337") in the importation into the United States, sale for importation, or sale in the United States after importation of certain infotainment systems, components thereof, and automobiles containing same that allegedly infringe one or more claims of U.S. Patent Nos. 6,937,187 ("the '187 patent"); 8,902,104 ("the '104 patent"); 7,512,752 ("the '752 patent"); 7,530,027 ("the '027 patent"); 8,284,844 ("the '844 patent"); and 7,437,583 ("the '583 patent") (collectively, "the Asserted Patents"). The notice of investigation named 15 respondents, including Toyota Motor Corporation of Aichi, Japan; Toyota Motor North America, Inc. of Plano, TX; Toyota Motor Sales, U.S.A., Inc. of Plano, TX; Toyota Motor Engineering & Manufacturing North America, Inc. of Plano, TX; Toyota Motor Manufacturing, Indiana, Inc. of Princeton, IN; Toyota Motor Manufacturing, Kentucky, Inc. of Erlanger, KY; Toyota Motor Manufacturing, Mississippi, Inc. of Tupelo, MS; and Toyota Motor

Manufacturing, Texas, Inc. of San Antonio, TX (collectively, "Toyota"); Panasonic Corporation of Osaka, Japan and Panasonic Corporation of North America of Newark, NJ (collectively, "Panasonic"); DENSO TEN Limited of Kobe City, Japan and DENSO TEN AMERICA Limited of Torrance, CA (collectively, "DENSO TEN"); Renesas Electronics Corporation of Tokyo, Japan and Renesas Electronics America, Inc. of Milpitas, CA (collectively, "Renesas"); and Japan Radio Co., Ltd. of Tokyo, Japan. *Id*. at 27349-50. The Office of Unfair Import Investigations was not named as a party. *Id*. at 27351.

The complaint and notice of investigation were later amended to add ten more respondents, including Pioneer Corporation of Tokyo, Japan and Pioneer Automotive Technologies, Inc. of Farmington Hills, MI (collectively, "Pioneer"); DENSO Corporation of Aichi, Japan; DENSO International America, Inc. of Southfield, MI; DENSO Manufacturing Tennessee, Inc. of Maryville, TN; and DENSO Wireless Systems America, Inc. of Vista, CA (collectively, "DENSO Corp."); u-blox AG of Thalwil, Switzerland; u-blox America, Inc. of Reston, VA; u-blox San Diego, Inc. of San Diego, CA; and Socionext Inc. of Kanagawa, Japan. Order No. 14 (Oct. 3, 2018), *not rev'd in relevant part*, Comm'n Notice (Nov. 1, 2018).

Certain patent claims were subsequently withdrawn and terminated from the investigation. *See* Order No. 20 (Jan. 31, 2019), *not rev'd*, Comm'n Notice (Feb. 19, 2019); Order No. 48 (June 5, 2019), *not rev'd*, Comm'n Notice (June 18, 2019); Order No. 49 (June 13, 2019), *not rev'd*, Comm'n Notice (June 28, 2019). At the time of the FID, the claims at issue were claims 1-3, 5, and 9 of the '187 patent; claim 12 of the '104 patent; claims 1-2 and 4-8 of the '752 patent; claims 11 and 20 of the '027 patent; claims 11 and 13 of the '844 patent; and claims 17-18 and 25-26 of the '583 patent. *See* Comm'n Notice (June 28, 2019).

On November 13, 2019, the ALJ issued an FID finding no violation of section 337. *See* FID. On November 15, 2019, the ALJ issued a Notice of Correction to Conclusions of Law in Initial Determination on Violation of Section 337 and a corrected FID issued on November 18, 2019. The corrected FID fixes a typographical error in the conclusions of law and correctly identifies Respondents found to infringe the '583 patent. *See* FID at p. 272.

The FID also contains the ALJ's recommended determination recommending, if a violation is found, that the Commission issue a limited exclusion order prohibiting the importation of infringing infotainment systems, components thereof, and automobiles containing same that infringe. as well as cease and desist orders directed to certain domestic respondents.

On November 26, 2019, Broadcom filed a petition for review of the FID and the respondents filed a contingent petition for review. On December 4, 2019, Broadcom and the respondents filed responses to each other's petitions.

On December 16, 2019, Broadcom filed a submission on the public interest pursuant to Commission Rule 210.50(a)(4) (19 CFR 210.50(a)(4)). That same day, Toyota, Renesas, and Tier 1 Suppliers (DENSO Corp., DENSO TEN, Panasonic, and Pioneer) filed their submissions on the public interest pursuant to Commission Rule 210.50(a)(4) (19 CFR 210.50(a)(4)). On December 18, 2019, two non-parties, Peter Morici and the Reshoring Initiative, filed submissions on the public interest in response to the Commission's notice requesting such responses. 84 FR 64104 (Nov. 20, 2019).

On March 3, 2020, the Commission determined to review the FID in part and requested briefing on certain issues. 85 FR 12576-78 (March 3, 2020). Specifically, the Commission determined to review the FID's findings on: (1) the claim construction of the limitation "at least one processor" recited in claims 25 and 26 of the '583 patent; (2) infringement of the asserted claims of the '583 patent; (3) technical prong of the domestic industry requirement as to the '583 patent; (4) invalidity of the asserted claims of the '752 patent; and (5) whether the accused Pioneer head units meet the limitations of claims 2 and 5 of the '752 patent. *Id.* The Commission requested briefing on some of the issues under review, and remedy, bonding, and the public interest. *Id*. On March 11, 2020, the parties filed their written responses to the Commission's request for briefing. On March 18, 2020, the parties filed their reply submissions.

On March 11, 2020, additional submissions on remedy, bonding, and the public interest were received from the following non-parties: Representatives and Senators from Kentucky; Representatives and Senators from Texas; Harman International Industries, Incorporated; and the Alliance for Automotive Innovation.

Having examined the record of this investigation, including the FID, the petitions for review, and the responses thereto, and filings in response to the Commission's request for briefing, the Commission has determined to affirm, with modified reasoning, the FID's finding of no violation of section 337. Specifically, the Commission affirms, with modified reasoning as explained in the Commission opinion, that: (1) claims 25 and 26 of the '583 patent are not infringed by any Respondent; (2) the technical prong of the domestic industry requirement is not met for the '583 patent; (3) the Pioneer head units do not meet the limitations of claims 2 and 5 of the '752 patent; and (4) claims 1, 2, 4, 5, 7, and 8 of the '752 patent are invalid as anticipated and obvious. The Commission affirms the FID's infringement finding as to claims 17 and 18 of the '583 patent.

The investigation is terminated.

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 CFR part 210).

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: April 30, 2020

**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** **Inv. No. 337-TA-1119**

## PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the following parties as indicated, on April 30, 2020.

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

**On Behalf of Complainant Broadcom Corporation:**

John M. Caracappa, Esq.
**STEPTOE & JOHNSON LLP**
1330 Connecticut Avenue, N.W.
Washington, DC 20036
Email: Jcaracappa@steptoe.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Renesas Electronics Corporation and Renesas Electronics America, Inc. :**

Daniel P. Muino, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 60000
Washington, DC 20006
Email: Dmuino@mofo.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing, Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing, Mississippi, Inc., Toyota Motor Manufacturing, Texas, Inc., Panasonic Corporation, Panasonic Corporation of North America, Denso Ten Limited, Denso Ten America Limited, Japan Radio Corporation, Denso Corporation, Denso International America, Inc., Denso Manufacturing Tennessee, Inc, and Denso Wireless Systems America, Inc.:**

Paul Steadman, Esq.
**DLA PIPER LLP**
444 West Lake Street

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail

Suite 900
Chicago, IL 60606
Email: paul.steadman@dlapiper.com

☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Pioneer Corporation and Pioneer Automotive Technologies, Inc.**

Lora A. Brzezynski, Esq.
**FAEGRE DRINKER BIDDLE & REATH LLP**
1500 K Street, NW, Suite 1100
Washington, DC 20005
Email: lora.brzezynski@faegredrinker.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Socionext, Inc.**

G. Brian Busey, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 6000
Washington, DC 20006
Email: Gbusey@mofo.com

☐ Via Hand Delivery
☐ Via Express Delivery
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**On Behalf of Respondents u-blox AG, u-blox America, Inc., and u-blox San Diego, Inc.**

Smith Brittingham IV, Esq.
**FINNEGAN, HENDRESON, FARABOW, GARRETT & DUNNER LLP**
901 New York Avenue, NW
Washington, DC 20001
Email: smith.brittingham@finnegan.com

☐ Via Hand Delivery
☐ Via Express Delivery
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**PUBLIC VERSION**

**UNITED STATES INTERNATIONAL TRADE COMMISSION**
**Washington, D.C.**

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|---|---|
| **In the Matter of**<br><br>**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** | **Investigation No. 337-TA-1119** |

# COMMISSION OPINION

## TABLE OF CONTENTS

The Commission has determined that there has been no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337 ("section 337"), with respect to U.S. Patent Nos. 6,937,187 ("the '187 patent"); 8,902,104 ("the '104 patent"); 7,512,752 ("the '752 patent"); 7,530,027 ("the '027 patent"); 8,284,844 ("the '844 patent"); and 7,437,583 ("the '583 patent") ("the Asserted Patents") on review of the presiding administrative law judge's ("ALJ") final initial determination ("FID"). This opinion sets forth the Commission's reasoning in support of that determination. In addition, the Commission adopts the findings in the FID that are not inconsistent with this opinion.

## I. BACKGROUND

### A. Procedural History

On June 12, 2018, the Commission instituted this investigation based on a complaint filed by Broadcom Corporation ("Broadcom"). 83 Fed. Reg. 27349 (June 12, 2018). The complaint alleges a violation of section 337 based on the importation into the United States, the sale for importation, and the sale in the United States after importation of automobile information and entertainment systems and components thereof that allegedly infringe one or more claims of the Asserted Patents. FID at 1-2. Broadcom also alleges the existence of a domestic industry.

The notice of investigation names 15 respondents, including: Toyota Motor Corporation of Aichi, Japan; Toyota Motor North America, Inc. of Plano, TX; Toyota Motor Sales, U.S.A., Inc. of Plano, TX; Toyota Motor Engineering & Manufacturing North America, Inc. of Plano, TX; Toyota Motor Manufacturing, Indiana, Inc. of Princeton, IN; Toyota Motor Manufacturing, Kentucky, Inc. of Erlanger, KY; Toyota Motor Manufacturing, Mississippi, Inc. of Tupelo, MS; and Toyota Motor Manufacturing, Texas, Inc. of San Antonio, TX (collectively, "Toyota"); Panasonic Corporation of Osaka, Japan and Panasonic Corporation of North America of Newark, NJ (collectively, "Panasonic"); DENSO TEN Limited of Kobe City, Japan and DENSO TEN

AMERICA Limited of Torrance, CA (collectively, "DENSO TEN"); Renesas Electronics Corporation of Tokyo, Japan and Renesas Electronics America, Inc. of Milpitas, CA (collectively, "Renesas"); and Japan Radio Co., Ltd. of Tokyo, Japan ("JRC"). *Id.* The complaint and notice of investigation were later amended to add ten more respondents, namely: Pioneer Corporation of Tokyo, Japan and Pioneer Automotive Technologies, Inc. of Farmington Hills, MI (collectively, "Pioneer"); DENSO Corporation of Aichi, Japan; DENSO International America, Inc. of Southfield, MI; DENSO Manufacturing Tennessee, Inc. of Maryville, TN; and DENSO Wireless Systems America, Inc. of Vista, CA (collectively, "DENSO Corp."); u-blox AG of Thalwil, Switzerland; u-blox America, Inc. of Reston, VA; u-blox San Diego, Inc. of San Diego, CA; and Socionext Inc. of Kanagawa, Japan ("Socionext"). Order No. 14 (Oct. 3, 2018), *not rev'd in relevant part*, Comm'n Notice (Nov. 1, 2018); *see also* FID at 2.[1] The Office of Unfair Import Investigations was not named as a party. *Id.*

The ALJ held a tutorial and *Markman* hearing on February 6, 2019. FID at 2. The disputed claim terms are construed in the FID. The ALJ held an evidentiary hearing on June 3-7, 2019. *Id.* at 2.

On November 13, 2019, the presiding ALJ issued the FID finding no violation of section 337 with respect to each of the Asserted Patents. The relevant findings are summarized as follows:

**Respondent Socionext (no violation – no importation)**

- The importation requirement as to Socionext was not met. FID at 14-16, 271.

[1] Hereinafter, all named respondents are referred to collectively as "Respondents." In general, Respondents are Toyota and Toyota's suppliers.

**’583 patent (no violation – technical prong of domestic industry not met):**

- Claims 17 and 18 of the ’583 patent are infringed by Renesas, DENSO Corp., and Toyota. FID at 30-36, 40-41, 271.
- Claims 25 and 26 of the ’583 patent are not infringed by any respondent. *Id*. at 36-39.
- Technical prong of the domestic industry (“DI”) requirement was not met for any claim of the ’583 patent. *Id*. at 42-48, 271.
- No asserted claims of the ’583 patent were shown to be invalid. *Id*. at 48-54.

**’752 patent (no violation – asserted claims are invalid):**

- Claims 1, 2, 5, 7, and 8 of the ’752 patent are infringed by Renesas, Panasonic, Pioneer, DENSO TEN, and Toyota. *Id*. at 63-78, 272.
- The DI requirement was satisfied for the ’752 patent as to claims 1, 2, 4, 5, 6, and 7. *Id*. at 78-81, 272.
- Claims 1, 2, 4, 5, 7, and 8 of the ’752 patent are invalid as anticipated by U.S. Patent No. 6,240,492 to Foster, et al. (“Foster”) or are obvious in view of Foster or U.S. Patent Pub. No. 2003/0106053 (“Sih”) in combination with additional prior art. *Id*. at 81-113, 272.

**’844 patent (no violation – no infringement or domestic industry):**

- No claims of the ’844 patent are infringed. *Id*. at 272.
- The DI requirement was not satisfied for any claim of the ’844 patent. *Id*. at 272.
- No asserted claims of the ’844 patent were shown to be invalid. *Id*. at 272.

**’187 patent (no violation – no infringement or domestic industry, invalid claims):**

- No claims of the ’187 patent are infringed. *Id*. at 272.
- The DI requirement was not satisfied for any claim of the ’187 patent. *Id*. at 272.
- Claims 1, 3, 5, and 9 of the ’187 patent are invalid. *Id*. at 272.

**’027 patent (no violation – no infringement or domestic industry, invalid claims):**

- No claims of the ’027 patent are infringed. *Id*. at 272.
- The DI requirement was not satisfied for any claim of the ’027 patent. *Id*. at 272.

- Claims 11 and 20 of the '027 patent are invalid. *Id*. at 272.

**'104 patent (no violation – no infringement, claim 12 invalid):**

- Claim 12 of the '104 patent is not infringed. *Id*. at 272.
- The DI requirement was satisfied as to claim 12 of the '104 patent. *Id*. at 272.
- Claim 12 of the '104 patent is invalid. *Id*. at 272.

In addition, Broadcom alleged indirect infringement of the Asserted Patents, but the FID finds Broadcom failed to carry its burden as to indirect infringement. *Id.* at 41-42, 78.

The FID also includes the ALJ's recommended determination ("RD") on remedy and bonding. FID at 259-71. Specifically, the RD recommends, in the event a violation is found, the issuance of a limited exclusion order and cease and desist orders as to each of the domestic Respondents, and that no bond be imposed for products imported during the period of Presidential review. *Id.*

On November 26, 2019, Broadcom petitioned the Commission to review certain of the FID's findings related to only the '583 patent and the '752 patent.[2] On the same day, Respondents filed a contingent petition for review of issues related to all of the Asserted Patents except the '027 patent and the '104 patent. *Id*. On December 4, 2019, the parties filed responses to each other's petitions.[3]

On December 16, 2019, Broadcom and respondents Toyota, Renesas, and the Tier 1 Suppliers[4] filed submissions on the public interest pursuant to Commission Rule 210.50(a)(4)

[2] Complainant Broadcom Corporation's Petition for Commission Review (Nov. 26, 2019) ("Broadcom Pet.").

[3] Complainant Broadcom Corporation's Response to Respondents' Contingent Petition for Commission Review (Dec. 4, 2019) ("Broadcom Reply"); Respondents' Reply to Complainant's Petition for Commission Review (Dec. 4, 2019) ("Resp. Reply").

[4] DENSO Corp.; DENSO TEN; Panasonic; and Pioneer.

(19 C.F.R. § 210.50(a)(4)). On December 18, 2019, two non-parties, Peter Morici and the Reshoring Initiative, filed submissions on the public interest in response to the Commission's notice requesting such responses (84 Fed. Reg. 64104 (Nov. 20, 2019)).

On February 26, 2020, the Commission determined to review the FID in part. *See* Notice (Feb. 26, 2020); 85 Fed. Reg. at 12576-78. Specifically, the Commission determined to review: (1) the FID's construction of the term "at least one processor" in claims 25 and 26 of the '583 patent; (2) the FID's infringement and technical prong findings regarding the '583 patent; (3) the FID's infringement findings regarding the '752 patent, in particular, whether the accused Pioneer head units meet the limitations of claims 2 and 5; and (4) the FID's findings regarding invalidity of the '752 patent. *Id.* The Commission determined not to review the FID's findings of no violation as to the '187 patent, the '104 patent, the '027 patent, and the '844 patent. *Id.* The Commission also requested briefing on certain questions related to the issues under review, as well as remedy, bonding, and the public interest.

On March 11, 2020, Broadcom filed its initial written response to the Commission's request for briefing.[5] Respondents filed their initial written response that same day.[6] On March 18, 2020, the parties filed their reply submissions.[7]

[5] Complainant Broadcom Corporation's Written Submission on the Issues Identified in the Notice of Commission Determination to Review in Part a Final Initial Determination (March 11, 2020) ("Broadcom Sub.").

[6] Respondents' Additional Briefing on the Questions Posed by the Commission in the Notice of a Commission Determination to Review in Part a Final Initial Determination Finding No Violation of Section 337 (March 11, 2020) ("Resp. Sub.").

[7] Complainant Broadcom Corporation's Reply to Respondents' Additional Briefing on the Questions Posed by the Commission in Notice of Commission Determination to Review in Part a Final Initial Determination (March 18, 2020) ("Broadcom Sub. Reply"); Respondents' Reply Brief on the Questions Posed by the Commission in Notice of a Commission Determination to Review in Part a Final Initial Determination Finding No Violation of Section 337 and on Public Interest, Remedy and Bonding (March 18, 2020) ("Resp. Sub. Reply").

On March 11, 2020, the Commission received submissions on remedy, bonding, and the public interest from the parties[8] and the following non-parties: Representatives and Senators from Kentucky[9]; Representatives and Senators from Texas[10]; Harman International Industries, Incorporated (a Tier 1 supplier for Toyota); and the Alliance for Automotive Innovation.

### B. The Asserted Patents

Broadcom asserted six patents in this investigation, which fall broadly into three categories: (1) the '583 patent relates to electronics architecture; (2) the '752, '027, and '844 patents relate to electronics for video processing and have overlapping inventors; and (3) the '187 and '104 patents relate to navigation satellite systems. FID at 6. Because the Commission determined not to review the FID's findings of no violation as to the '187, '104, '027, and '844 patents, those patents have been terminated from the investigation, and this opinion does not address them.

#### 1. The '583 Patent

The '583 patent is entitled "Method and System for Flexible Clock Gating Control" and issued on October 14, 2008. '583 patent (JX-0004), cover; FID at 7. The '583 patent relates to electronics architecture and discloses a system for controlling clock signals by using software to control gates. *Id*. at Abstract. The '583 patent describes a processor that can more flexibly

[8] Broadcom Sub. at 39-50; Respondents' Initial Joint Submission on the Public Interest, Remedy, and Bonding (March 11, 2020).

9 Letter from Congressman Aaron Barr, Congressman Hal Rogers, Congressman John Yarmuth, Congressman James Comer, Congressman Brett Guthrie, Senator Mitch McConnell, and Senator Rand Paul from Kentucky (March 11, 2020).

10 Letter from Congressman Van Taylor, Congressman Will Hurd, Congressman Michael C. Burgess, M.D., and Congressman Vincente Gonzalez from Texas (March 11, 2020); Letter from Senator John Cornyn from Texas (March 11, 2020).

control gates, as compared to the prior art, by reading and writing to registers mapped to the gates. *Id*. at 5:3-33.

An exemplary clock signal control system is depicted in Figure 3 of the specification. *Id.* at Fig. 3.

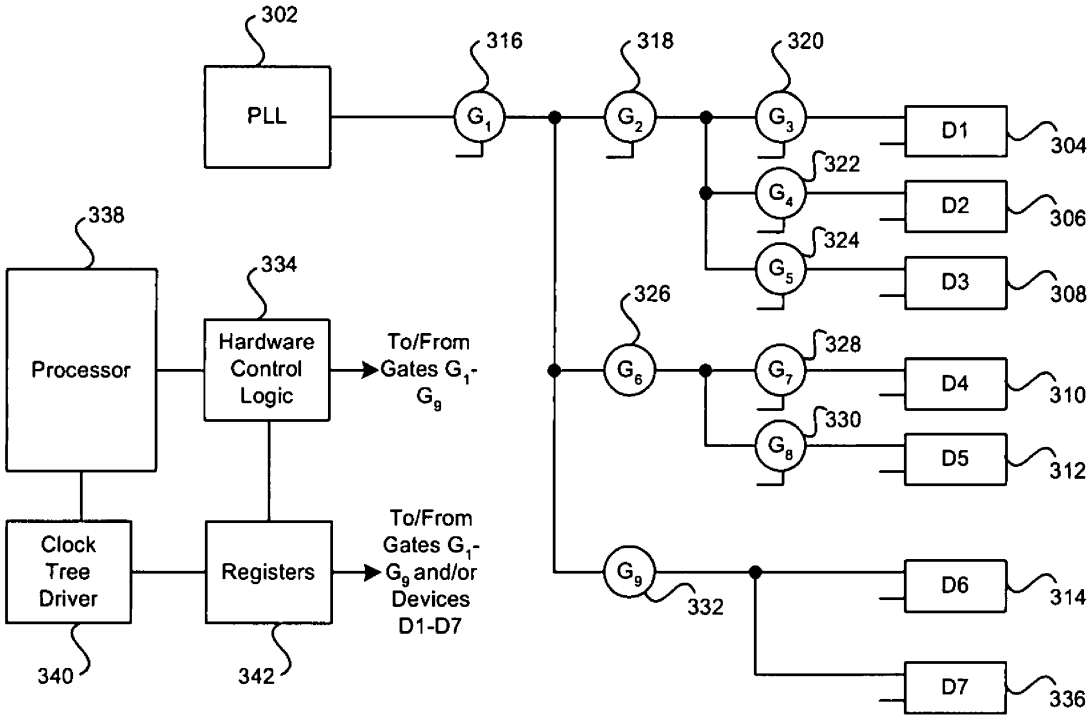


**FIG. 3**

In operation, the hardware control logic **334** turns the gates (G1-G9) on and off to supply clock signals to the devices (D1-D7), but the processor **338** can also control the gates and devices through the clock tree driver **340** and registers **342**. *Id.* at 4:63-5:13. This feature allows the gates to be "more flexibly controlled in order to cover scenarios that were not anticipated when hardware control logic **334** was designed." *Id.*

Broadcom asserts claims 17-18 and 25-26 of the ’583 patent for infringement and claims 25 and 26 of the ’583 patent for purposes of satisfying the technical prong of the DI requirement. FID at 5, 27-28, 42.

Claim 17 is an independent claim and recites the following:

> 17. A system for distributing clock signals within an electronic device, the system comprising:
>
> at least one processor that determines a status of at least one gate that controls flow of a clock signal to at least one device coupled to said at least one gate; and
>
> said at least one processor controls said at least one gate based on said determined status.

’583 patent at 7:83-8:2.

Claim 18 depends from claim 17 and recites the following:

> 18. The system according to claim 17, wherein said at least one processor determines whether said at least one device coupled to said at least one gate is active or inactive.

*Id.* at 8:3-5.

Claim 25 is also an independent claim and recites the following:

> 25. A system for distributing clock signals within an electronic device, the system comprising:
>
> a clock tree having a plurality of gates;
>
> a hardware control logic block coupled to said clock tree that controls at least a portion of said plurality of gates;
>
> at least one register that is controlled by a clock tree driver; and
>
> at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block.

*Id.* at 8:28-37 (emphasis added for disputed limitations).

Claim 26 depends from claim 25 and recites the following:

> 26. The system according to claim 25, wherein said processor via said clock tree driver asserts or de-asserts a current value of said at least one register.

*Id.* at 8:38-40.

### 2. The '752 Patent

The '752 patent is entitled "Systems, Methods, and Apparatus for Pixel Fetch Request Interface," and generally relates to a memory access unit ("MAU"), which is an interface between clients that are requesting access to data in memory and a memory controller that controls the access to the memory. '752 patent (JX-0005), cover, 2:51-3:67; FID at 7. The invention of the '752 patent is embodied in an MAU and addresses problems in the prior art of accessing a variety of different, and potentially non-consecutive, addresses within a shared memory. FID at 8 (citing '752 patent at 1:25-2:9).

The MAU can comprise a queue for access requests and logic for generating lists of addresses from the requests and reordering the lists of addresses to optimize access to the memory. *Id.* at 56 (citing '752 patent at 3:20-34). This can "relieve the internal video decoding modules . . . from the burden of knowing the detail of the memory pixel data arrangement and access control." *Id.* (citing '752 patent at 6:16-20).

Broadcom asserts claims 1, 2, 5, 7, and 8 of the '752 patent for infringement purposes and claims 1, 2, 4, 5, 6, and 7 for DI purposes. *Id.* at 57 (citing CIB[11] at 79, 95). The asserted claims follow:

> 1. A memory access unit for accessing data for a module, said memory access unit comprising:
>
> an output port for providing access requests for lists of addresses in a memory over a link to a memory controller; and
>
> a queue for queuing the access requests for the lists of addresses.

'752 patent at 8:61-67.

[11] Complainant Broadcom Corporation's Post-Hearing Brief (June 21, 2019) ("CIB").

2. The memory access unit of claim 1, further comprising:

an input port for receiving requests for blocks of pixels from a motion prediction processing unit; and

logic for generating the lists of addresses from the requests for blocks of pixels, wherein the lists of addresses correspond to addresses in a memory that store pixels in the blocks of pixels.

*Id.* at 9:1-7.

4. The memory access unit of claim 2, wherein the logic generates the access requests based on the list of addresses and based on row-bank accesses needed to access the addresses.

*Id*. at 9:13-16.

5. The memory access unit of claim 2, wherein the logic generates the access requests based on the list of addresses and based on sizes of each of the requests for blocks of pixels from the motion prediction processing unit.

*Id*. at 9:17-20.

6. The memory access unit of claim 1, wherein the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over a bus shared with one or more clients.

*Id*. at 9:21-24.

7. The memory access unit of claim 1, wherein the addresses are non-contiguous.

*Id*. at 9:25-26.

8. The memory access unit of claim 1, wherein the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over said link.

*Id*. at 9:27-30.

### C. The Accused Products[12]

The accused products include certain system-on-chip ("SoC")[13] products, Global Navigation Satellite System ("GNSS") products, head units that incorporate these products, and automobiles in which the head units are installed. The specific allegations of infringement as to the SoCs and GNSS chips are set forth in the table below:

| **Patent (Asserted Claims)** | **Accused Products** |
|---|---|
| '583 patent, claims 17-18 | Renesas SH7769 SoCs |
| '583 patent, claims 25-26 | Renesas [redacted] SoCs[14] |
| '752 patent, claims 1, 2, 5, 7, 8 | Renesas [redacted] SoCs<br>Renesas [redacted] SoCs<br>Renesas [redacted] SoCs |

FID at 27, 57.

The Renesas SH7769 SoCs are incorporated in head units manufactured by DENSO Corporation, which are installed in Toyota automobiles, specifically, Lexus-branded vehicles. *Id.* at 40. The Renesas [redacted] SoCs, [redacted] SoCs, and [redacted] SoCs are incorporated in Pioneer, Panasonic, and DENSO TEN head units, which are installed in general Toyota automobiles. *Id.*

[12] As noted above, the Commission determined not to review the FID's finding of no violation as to the '187, '104, '027, and '844 patents. Therefore, the accused products alleged to infringe those patents are not addressed.

[13] A Broadcom engineer, Mr. Hellman, testified that an SoC refers to a "single chip that incorporates a bunch of components that previously would have been implemented in many discrete chips." CX-0003C at Q9.

[14] The accused [redacted] products include the [redacted], and [redacted]. FID at 64.

### D. The Domestic Industry Products[15]

For the purpose of satisfying the technical prong of the DI requirement, 19 U.S.C. § 1337(a)(2), Broadcom alleged that several of its SoCs, for use in its customers' set top boxes ("STB"), practice claims 25 and 26 of the '583 patent and claims 1, 2, and 4-7 of the '752 patent. FID at 42, 78; *see also* CIB at App. 3.

## II. STANDARD ON REVIEW

With respect to the issues under 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." 19 C.F.R. § 210.45(c). The Commission also "may take no position on specific issues or portions of the initial determination," and "may make any finding or conclusions that in its judgment are proper based on the record in the proceeding." *Id.*; *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984).

## III. ANALYSIS

The Commission determines to make the findings, conclusions, and supporting analysis set forth below. Any findings, conclusions, and supporting analysis in the FID regarding issues that are under review that are not inconsistent with these findings, conclusions, and supporting analysis are affirmed and adopted herein.

### A. '583 Patent Issues Under Review

The Commission determined to review three findings related to the '583 patent: (1) the claim construction of the limitation "at least one processor" recited in claims 25 and 26; (2) the finding that Broadcom failed to satisfy the technical prong of the DI requirement; and (3) the

[15] As noted above, the Commission determined not to review the FID's findings of no violation as to the '187, '104, '027, and '844 patents, therefore the alleged DI products for those patents are not addressed.

infringement findings, which includes findings that the Renesas SH7769 SoCs meet the limitations of claims 17 and 18 and the accused [redacted] products do not meet the limitations of claims 25 and 26. 85 Fed. Reg. at 12576-77.

For the reasons set forth below, the Commission has determined to modify the FID's construction of "at least one processor" in claims 25 and 26 of the '583 patent but finds that this modified construction does not affect the FID's infringement, invalidity, or DI findings for the '583 patent. The Commission affirms, under a modified analysis explained below, the FID's finding that Broadcom failed to satisfy the technical prong of the DI requirement for the '583 patent. The Commission also affirms the FID's finding that Respondents Renesas, DENSO Corp., and Toyota infringe claims 17 and 18. The Commission further affirms, with the modified reasoning detailed below, the FID's finding that Respondents Renesas, Pioneer, Panasonic, DENSO TEN, and Toyota do not infringe claims 25 and 26 of the '583 patent because the accused products lack the specific processor recited in those claims. Thus, the Commission affirms the finding of no violation for the '583 patent.

### 1. Construction of "at least one processor" in Claims 25 and 26

Claim terms are normally construed according to their ordinary and customary meaning in the art, as understood by a person of ordinary skill in the art ("POSA") in the context of the entire patent. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*), *cert. denied*, 546 U.S. 1170 (2006). Claim construction focuses on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *Id.* at 1313-17. In addition to the intrinsic evidence, extrinsic evidence may also be considered. *Id*. at 1317, 1319 (noting that extrinsic evidence may be "less significant" and "less reliable" than the intrinsic record). Extrinsic evidence consists of all evidence external to the patent and the

prosecution history, and includes inventor testimony, expert testimony, dictionaries, and learned treatises. *Id*.

**a. The FID**

Respondents argued before the ALJ that the limitation "at least one processor" should be construed such that the processor is separate from both: (1) the clock tree driver and (2) the hardware control block. FID at 28-29. Broadcom argued that the term should have its plain and ordinary meaning. *Id.* The FID construes the term "at least one processor" in claims 25 and 26 as having its plain and ordinary meaning. *Id*.

**b. Analysis**

The Commission has determined to modify the construction of the term "at least one processor" recited in claims 25 and 26 of the '583 patent to mean "at least one processor separate from the hardware control block." We see no error in the FID's refusal to adopt Respondents' first proposed limitation that the processor be separate from the clock tree driver. *See* FID at 28-29. However, the parties' submissions in response to the Commission's notice of review, the intrinsic record, and certain findings in the FID support construing the term to include Respondents' second proposed limitation that the processor be separate from the hardware control block.

The parties agree that the modified construction is supported by the intrinsic record. Broadcom Sub. at 2, 6-8; Resp. Sub. at 1-4. Specifically, the plain language of claim 25 separately recites a "hardware control logic block" and "at least one processor." '583 patent at claim 25. Further, Figure 3 shows a processor that is separate from the hardware control logic block. *Id.* at Fig. 3, 2:63-66, 3:12-22, 4:1-27, 4:67-5:18. In addition, Broadcom admitted that it argued during prosecution that "the claimed overwriting by the processor is not performed by the hardware control logic block." FID at 51; CIB at 72-74, 110.

Accordingly, the Commission has determined to modify the claim construction of "at least one processor" recited in claims 25 and 26 of the '583 patent to mean "at least one processor separate from the hardware control block." As acknowledged by the parties, the modified claim construction does not affect the FID's relevant findings with respect to the '583 patent. *See* Broadcom Sub. at 2, 6-8; Resp. Sub. at 1-4; *see also* Broadcom Sub. Reply at 2-3.

### 2. Domestic Industry – Technical Prong for the '583 Patent

#### a. The FID

The FID finds that Broadcom failed to demonstrate that its DI products, as represented by the Broadcom [redacted][16] SoC, satisfy the technical prong of the DI requirement because the asserted SoCs do not meet the limitations of claims 25 or 26 of the '583 patent, in particular, the limitation "at least one register that is controlled by a clock tree driver" recited in claim 25. FID at 42-48. The FID finds that Broadcom does not dispute that the claimed "clock tree driver" is stored on external memory separate from Broadcom's SoC. *Id.* at 44. The FID also finds that Broadcom has not identified any particular set-top box or any specific memory that contains the clock tree driver software relied on by Broadcom's expert. *Id.* at 46.

The FID relies on *Certain Mobile Devices, Associated Software, and Components Thereof*, Inv. No. 337-TA-744 ("*Mobile Devices*"), in which the Commission considered the issue of Microsoft software provided for use on mobile devices in the context of the technical prong for DI. *Id.* at 44-46 (citing *Mobile Devices*, Final ID at 196-206 (Dec. 20, 2011), *not rev'd in relevant part by* Comm'n Op. (May 18, 2012)). In *Mobile Devices*, the Commission

[16] There was no dispute that the Broadcom [redacted] is representative of the other asserted Broadcom DI products. FID at 42.

affirmed, in relevant part, that Microsoft failed to satisfy the technical prong because it failed to confirm how the devices on which it relied actually operated. *Id.*[17]

The FID concludes that Broadcom failed to identify any specific external memory or any set-top box integrating Broadcom's SoC DI products that meet the "clock tree driver" limitation and thus failed to satisfy the technical prong of the DI requirement with respect to the '583 patent. *Id.* at 45-46 (citing *Microsoft Corp.*, 731 F.3d at 1363).

**b. Analysis**

The Commission determined to review the FID's findings regarding the technical prong of the DI requirement for the '583 patent. 85 Fed. Reg. at 12576-77. For the reasons below, the Commission has determined to affirm, with a modified reasoning, the FID's finding that Broadcom has failed to satisfy the technical prong with respect to the '583 patent.

The "domestic industry requirement" consists of a so-called "technical prong" and a so-called "economic prong." The technical prong requires that the complainant practice the asserted patent claims. *Crocs, Inc. v. Int'l Trade Comm'n*, 598 F.3d 1294, 1306-07 (Fed. Cir. 2010); *Certain Microsphere Adhesives, Process for Making Same and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. at 8 (Jan. 16, 1996). The test for "practicing" a patent is essentially the same as it is for infringement, only it involves comparing the complainant's own "domestic industry products" to one or more claims of the patent. *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). "In order to satisfy the technical prong of the domestic industry requirement, it is sufficient to show that the domestic industry practices any claim of that patent, not necessarily an asserted claim of

[17] The Federal Circuit affirmed the Commission's determination. *See Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d 1354, 1362-64 (Fed. Cir. 2013).

that patent." *Certain Ammonium Octamolybdate Isomers*, Inv. No. 337-TA-477, Comm'n Op. at 55 (Jan. 5, 2004) (citing *Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-stick Repositionable Notes*, Inv. No. 337-TA-366, USITC Pub. No. 2949 (Jan. 1996), Comm'n Op. at 16, 1996 WL 1056095 at *8, *aff'd sub nom. Minnesota Mining & Mfg. Co. v. U.S. Int'l Trade Comm'n*, 91 F.3d 171 (Fed. Cir. 1996)).

In its petition for review, Broadcom argued that the development and testing of its "Broadcom DI system," which Broadcom alleged includes both hardware (physical SoC) and firmware (software that runs on SoC), meets the limitations of claim 25. Broadcom Pet. at 44-55. Broadcom further argued that, when the firmware is executed, the clock tree driver software (the [redacted] file) that is initially stored on the external memory of its customer's set-top box is brought into the SoC's internal memory. *Id*. Broadcom contended that its hardware and firmware are implemented together and tested, and that both are needed for the system to be operational. *Id.* at 47 (citing CX-0006C at Q/A180-209; RX-00014C at Q/A27). Broadcom concluded that the clock tree driver software, once executed, meets the limitations of claim 25.

The Commission specifically finds that Broadcom's DI product with respect to the '583 patent is only the SoC and does not include customer set-top boxes or a larger system. Thus, as the FID finds, Broadcom's SoC DI products do not meet the limitation in claim 25, "at least one register that is controlled by a clock tree driver." FID at 42-48. Further, to the extent that Broadcom sought in its petition to rely on a customer set-top box or larger system, as opposed to only the SoC, as its DI product, the Commission finds such reliance waived because Broadcom did not present it before the ALJ.

**1) Broadcom's DI Products are the SoCs Only**

In its post-hearing brief, Broadcom stated that its "STB DI Products that practice one or more claims of the '583 patent include products with the following Core/Die Part Numbers:

[redacted]. The STB DI Products are listed in Appendix 3." CIB at 15-16, App. 3. Broadcom's "[redacted] Hardware Data Module" document describes the representative "[redacted]" as "a next-generation ***single-chip*** High Definition TV (HDTV) SoC delivering high-performance and low-power solutions for IP, cable, satellite, terrestrial, and over-the-top (OTT) ultra-small form factor set-top box (STB) applications." RX-0337C.18 (BCMTOY0055591) (emphasis added). The following are two examples of system block diagrams of the Broadcom SoC DI products:

[redacted]

RX-0337C.22 (BCMTOY0055595); RX-0023C.18 (BCMTOY0033113) (respectively). From the Broadcom system block diagrams, it is clear that the Broadcom DI products, [redacted] and [redacted] are only the "single-chip" SoCs at the center of the diagram. *Id.*; RX-0337C.18 (BCMTOY0055591). Further, as explained by Respondents' expert, Dr. Przybylski, the Broadcom SoCs are not complete systems but instead are complex integrated circuits. RX-0014C at Q/A20.

Broadcom and its expert relied on the testimony of a Broadcom engineer, Mr. Hellman, who testified about Broadcom's SoCs. CIB at 59 (citing CX-0003C at Q/A71-77). When asked, "[w]hat is an SoC?", Mr. Hellman testified that,

> SoC stands for "System on a Chip." It refers to a single chip that incorporates a bunch of components that previously would have been implemented in many discrete chips. It usually refers to a chip tailored for a specific market or application, as opposed to things like general-purpose CPU chips that can be used for many different applications. A SoC gives a low-cost solution for an application because all the necessary functions are incorporated in a single device.

CX-0003C at Q/A9. Mr. Hellman also testified regarding Broadcom's clock gating technology, which is referred to as "[redacted]" functionality and is relevant to the invention claimed in the '583 patent. *Id.* at Q/A71-77. Mr. Hellman's testimony regarding clock gating technology focused on only the SoCs (the "chips") and did not address the customers' set-top boxes. *Id.*

Broadcom's expert, Dr. McNair, analyzed the [redacted] SoC in his technical prong analysis for the '583 patent. CX-0006C at Q/A180; *see also id.* at Q/A174-209 (DI technical prong analysis). In particular, Dr. McNair relied on Mr. Hellman's testimony that the "[redacted]" and "[redacted]." *Id.* at Q/A178 (emphasis added). At the hearing, Dr. McNair confirmed that the [redacted] is a Broadcom SoC and is physically a chip. Tr. 109:3-25.

Based on the evidence of record, it is clear that Broadcom's DI products are only the asserted SoCs and do not include the customers' set-top boxes or a larger system. To the extent that Broadcom argued in its petition that its DI products are a system or something other than the SoCs, Broadcom waived that argument because it was not presented to the ALJ. *Certain Wireless Consumer Electronics Devices and Components Thereof*, Inv. No. 337-TA-853, Comm'n Op. at 41 (Pub. Ver. Mar. 21, 2014); *Broadcom Corp. v. Int'l Trade Comm'n*, 542 F.3d 894, 900-01 (Fed. Cir. 2008) (finding waiver where "Broadcom did not adequately present to the administrative law judge the argument it now presents on appeal[.]").

**2) Broadcom's Evidence of Alleged Testing and Use by Customers is Insufficient to Satisfy the Technical Prong**

Even if the system described in Broadcom's petition (*see* Broadcom Pet. at 44) is considered, there is a lack of evidence to support a finding that the alleged system meets the limitations of claims 25 and 26 of the '583 patent. Broadcom's evidence is not specific, not

corroborated by documents or testimonial evidence, and does not show that the clock tree driver is actually present on either the Broadcom DI products or any of its customers' set-top boxes.

Broadcom argued that its testing of the "firmware and hardware of the DI System" satisfies claim 25. Broadcom Pet. at 45-46 (citations omitted). Specifically, Broadcom contended that its hardware and firmware are implemented together and tested, and that both are needed for the system to be operational. *Id.* at 47 (citing CX-0006C at Q/A180-209; RX-00014C at Q/A27). However, Broadcom's development and testing allegations are supported by only the vague testimony of a Broadcom engineer, Mr. Hellman, who testified generally about development. CX-0003C at Q/A13, 16 (stating that the firmware and hardware "must be fully functional to validate the operation of the core before tapeout"). Broadcom failed, however, to cite to any explanation of what makes the product "fully functional" or what is included in the various steps in the validation process, specifically showing the practice of each limitation of claims 25 and 26. Broadcom Pet. at 45-47.

Broadcom also relied on Mr. Hellman's general statements regarding testing, including the following:

*Id*. at 45-46 (citing CX-0003C at Q/A13) (emphasis omitted). However, Broadcom presented no evidence of a prototype or product incorporating the SoCs, no evidence of development or testing beyond Mr. Hellman's testimony, and no evidence of the specifically identified clock tree driver software allegedly installed on the SoCs during development or testing. *See* CX-0003C at Q/A13, 16; Tr. 110:23-111:8.

We agree with the FID's reliance on *Mobile Devices*. FID at 43-46 (citing Inv. No. 337-TA-744, ID at 196-206). Pursuant to section 337(a)(2) and (3), a complainant must identify "actual 'articles protected by the patent'" in order to establish a domestic industry. *See Microsoft Corp.*, 731 F.3d at 1361-62. In *Mobile Devices*, the ALJ found that, because Microsoft did not point to evidence that its expert examined client applications running on third-party mobile phones or confirmed how they operated, Microsoft failed to show that there was a domestic industry product that actually practiced the patent Microsoft asserted. *Microsoft*, 731 F.3d at 1361-62. The Federal Circuit affirmed the Commission's determination that there was "insufficient proof that the [Microsoft] patent covers the articles on which Microsoft relied to prove a domestic industry." *Id.* at 1363-64.

Here, even under Broadcom's new "system" argument, Broadcom has not offered any analysis of its customers' products. Broadcom Pet. at. 51-54; *see also* FID at 43-46. Broadcom asserted that it provides actual firmware to its customers, including Comcast, DirecTV, SKY, EchoStar, and TiVo, but fails to provide any evidence beyond stating its customers' names. *Id*. at 53. Broadcom failed to identify any specific customer set-top boxes or particular memory that is incorporated in the customer's set-top boxes and satisfies the "clock tree driver" limitation recited in claim 25. *Id.* at 51-54; *see also* CX-0003C at Q/A12, 53–60; Tr. 113:1–114:13 (Hellman). Broadcom also failed to offer any detailed evidence regarding its alleged use and testing of the SoCs, such as what the testing entails or when it occurs in the development process. *Id.* Neither does Broadcom present any specific evidence or documents to substantiate the alleged customer use (including customer requests for help), what software or hardware required assistance from Broadcom, or how Broadcom allegedly "knows what software is running on its customers' products." *Id*. at 53-54 (citing CX-003C at Q/A51, 53, 55, 59; Tr.

114:2–13; Tr. 113:1-9; Tr. 111:4–8; Tr. 106:10-17). Thus, even if Broadcom's new system argument is considered, there is insufficient proof that the '583 patent covers the system. *Id.*; *see also Microsoft*, 731 F.3d at 1363-64.

Because the Broadcom SoC DI products do not meet all of the limitations of claims 25 and 26 of the '583 patent, the Commission affirms, with the additional reasoning provided above, the FID's finding that Broadcom failed to satisfy the technical prong of the DI requirement with respect to the '583 patent.

### 3. Non-Infringement of Claims 25 and 26 of the '583 Patent

Section 337 prohibits "the importation into the United States, the sale for importation, or the sale within the United States after importation . . . of articles that infringe a valid and enforceable United States patent . . . ." 19 U.S.C. § 1337(a)(1)(B). Direct infringement includes making, using, offering to sell, or selling a patented invention or importing a patented invention into the United States, without consent of the patent owner. 35 U.S.C. § 271(a). To prove direct infringement, the plaintiff must establish by a preponderance of the evidence that one or more claims of the asserted patent read on the accused product or process, either literally or under the doctrine of equivalents. *Advanced Cardiovascular Sys., Inc. v. Scimed Life Sys., Inc.*, 261 F.3d 1329, 1336 (Fed. Cir. 2001). Each limitation in a patent claim is considered material and essential to an infringement determination. *See London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991).

#### a. FID

The FID finds that the accused Renesas [redacted] SoCs do not satisfy the limitations of claims 25 or 26[18] of the '583 patent. FID at 36-42. Specifically, those accused SoCs do not

[18] Broadcom accused products incorporating the Renesas [redacted] SoCs, the [redacted] models, of infringing only claims 25 and 26 of the

meet the limitation, "at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block" from claim 25. *Id.* at 37-38. Claim 26 depends from claim 25; thus, the accused products also do not meet the limitations of claim 26. *Id.* at 38; *Ferring B.V. v. Watson Labs., Inc.-Fla.*, 764 F.3d 1401, 1411 (Fed. Cir. 2014) ("Because we hold that the asserted independent claims of [plaintiff's] patents are not infringed, the asserted dependent claims are likewise not infringed.").

The FID finds that Broadcom's expert identified only a hypothetical scenario that allegedly meets the overwriting limitation and, moreover, did not identify any software that performs the overwriting function. *Id.* at 37-39. The hypothetical called for the [redacted] to change [redacted], and, as a result, the processor's software would perform the overwriting function in response to the change in [redacted] *Id.* at 37-39 (citing CX-0006X at Q/A121). Broadcom's expert admitted that his alleged "overwriting" hypothetical would occur only when the [redacted] changes during [redacted] and that he could not identify any specific source code in the accused products where that sequence "actually happened." *Id*. Respondents' expert testified that [redacted] ." *Id.*; RX-0008C at Q/A102-04.

Before the ALJ, the parties argued as to which Federal Circuit case provided the proper standard for evaluating infringement. *Id.* at 39. The FID finds that the "overwrites a status"

'583 patent. FID at 30-31 (citing CIB at 37), 36 (citing CIB at 44-45). Broadcom accused the Renesas SH7769 SoCs, and products that incorporate them, of infringing claims 17 and 18 of the '583 patent. *Id.* The FID finds infringement of claims 17 and 18, and, on review, the Commission affirms that finding without modification. *Id.* at 31-36; 85 Fed. Reg. at 12576-77.

limitation is closer to the claim at issue in *Nazomi*, as argued by Respondents, than the claim at issue in *Silicon Graphics*, as argued by Broadcom. *Id.* at 39 (citing *Nazomi Commc'ns, Inc. v. Nokia Corp.*, 739 F.3d 1339, 1343-45 (Fed. Cir. 2014) (finding non-infringement where claimed functionality was not enabled without modification); *Silicon Graphics Inc. v. ATI Techs., Inc.*, 607 F.3d 784, 794-95 (Fed. Cir. 2010) (finding infringement where "a product includes the structural means for performing the claimed function")).

The FID explains that in *Nazomi*, the Federal Circuit distinguished *Silicon Graphics* because the claims at issue in *Nazomi* included limitations that "recite specific claim functionalities that cannot be practiced in hardware alone and require enabling software," as opposed to the claim limitations in *Silicon Graphics*, where hardware would be used with a standard operating system to perform the claimed processes. *Id.* at 38-39 (citing *Nazomi*, 739 F.3d at 1343-45). The FID finds that the processor in the [redacted] SoCs requires [redacted], to perform the claimed function. *Id.* at 39 (citing Tr. At 167:2-5; RX-0008C at Q/A106). The FID further finds that Broadcom did not identify software that actually performs the overwriting function, and thus failed to carry its burden to show claims 25 and 26 are infringed. *Id*.

**b. Analysis**

The Commission determined to review the FID's findings that Respondents do not infringe claims 25 and 26 of the '583 patent. 85 Fed. Reg. at 12576-78. The Commission hereby affirms, with the modified analysis set forth below, the FID's determination that Respondents do not infringe claims 25 and 26 of the '583 patent and adopts the FID's findings to the extent they are not inconsistent with this opinion.

In its petition for review, Broadcom argued that infringement of claims 25 and 26 requires hardware and software capable of practicing the claimed functionality of "overwrites a

status," but that there is no requirement that the functionality is actually performed. Broadcom Pet. at 55-62. Although we agree with this general statement, Broadcom has failed to show that the accused products have the required functionality.

The FID correctly finds that Broadcom's expert identified a hypothetical scenario that would occur only when the [redacted] changes [redacted]. FID at 37-39; *see also* '583 patent at 8:27-37. Broadcom's expert admitted, however, that he could not identify any specific source code in the accused products where that sequence of events actually happened or could happen. *Id.* at 38 (citing Tr. 165-67). This lack of evidence is fatal to Broadcom's infringement theory for claims 25 and 26.

Moreover, Broadcom's hypothetical is illogical. As noted in the FID, Respondents' expert, Dr. Colwell, testified that [redacted]." FID at 37-38 (RX-0008C at Q/A103-04); *see also* RX-0008C at Q/A77-81 (Dr. Colwell reviewed a hardware manual and source code). Thus, the evidence shows that the hypothetical software overwrite could not happen in a functional system because such a system does not [redacted]. Tr. 164:7-165:20; RX-0008C at Q/A102-104. Instead, the [redacted], and then the [redacted] *Id.* Notably, Broadcom did not identify any possible source material, such as a manual, product specifications, or software, that discloses the alleged [redacted] of the [redacted]. Tr. 166:12-167:17; CIB at 48-52; CRB[19] at 11-16; RX-0008C at Q/A105-06. Thus, Broadcom failed to present evidence of the prerequisite necessary for the hypothetical.

[19] Complainant Broadcom Corporation's Post-Hearing Reply Brief (July 1, 2019) ("CRB").

In *Nazomi*, the Federal Circuit found that the asserted apparatus claim required both hardware and software capable of practicing the claimed functionality. 739 F.3d at 1343-45. The Court then found that non-infringement was appropriate because the accused Jazelle hardware was not functional without the enabling Jazelle Technology Enabling Kit ("JTEK") software and the JTEK software was not installed by the alleged infringers. *Nazomi*, 739 F.3d at 1345. The Federal Circuit distinguished its prior holding in *Silicon Graphics* that "an apparatus claim directed to a computer that is claimed in functional terms is nonetheless infringed so long as the product is designed in such a way as to enable the user of that [product] to utilize the function *without having to modify the product*," and further reasoned that "[t]he purchase and installation of the JTEK software clearly constitutes a 'modification' of the accused products." *Id.* (citing *Silicon Graphics*, 607 F.3d at 794) (emphasis in original).

Here, Broadcom asserted both software and hardware were required to practice claims 25 and 26, yet it failed to present evidence of any software or other enabling functionality present on the accused SoCs that results in a change in the [redacted], and thus, there is no evidence of Broadcom's hypothetical overwriting capability. Thus, the FID's finding that claims 25 and 26 are not infringed comports with *Nazomi* because functionality that allows for changing the [redacted] process would be a necessary modification.

Accordingly, the Commission affirms, with the modified reasoning described above, the FID's finding that Respondents do not infringe claims 25 and 26 of the '583 patent.

### B. '752 Patent Issues Under Review

The Commission determined to review two findings related to the '752 patent: (1) whether the asserted claims are invalid and (2) whether the accused Pioneer head units meet the limitations of claims 2 and 5. 85 Fed. Reg. at 12576-77.

### 1. Invalidity Findings for Claims 1, 2, 4, 5, 6, 7, and 8 of the '752 Patent

A party cannot be held liable for infringement if the asserted patent claim is invalid. *See Pandrol USA, LP v. AirBoss Railway Prods., Inc*., 320 F.3d 1354, 1365 (Fed. Cir. 2003). Patent claims are presumed valid (35 U.S.C. § 282), so a respondent challenging validity must overcome this statutory presumption by "clear and convincing" evidence of invalidity. *Checkpoint Systems, Inc. v. Int'l Trade Comm'n*, 54 F.3d 756, 761 (Fed. Cir. 1995); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 95 (2011).

The FID makes the following invalidity findings for the '752 patent's asserted claims:

1. Foster anticipates claims 1, 2, 4, and 7; Foster does not anticipate claims 5 and 8. *See* FID at 82-94.

2. Foster alone renders claims 1, 2, 4, 7, and 8 obvious; Foster combined with U.S. Patent Publication No. 2002/00331179 A1 to Rovati, et al. ("Rovati") does not render claim 5 obvious. *See id.* at 94-100.

3. Sih in combination with several other prior art references, including Foster and/or U.S. Patent No. 6,075,899 to Yoshioka, et al. ("Yoshioka"), render claims 1, 2, 4, 5, and 7 obvious (*see id.* at 100-108; 110-111); Sih in combination with Foster does not render claim 6 obvious (*see id*. at 109-110); Sih in combination with Foster does not render claim 8 obvious (*see id.* at 111).

Thus, the FID finds that every asserted claim, except for claim 6,[20] of the '752 patent is invalid.

The Commission hereby affirms the FID's determination that claims 1, 2, 4, 5, 7, and 8 of the '752 patent are invalid for the reasons discussed herein and adopts the FID's findings to the extent they are not inconsistent with this opinion. Specifically, the Commission:

- Reverses the FID's finding that claim 8 is not anticipated by Foster, affirms that claims 1, 2, 4, and 7 are anticipated by Foster, and affirms that claim 5 is not anticipated by Foster.

[20] Broadcom relied on claim 6 for only its domestic industry allegations and does not allege that any Respondent infringes claim 6. FID at 57 (citing CIB at 79, 95). The FID finds that Broadcom satisfied the technical prong of the DI requirement for the '752 patent, and this finding is not under review. *Id.* at 78-81; 85 Fed. Reg. at 12576-77.

- Affirms, with the modified analysis below, the FID's findings that claims 1, 2, 4, 7, and 8 are obvious based on Foster alone and that claim 5 is not obvious based on Foster in combination with Rovati.

- Affirms without modification the FID's obviousness findings based on Sih in combination with other prior art references, including that claim 5 is invalid as obvious.

#### a. Anticipation of Claim 8 of the '752 Patent by Foster

##### 1) The FID

The FID finds that Foster anticipates claims 1, 2, 4, and 7, but not claims 5 and 8, of the '752 patent. FID at 82-94. Foster describes the integration of multiple functions onto a single chip system and identifies "a need in the art for a memory interface for a functional unit of an integrated system which allows the functional unit to simultaneously access both dedicated memory and shared memory through multiple ports." *Id.* at 82 (citing Foster at 1:29-2:10, 2:31-37).

Specifically, the FID finds that Foster's dedicated bus **22** and general system bus **16** disclose the "link" limitation recited in claim 1. *Id.* at 94. Foster further provides that "the depicted data buses in practice may each comprise an associated read bus and write data bus," and Figure 3 depicts memory data paths going to and from the memory interface **28**. *Id*. (citing RX-0109 at 6:16-18, RX-0005C at Q/A 93). The FID also finds that "[o]n cross-examination, [Broadcom's expert] admitted that the arrows in Foster's figures indicate that data is provided in both directions." *Id.* (citing Tr. 994). The FID agrees with Respondents that Foster "discloses a memory access unit that is capable of receiving data over a link." *Id.*

The FID concludes with respect to claim 5, however, that Foster does not disclose that "the logic generates the access requests based on the list of addresses and based on sizes of each of the requests for blocks of pixels from the motion prediction processing unit" based on Respondents' argument regarding Foster's lookahead request generator **46** and alternative

argument regarding additional applications. FID at 91-93. As to claim 8, the FID finds that "Foster does not explicitly disclose that the memory access unit actually 'receives data stored at the addresses in the memory from the lists of addresses in the memory,'" as claim 8 requires. *Id.* at 94 (citing CIB at 104-05; CX-0014C at Q/A 63).[21]

**2) Analysis**

Based on the evidence of record, the FID's findings, and the parties' submissions, the Commission reverses the FID's finding that claim 8 is not anticipated by Foster. The Commission finds that Foster anticipates claim 8 because Foster has figures that exactly illustrate claim 8's limitation of a link that receives data and there is no dispute that Foster's figures are enabled and operable. In general, both the '752 patent and Foster describe a system with an interface and methods for requesting data from and accessing a memory. CIB at 75-76 (describing the '752 patent); 96-97 (describing Foster).

While the FID finds that "Foster does not explicitly disclose that the memory access unit actually 'receives data . . . ," it further finds that Foster's system "may be capable of practicing the claimed limitation." FID at 94 (citing CIB at 104-05; CX-0014C at Q/A63). The FID further finds that Respondents' expert "makes a convincing case for obviousness by explaining how one of ordinary skill in the art would recognize that Foster's memory interface is capable of receiving the requested data." FID at 100 (RX-0005C at Q/A93). Claim 8, however, is an apparatus claim and is anticipated by Foster even if Foster's disclosure is only capable of receiving, or configured to receive, data over a link.

[21] However, as discussed below, the FID later finds that Foster alone renders claim 8 obvious because Foster discloses a limited number of data paths and both parties' experts agreed that memory data can be sent and received from the memory interface, therefore, receiving the requested data at the memory interface would be one of a finite number of identified, predictable options. FID at 100.

Specifically, the Federal Circuit has explained that "[a]pparatus claims cover what a device is, not what a device does." *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2008) (citing *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990)). "[D]epending on the claims, 'an accused device may be found to infringe if it is reasonably capable of satisfying the claim limitations, even though it may also be capable of noninfringing modes of operation.'" *Id*. (citations omitted). "Similarly, a prior art reference may anticipate . . . an apparatus claim—depending on the claim language—if the reference discloses an apparatus that is reasonably capable of operating so as to meet the claim limitations, even if it does not meet the claim limitations in all modes of operation." *Id.*

The parties agree that the "data" recited in claim 8 must be received over the same link used to request it and it must be the same "data" that was requested over the link. Resp. Sub. Reply at 3-4; Broadcom Sub. at 5. Moreover, both parties' experts agree that Figure 3 of Foster "indicates that ***memory data*** can be sent and received from the memory interface." *Id*. at 100 (emphasis added) (citing RX-0005C at Q/A93; Tr. 993-94 (Wolf)). Importantly, the FID finds that the MAU disclosed in Foster "is capable of receiving data over a link," although it also finds that "Foster does not explicitly disclose that the memory access unit actually 'receives ***data stored at the addresses in the memory***' from the lists of addresses in the memory.'" *Id.* at 94 (emphasis added).

Broadcom, however, did not identify any deficiency in the "link" (dedicated bus **22**) disclosed in Foster that would need to be modified in order for the memory interface to receive the data that it requested from dedicated memory. Broadcom Sub. at 13-15.[22] Rather, as the FID

[22] Instead of substantively addressing alleged deficiencies in Foster's disclosure of a "link," Broadcom argues that: (1) there is no evidence in the record regarding how a POSA could or would need to modify the link; and (2) Respondents did not argue that Foster could be

finds, Foster is already configured to, and capable of, meeting the claim 8 limitations. FID at 94, 100. Thus, the FID correctly finds that the "data" which the link disclosed in Foster is capable of receiving is the requested data as required by claim 8. *Id*.

Finally, Broadcom's statement that "claim 8 recites a 'memory access unit' configured to ***both*** (1) 'receive[] data stored at the addresses in the memory from the lists of address in the memory' . . . ***and*** (2) receive the data over 'said link[,][23]'" supports an anticipation finding. Broadcom Sub. at 10 (emphasis in original); *see also id*. at 12. Broadcom argued in its post-hearing briefs that Foster did not "discuss the memory interface **28** receiving data" and "none of Respondents' evidence establishes that the MAU, memory interface **28**, receives data." CIB at 106; CRB at 44. However, in its brief on review, Broadcom concedes that the MAU need only be "configured to" receive the data over said link. This admission, combined with the FID's finding that Foster's MAU is "capable of receiving data," further supports a finding that the disclosure in Foster meets claim 8's requirement that the memory be "configured to" receive the data. FID at 94.

Accordingly, the Commission reverses the FID's anticipation analysis and finds that the evidence shows that Foster discloses every limitation of, and thus anticipates, claim 8 of the '752 patent.

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modified to disclose the limitations of claim 8, so Respondents waived any arguments regarding modifying Foster. Broadcom Sub. at 13-15.

[23] The "said link" that Broadcom mentions is the "link" in claim 1. Specifically, claim 1 of the '752 patent requires, "an output port for providing access requests for lists of addresses in a memory over ***a link to a memory controller***." '752 patent at claim 1 (emphasis added). Claim 8 depends from claim 1 and further requires, "wherein the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over ***said link***." *Id.* at claim 8 (emphasis added).

### b. Obviousness of Claims 1, 2, 4, 5, 7, and 8 of the '752 Patent Over Foster Alone

The FID finds that claims 1, 2, 4, 7, and 8 are obvious over Foster alone and claim 5 is not obvious over the combination of Foster and Rovati. FID at 94-100. Broadcom argued in its petition that Respondents allegedly did not argue for obviousness of the asserted claims over Foster alone and thus such a finding violated the Administrative Procedures Act ("APA"). Broadcom Pet. at 17-20 (citing 5 U.S.C. § 554(c); 5 U.S.C. § 556(d); 19 C.F.R. § 210.36(a)), 22-23, 26 n.10, 30 n.14, 31 n.15, 36 n.16.

The Commission has determined to affirm, based on the modified reasoning discussed below, the FID's findings that claims 1, 2, 4, 7, and 8 of the '752 patent are rendered obvious by Foster alone, and that claim 5 is not obvious over Foster in combination with Rovati. The Commission adopts the FID's findings to the extent they are not inconsistent with the modified reasoning. This determination does not violate the APA because Broadcom had both notice of, and an opportunity to respond to, the invalidity arguments based on Foster, as explained below.

#### 1) The FID

Respondents argued "that Foster renders obvious claims 1, 2, 4, 5, 7, and 8 of the '752 patent, alone or in combination with additional prior art references." FID at 94 (citing RIB at 98-104). The FID finds that claims 1, 2, 4, 7, and 8 are invalid as obvious over Foster alone, but does not find claim 5 invalid as obvious over the combination of Foster and Rovati. *Id.* at 94-100.

The FID finds that Foster alone renders claims 1, 2, and 4 obvious for the same reasons it finds that Foster anticipates those claims. *Id.* at 95. The FID further finds that Foster "provides explicit guidance for how one of ordinary skill in the art would combine the various features that it discloses, explicitly stating that the memory interface depicted in Figure 4 can be incorporated

into the system depicted in Figures 1 and 2." *Id.* (citing Foster at 7:54-56). Thus, the FID finds that claims 1, 2, and 4 of the '752 patent are obvious in view of Foster. *Id.* at 96.

The FID finds that claim 5 is not obvious in view of the combination of Foster and Rovati. *Id.* at 96-98. Specifically, the FID finds that Respondents' identified motivation to combine is unsupported and conclusory. *Id.*

The FID finds that Foster renders claim 7 obvious for the same reasons that Foster anticipates claim 7. *Id.* at 98. The FID also analyzes Respondents' argument that claim 7 is obvious in view of Foster in combination with Yoshioka. *Id.* (citing RIB at 102-04). The FID finds that modifying the memory interface in Foster to output such requests would have been obvious to one of ordinary skill in the art, and the system of Foster is compatible with the motion processing described in Yoshioka. *Id.* at 99-100.

For claim 8, the FID finds that Foster alone renders claim 8 obvious. *Id.* at 100. The FID finds that Foster discloses that its data buses "may each comprise an associated read bus and write data bus," and further finds that a POSA would recognize that the memory interface in Foster is capable of receiving the requested data. *Id.* (citing Foster at 6:16-18; RX-0005C at Q/A93). The FID reasons that Figure 3 in Foster shows a limited number of data paths, including two-way paths between the memory interface and memory and both experts agree that Figure 3 indicates that memory data can be sent and received from the memory device. *Id.* (citing Foster at Fig. 3; RX-0005C at Q/A93; Tr. 993-94). Thus, the FID finds that "receiving the requested data at the memory interface would be one of a finite number of identified, predictable options" and Foster renders claim 8 obvious. *Id.*

**2) Analysis**

The Commission has determined to affirm the FID's finding that claims 1, 2, 4, 7, and 8 are obvious over Foster alone, but with the modified reasoning below. The Commission also

finds that the FID's obviousness findings based on Foster alone do not violate the APA. Moreover, the Commission gave the parties an opportunity to brief the issue further in response to the Commission's notice of review.

#### i. The FID's Obviousness Findings Based on Foster Alone Are Affirmed

Broadcom argues, regarding whether Foster alone renders claims 1, 2, 4, 5, 7, and 8 obvious, that the FID errs by failing to make findings regarding: (1) whether a person of ordinary skill in the art would have been motivated to modify or combine teachings in the prior art; and (2) whether a person of ordinary skill in the art would have had a reasonable expectation of success in making the proposed modification/combination. Broadcom Sub. at 15-16 (citing *In re Stepan*, 868 F.3d 1342, 1345-46 (Fed. Cir. 2017)); Broadcom Sub. Reply at 16-22. Broadcom maintains that those two findings are required even when obviousness is based on a single reference. *Id.* However, we agree with Respondents that Broadcom improperly focuses on whether the FID uses particular words in its analysis and findings, which is inconsistent with *KSR Int'l v. Teleflex Inc*., 550 U.S. 398, 417 (2007). Resp. Sub. Reply at 9-10.[24]

Regarding the alleged lack of a motivation to combine, in response to the Commission's request for analysis of *Realtime Data*, Broadcom argues that *Realtime Data* does not change the requirement that a single-reference obviousness analysis must include factual determinations as to both a motivation to combine and a reasonable expectation of success. Broadcom Sub. at 19-20 (citing *Realtime Data*, 912 F.3d 1368, 1370-72 (Fed. Cir. 2019)); *see also* Broadcom Sub. Reply at 18-19. According to Broadcom, "*Realtime Data* addressed whether a proper obviousness analysis is required when one reference, in a two-reference combination, is found by

[24] Respondents also pointed out that Broadcom does not dispute that where a claim is anticipated, it is also obvious. *Id.* at 9, n.3.

itself to anticipate the claim." *Id.* Broadcom interprets the decision as determining "that the [Patent Trial and Appeal Board's ("PTAB")] obviousness determination did not require a finding regarding a motivation to combine because their determination was based on the factual finding that O'Brien *alone* disclosed every claim limitation at issue and therefore anticipated the claim." *Id.* (emphasis in original). Broadcom concludes that *Realtime Data* does not overrule the holding in *In re Stepan*, requiring a finding of a motivation to combine in an obviousness determination, but merely explains there is no need to find a motivation to combine references if one reference anticipates the claims at issue. *Id.; see In re Stepan*, 868 F.3d 1342, 1345-46 (Fed. Cir. 2017).

We disagree with Broadcom that a specific, articulated motivation to combine is necessary for obviousness over a single reference, such as Foster. In *Realtime Data*, the Federal Circuit concluded that, where a single reference alone rendered the claims obvious, the PTAB was not required to find a motivation to combine. *See Realtime Data*, 912 F.3d at 1373-74. Broadcom's interpretation of *Realtime Data* is untenable and directly contrary to the decision itself. Broadcom Sub. at 19-20; Broadcom Sub. Reply at 18-19; *cf. Realtime Data*, 912 F.3d at 1373-76. Contrary to Broadcom's assertion that the court's opinion was based on a finding that the single reference is anticipatory (*see* Broadcom Sub. at 19-20), the court never found that the single reference at issue ***anticipated*** the claim at issue. *Realtime Data*, 912 F.3d at 1373-76. Specifically, the court "conclude[d] that the Board did not err in concluding that the claims would have been obvious in view of a single reference." 912 F.3d at 1376.

Further, for claims 1, 2, 4, and 7, the Commission has determined to affirm that Foster anticipates these claims. *See* Section III.B.1. above; *see also* FID at 82-91, 93-96, 98-100. "[I]t is well settled that 'a disclosure that anticipates under § 102 also renders the claim invalid under

§ 103, for 'anticipation is the epitome of obviousness.'" *Realtime Data*, 912 F.3d at 1373. Further, for claims 1, 2, and 4, the FID finds that in addition to Foster's substantive disclosures, Foster also provides explicit guidance for how a POSA would combine the various features that it discloses. FID at 94-96. For claim 7, the FID finds that Respondents' expert offers an opinion that Foster discloses the "noncontiguous" limitation and for the same reasons that these disclosures anticipate claim 7, Foster also renders claim 7 invalid for obviousness. *Id.* at 98 (citing RX-0005C at Q/A84). Thus, Foster renders claims 1, 2, 4, and 7 obvious.

With respect to claim 8, the FID finds that Broadcom's expert "makes a convincing case for obviousness by explaining how one of ordinary skill in the art would recognize that Foster's memory interface is capable of receiving the requested data." *Id.* at 100 (citing RX-0005C at Q/A93). This finding may not use the specific term "motivation," but it is supported by expert testimony and does provide a reason for a POSA to modify Foster's disclosure as the FID finds necessary. *Id*.

Respondents' expert further testified:

> Foster also discloses that its memory interface may receive requests from a motion compensation unit "for a block of data it is processing," and that a series of eight requests would typically be generated to access that data. (RX-0109 (Foster) at 9:32-35.) A person of ordinary skill in the art would understand that these blocks of data are used by the motion compensation unit to create reference images used in motion.

RX-0005C at Q/A92; *see also id*. at Q/A93-94 (providing additional explanation of how the memory link operates and discloses the claimed subject matter). Unless the memory interface is capable of receiving and actually does receive data over the link, Foster's motion compensation unit cannot process it. *Id.* Respondents' expert confirmed that the motion compensation unit's need for the data is a reason to make sure the memory interface actually receives the data. FID at

100 (citing RX-0005C at Q/A93); RX-0005C at Q/A92-94. Thus, the record evidence fully supports the FID's finding that claim 8 is obvious over Foster alone.

The FID identifies both a motivation and a reasonable expectation of success that Foster's MAU is configured to and actually "receives data stored at the addresses in the memory from the lists of addresses in the memory over said link." FID at 100. Obviousness does not require that the motivation be the ***best*** option, only that it be a ***suitable*** option from which the prior art did not teach away. *Bayer Pharma AG v. Watson Labs.*, 874 F.3d 1316, 1328 (Fed. Cir. 2017) (emphasis in original); *see also Certain Magnetic Data Storage Tapes and Cartridges Containing the Same (II)* ("*Magnetic Data Storage Tapes*"), Inv. No. 337-TA-1076, Comm'n Op. at 55-57 (June 20, 2019). Here, Foster's drawings and both experts' testimony demonstrates that there are two possible options for receiving data at the memory interface, and thus, there is a reasonable expectation of success. FID at 82-91, 93-100; *see also* Resp. Sub. at 14-16.

The following findings in the FID further support a reasonable expectation of success and the conclusion that Foster alone renders claim 8 obvious:

- In [Respondents' expert's] opinion, these disclosures are sufficient for Foster to meet the limitation in claim 8 requiring that "the memory access unit receives data stored at the addresses in the memory for the lists of addresses in the memory."
- Respondents' expert's testimony "makes a convincing case for obviousness by explaining how one of ordinary skill in the art would recognize that Foster's memory interface is capable of receiving the requested data."
- "Figure 3 depicts a limited number of data paths for the system in Foster, including two-way paths between the memory interface and the memory."
- "Both [parties' experts] agree that this figure indicates that memory data can be sent and received from the memory interface."
- "Based on these disclosures and expert testimony, it is clear that receiving the requested data at the memory interface would be one of a finite number of identified, predictable options."

FID at 100; *see also* RX-0005C at Q/A93 (quoting Foster at 5:6-8, Fig. 3). The FID's findings specifically include citations to and are supported by Respondents' expert's testimony. *Id.* Further, Broadcom never argued that the prior art taught away from using Foster's data paths to receive data. CIB at 106-110; CRB at 44-46; Broadcom Pet. at 15-23; Broadcom Sub. at 15-23; Resp. Sub. at 14-16, 16-22.

Regarding claim 5, Respondents argue that, because Foster anticipates claim 5, Foster also renders claim 5 obvious for the same reasons. Resp. Sub. at 21-22. However, the FID finds that the adjustment of burst size described in Foster does not meet the limitations of claim 5 because "Foster only describes adjusting the size of bursts based on the destination for the requests, while claim 5 requires generating access requests based on the size of the requests." FID at 91-93 (citing CRB at 43). Respondents' arguments do not address the FID's finding that Foster's size adjustment is based on destination and repeat their previous arguments. Resp. Sub. at 21-22.[25] The Commission affirms that Foster does not render claim 5 invalid.

Based on the preceding discussion, the Commission finds that Respondents have made a *prima facie* showing of obviousness of claims 1, 2, 4, 7, and 8, but not claim 5, over Foster alone.

Broadcom alleged one secondary consideration of non-obviousness, specifically commercial success, with respect to the '752 patent. *See* Broadcom Pet.; FID at 112-113. We find that the FID correctly concludes that Broadcom failed to establish a nexus between the commercial success of its products and the alleged invention of the '752 patent. FID at 112

[25] Respondents argue, "if a burst is too long, it must be adjusted before being sent to the ***shared memory***. But for ***dedicated memory***, requests must be optimized for 'long bursts.'" Resp. Sub. at 21-22 (emphasis added). Thus, the destination is the basis for Foster's alleged size adjustment. *See* FID at 91-93.

(citing RIB at 122-23); *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 668 (Fed. Cir. 2000) (the patentee must establish "[a] nexus between the merits of the claimed invention and evidence of secondary considerations . . . in order for the evidence to be given substantial weight in an obviousness decision."). Here, Broadcom's employee's testimony and its reliance on the same evidence for multiple patents falls short of showing that the alleged success is attributable to the asserted claims. *See Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018) ("[w]hen the thing that is commercially successful is not coextensive with the patented invention—for example, if the patented invention is only a component of a commercially successful machine or process—the patentee must show prima facie a legally sufficient relationship between that which is patented and that which is sold.'"); *see also J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997) ("the asserted commercial success of the product must be due to the merits of the claimed invention beyond what was readily available in the prior art."). Broadcom thus failed to show that any alleged commercial success was due to the memory access unit recited in claims 1-8, and, accordingly, Broadcom's evidence falls short of demonstrating secondary considerations that weigh against a finding of obviousness of claims 1, 2, 4, 7, and 8. *Id.*

Based on the preceding discussion, the Commission affirms, with the additional reasoning discussed above, the FID's finding that Foster alone renders claims 1, 2, 4, 7, and 8 invalid as obvious.

#### ii. The FID's Findings of Obviousness Based on Foster Alone Do Not Violate the APA

The FID's findings that Foster alone renders claims 1, 2, 4, 7, and 8 obvious do not violate the APA because Respondents argued invalidity based on Foster before the ALJ and Broadcom had ample opportunity to respond. FID at 94-100 (RIB at 98-104); *cf.* Broadcom Pet.

at 22.[26] Specifically, Respondents argued in their post-hearing brief that "Foster discloses every element of claims 1 and 8 (which depends on claim 1) under Broadcom's construction of access requests for lists of addresses." *Id.* (citing RIB at 104). Further, Respondents stated in their post-hearing brief that "even if the ALJ finds that Foster by itself does not disclose all elements of claims 1, 2, and 4-8, those claims are still rendered obvious by Foster or Sih in combination with other references." RIB at 97. Further, in their post-hearing reply brief, Respondents stated,

> As demonstrated by Dr. Subramanian's testimony, because all elements of the asserted claims are disclosed in Foster in a way that suggests they are or should be combined, "a person of skill in the art, reading the reference, would 'at once envisage' the claimed arrangement or combination" of claims 1, 2, 4, 5, 7, and 8. *Blue Calypso* at 1341, 1344; *see also Respironics, Inc. v. Invacare Corp.*, 437 F. App'x 917, 925 (Fed. Cir. 2011) (claim anticipated based on combination of two figures that included elements common to the same apparatus); *CSR, PLC v. Skullcandy, Inc.*, 594 F. App'x 672, 679–80 (Fed. Cir. 2014) (anticipation based on combination of two figures).

RRB[27] at 35-36.

Respondents' expert also provided an element by element analysis of the asserted claims as compared to Foster. RX-0005C at Q/A35, 39-94. Respondents' expert testified that it is his opinion that "(1) Patent No. 6,240,492 to Foster anticipates claims 1, 2, 4-5, and 7-8, or in the alternative, renders obvious claims 1, 2, 4-5, and 7-8 in view of Rovati and Yoshioka; and (2) U.S. 2003/0106053 to Sih renders obvious claims 1, 2, and 4-8 in view of Foster, Rovati, Yoshioka, and Matsui." *Id.* at Q/A35. Taken together, it is clear that Respondents made a specific and supported argument that Foster invalidates claims 1, 2, 4, 5, 7, and 8. Thus,

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[26] Broadcom argued that the APA requires an agency to give "all interested parties opportunity for – the submission and consideration of facts [and] arguments ... [and] hearing and decision on notice," 5 U.S.C. § 554(c), and to permit a party "to submit rebuttal evidence, and to conduct such cross-examination as may be required for a full and true disclosure of the facts." 5 U.S.C. § 556(d); *see also* 19 C.F.R. § 210.36(a) ("An opportunity for a hearing shall be provided in each investigation under this part, in accordance with the Administrative Procedure Act.").

[27] Respondents' Joint Reply Post-Hearing Reply Brief (July 1, 2019) ("RRB").

Broadcom had notice of Respondents' invalidity arguments and evidence based on Foster's disclosures. Moreover, before the ALJ, Broadcom had an opportunity and did respond to Respondents' invalidity arguments based on Foster. CIB at 96-110; CRB at 38-46. In fact, Broadcom voluntarily waived its cross-examination of Respondents' expert who opined that the '752 patent was invalid. Tr. 619:4-5. Broadcom also presented evidence of alleged secondary considerations of non-obviousness. CIB at 17, 124.

The Commission also finds that the additional briefing requested in the Commission's March 3, 2020 notice resolves any alleged APA violation in any event. Broadcom argues that because Respondents allegedly did not argue that claim 8 is obvious based on Foster alone in the post-hearing briefing, Respondents have waived their right to make the argument on review. Broadcom Pet. at 20 n.7 (citing *Certain Prods. Having Laminated Packaging, Laminated Packaging, and Components Thereof*, Inv. No. 337-TA-874, Comm'n Op. (2013 WL 11041479 at *9) (Sept. 3, 2013) ("Insofar as these arguments were not presented to the ALJ in [Complainant's] posthearing brief, they have been waived"); *see also* Ground Rule 11.1). The Federal Circuit, however, rejected a similar argument in *Ajinomoto Co., Inc. v. Int'l Trade Comm'n*, 932 F.3d 1342, 1354 n.8 (Fed. Cir. 2019), where the appellant failed to cite any authority that barred the Commission from exercising discretion to raise an issue and give the parties an adequate opportunity to address it. Here, Broadcom did not cite any authority that would limit the Commission's ability to request a response from all parties and allow an additional opportunity to address the issue.

As Broadcom admitted in its written submission, there is no section 337-related authority that supports its position.[28] Broadcom Sub. at 21, n.2. Broadcom cited only appeals from *inter partes* reviews ("IPR") decisions, but it failed to address the America Invents Act's statutory requirement that requires an IPR petition and the PTAB's institution decision to present all invalidity grounds in the IPR. *See* 35 U.S.C. §§ 312, 314; 37 C.F.R. §§ 42.104, 42.108.

Under the APA, "[p]ersons entitled to notice of an agency hearing shall be timely informed of . . . the matters of fact and law asserted," 5 U.S.C. § 554(b)(3), and the agency "shall give all interested parties opportunity for . . . the submission and consideration of facts [and] arguments," *id*. § 554(c)(1). The Federal Circuit has previously held that the PTAB's marked departure from the evidence and theories presented in the IPR petition or PTAB's institution decision created unfair surprise and an APA issue. *Arthrex, Inc. v. Smith & Nephew, Inc.*, 935 F.3d 1319, 1328 (Fed. Cir. 2019) (citing, *inter alia*, *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1372-73, 1377 (Fed. Cir. 2016)). However, the court found no APA issue in an IPR where the PTAB "properly relied on the same references, the same disclosures, and the same obviousness theories advanced by the petition and debated by the parties" to find obviousness.

[28] While Broadcom cites only IPR appeals, other complainants have alleged APA violations before the Commission. *See, e.g., Certain Non-Volatile Memory Devices and Products Containing the Same*, Inv. No. 337-TA-1046 ("*Memory Devices*"), Comm'n Op. (Oct. 26, 2018). In *Memory Devices*, the Commission affirmed, without analysis, an invalidity finding despite an APA challenge by a complainant that was similar to the one now raised by Broadcom. Comm'n Op. at 1, 71; 83 Fed. Reg. 31416-18 (July 5, 2018) (reviewing invalidity as to the '602 patent); *Memory Devices*, Complainants Macronix International Co., Ltd. and Macronix America, Inc.'s Petition for Review of the Initial Determination ("Macronix Petition"), at 41-44 (2018 WL 4300499 at *23-25) (May 14, 2018). Both APA challenges, in *Memory Devices* and here, are based on *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) as well as arguments that the respondent allegedly did not challenge the asserted claims on the invalidity basis in the FID. *Memory Devices*, Macronix Petition at 42-44 (2018 WL 4300499 at *23-25). In addition, in *Memory Devices* and here, the Commission requested responses to questions concerning invalidity prior to issuing its opinion affirming the ID's finding. 83 Fed. Reg. 31416-17; *Memory Devices*, Comm'n Op. at 1 (Oct. 26, 2019); 85 at 12576-77.

*Id.* Further, where a party has adequate notice and an opportunity to respond, there is no APA issue. *TQ Delta, LLC v. DISH Network LLC*, 929 F.3d 1350, 1355-56 (Fed. Cir. 2019) (citing *Intellectual Ventures II LLC v. Ericsson Inc.*, 686 Fed. Appx. 900, 906 (Fed. Cir. 2017)).

Here, there was no unfair surprise. Broadcom had notice of and an opportunity to respond to the Respondents' invalidity arguments, and it is undisputed that Respondents argued before the ALJ that claims 1, 2, 4, 5, 7, and 8 are invalid based on Foster. RIB at 98-104; RRB at 35-36; RX-0005C at Q/A35, 39-94. The FID properly relies on the same reference, Foster, the same disclosures in Foster, and the same invalidity theories argued by Respondents before the ALJ. FID at 94-100; *Arthrex*, 935 F.3d at 1328.

Also, Broadcom had an opportunity to respond to the Commission's Question D, which sought an analysis of whether Foster alone renders claims 1, 2, 4, 5, 7, and 8 obvious. 85 Fed. Reg. at 12577. Thus, the request for additional information further resolves any alleged APA issue. *Id*.

#### c. Obviousness of Claims 1, 2, 4, 5, 7, and 8 of the '752 Patent Over Sih in Combination with Other Prior Art

The Commission adopts, without modification, the FID's findings with regard to obviousness based on Sih combined with Foster and other prior art and thus, affirms that claims 1, 2, 4, 5, 7, and 8 are obvious based on those combinations. *See* FID at 100-111.

### 2. Non-Infringement of Claims 2 and 5 By Accused Pioneer Head Units Containing [redacted] SoCs

Subject to the additional analysis provided below, the Commission affirms and adopts the FID's analysis and conclusion that Pioneer does not infringe claims 2 and 5 of the '752 patent because the accused Pioneer head units do not meet the limitations of those claims. The Commission further affirms the remainder of the FID's findings with respect to infringement of

the asserted claims of the '752 patent to the extent they are not inconsistent with the reasoning herein.

**a. The FID**

The FID finds that the accused Pioneer head units, which contain infringing [redacted] SoCs, do not infringe claims 2 and 5 of the '752 patent. FID at 76-77; *see also id.* at 72, 74-75 (finding [redacted] SoCs infringe claims 2 and 5). Respondents disputed whether the Pioneer head units infringed claims 2 and 5 because the Pioneer head units do not include [redacted] functionality. *Id.* at 77. Respondents argued that in the Pioneer head units, the [redacted] functionality is disabled and the specific [redacted] that is necessary for [redacted]. *Id.* (citing RX-0009C at Q/A83). Broadcom argued that because claims 2 and 5 are apparatus claims, the actual performance of any actions are not needed for infringement. *Id.* (citing CIB at 94).

The FID finds that [redacted] in the accused products and concludes that, "without this source code, the accused products do not have the ***capability*** to infringe these claims." *Id.* at 77 (emphasis added) (citing RRB at 33-34). The FID notes that the Federal Circuit has found non-infringement in cases like this one where the asserted claims "recite specific claim functionalities that cannot be practiced in hardware alone and require enabling software." *Id.* (citing *Nazomi*, 739 F.3d at 1343). Thus, the FID concludes that Pioneer does not infringe claims 2 and 5.

**b. Analysis**

Broadcom's main argument is that if the accused Renesas [redacted] SoCs satisfy claims 2 and 5 alone, then the Pioneer head unit in which the infringing SoC is incorporated must also satisfy those claims. Broadcom Sub. at 23-29. However, this argument ignores any possible additions or changes to software or code that may come from installing the infringing SoC in the

head unit. *Nazomi*, 739 F.3d at 1343; *Telemac Cellular Corp. v. Topp Telecom, Inc.*, 247 F.3d 1316 (Fed. Cir. 2001); *see also Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, Inv. No. 337-TA-910, Comm'n Op., at 27 n.28 (Oct. 30, 2015) (considering the functionality of a component and how that component performs when it is incorporated into a finished product).

As noted in the FID, the Federal Circuit has held that a finding of non-infringement is appropriate where the asserted claims "recite specific claim functionalities that cannot be practiced in hardware alone and require enabling software." *Nazomi*, 739 F.3d at 1343. Thus, the [redacted], once placed in the Pioneer head units is no longer "an input port for receiving requests for blocks of pixels," as required by claims 2 and 5 of the '752 patent.

Further, in *Telemac*, the claim term "complex billing algorithm" was construed as "a function that includes the means to store phone rates for local, long distance, international, and roaming calls" and "includes means to identify the appropriate rate category and to selectively apply those rates to each call." 247 F.3d at 1322. The Federal Circuit affirmed a finding of non-infringement "[d]ue to a restriction built into the software program stored in the telephone's memory, a user of the accused system is prevented from directly placing international calls." *Id.* at 1330. The court reasoned, "that a device is capable of being modified to operate in an infringing manner is not sufficient, by itself, to support a finding of infringement." *Id.* (citing 247 F.3d at 1330). Thus, *Telemac* also supports the FID's finding of non-infringement because the [redacted] such that the embedded Renesas SoC is not capable of performing the function of the recited "input port." FID at 76-77 (citing RX-0009C at Q/A83); Resp. Sub. Reply at 21 (citing RX-0018C at Q/A123).

In *Intel Corp. v. Int'l Trade Comm'n*, upon which Broadcom relies, the Federal Circuit noted that the accused products "are *capable* of performing page mode addressing" and held that "the accused device, to be infringing, need only be capable of operating in the page mode." 946 F.2d 821, 832 (Fed. Cir. 1991) (emphasis in original); *see also* Broadcom Sub. at 26. In this investigation, however, the FID finds that, "without [the missing source code libraries], the accused products ***do not have the capability*** to infringe these claims." FID at 77 (emphasis added). Thus, *Intel*, where the accused products were capable of infringement, differs from this investigation, as the accused Pioneer head units are not capable of infringement because they lack an input port with the claimed capability for receiving requests for blocks of pixels from a motion prediction processing unit. *Id.*; *see also* RRB at 33-34.

Broadcom is also incorrect that its expert provided testimony showing "that claims 2 and 5 are infringed by hardware alone." Broadcom Sub. Reply at 25 (citing CX-0009C at Q/A62-72, 108-116, 153-67). Rather, Broadcom admitted that "Dr. Wolf identified deposition testimony, documentation, and *hardware code*." *Id.*[29] (emphasis added). Further, the cited portion of Broadcom's expert's demonstrative is titled, "***Source Code*** for Renesas Accused [redacted] Products." CDX-0006C.00014-20 (emphasis added); *see also* CX-0009C at Q/A159[30]. Broadcom also contended in its petition for review that "Broadcom develops *both*

[29] Broadcom's expert testified that, "I confirmed this functionality in the [redacted] for the [redacted] SoC, which implements [redacted]. I have described my detailed analysis in my demonstratives. [CDX-0006C.00014-20]." CX-0009C at Q/A47.

[30] Q159. Now turning to the Renesas ***source code***, please explain the bases for your opinion.

(1) hardware consisting of the physical SoC itself, that includes a processor, registers, internal memory, and circuitry, *and* (2) firmware, which is software that runs on the SoC processor to control clock gating (among other functions)." Broadcom Pet. at 41 (emphasis in original) (citing CX-0003C at Q/A16, 20; CIB at 278). Thus, Broadcom admitted that firmware, "hardware code," source code, and software each include code necessary to provide the infringing functionality or capabilities for hardware. As the FID finds, however, this necessary code is missing from the accused Pioneer head units. FID at 76-77.

Accordingly, the Commission determines to affirm, with the modified reasoning above, the FID's finding that the Pioneer head units do not practice the claims 2 and 5 of the '752 patent.

## IV. CONCLUSION

For the reasons set forth above, the Commission affirms the FID's finding that Broadcom has failed to show that Respondents have violated section 337. Accordingly, the investigation is terminated with a finding of no violation of section 337.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: May 28, 2020

[redacted]

A. The for the SoC confirms that the SoC includes a

CX-0009C at Q/A159 (emphasis added).

**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** **Inv. No. 337-TA-1119**

## PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the following parties as indicated, on May 28 2020.

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

**On Behalf of Complainant Broadcom Corporation:**

John M. Caracappa, Esq.
**STEPTOE & JOHNSON LLP**
1330 Connecticut Avenue, N.W.
Washington, DC 20036
Email: Jcaracappa@steptoe.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Renesas Electronics Corporation and Renesas Electronics America, Inc. :**

Daniel P. Muino, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 60000
Washington, DC 20006
Email: Dmuino@mofo.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing, Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing, Mississippi, Inc., Toyota Motor Manufacturing, Texas, Inc., Panasonic Corporation, Panasonic Corporation of North America, Denso Ten Limited, Denso Ten America Limited, Japan Radio Corporation, Denso Corporation, Denso International America, Inc., Denso Manufacturing Tennessee, Inc, and Denso Wireless Systems America, Inc.:**

Paul Steadman, Esq.
**DLA PIPER LLP**
444 West Lake Street

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail

Suite 900
Chicago, IL 60606
Email: paul.steadman@dlapiper.com

☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Pioneer Corporation and Pioneer Automotive Technologies, Inc.**

Lora A. Brzezynski, Esq.
**FAEGRE DRINKER BIDDLE & REATH LLP**
1500 K Street, NW, Suite 1100
Washington, DC 20005
Email: lora.brzezynski@faegredrinker.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents Socionext, Inc.**

G. Brian Busey, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 6000
Washington, DC 20006
Email: Gbusey@mofo.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**On Behalf of Respondents u-blox AG, u-blox America, Inc., and u-blox San Diego, Inc.**

Smith Brittingham IV, Esq.
**FINNEGAN, HENDRESON, FARABOW, GARRETT & DUNNER LLP**
901 New York Avenue, NW
Washington, DC 20001
Email: smith.brittingham@finnegan.com

☐ Via Hand Delivery
☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability to Download

**UNITED STATES INTERNATIONAL TRADE COMMISSION**
**Washington, D.C.**

| | |
|---|---|
| **In the Matter of**<br><br>**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** | **Investigation No. 337-TA-1119** |

# NOTICE OF A COMMISSION DETERMINATION TO REVIEW IN PART A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337; SCHEDULE FOR FILING WRITTEN SUBMISSIONS ON THE ISSUES UNDER REVIEW AND ON REMEDY, PUBLIC INTEREST, AND BONDING; EXTENSION OF TARGET DATE

**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 ("FID") of the administrative law judge ("ALJ"). The Commission requests briefing from the parties on certain issues under review, as indicated in this notice. The Commission also requests briefing from the parties, interested government agencies, and interested persons on the issues of remedy, the public interest, and bonding. The Commission has also determined to extend the target date for completion of this investigation until April 30, 2020.

**FOR FURTHER INFORMATION CONTACT**: Lynde Herzbach, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, SW, Washington, DC 20436, telephone 202-205-3228. 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, DC 20436, telephone 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (*https://www.usitc.gov*). The public record for this investigation may be viewed on the Commission's Electronic Docket Information System ("EDIS") (*https://edis.usitc.gov*). Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal, telephone 202-205-1810.

**SUPPLEMENTARY INFORMATION**: On June 12, 2018, the Commission instituted this investigation based on a complaint filed by Broadcom Corporation ("Broadcom") of San Jose, California. 83 *Fed. Reg.* 27349 (June 12, 2018). The complaint alleged that 19 U.S.C. 1337, as amended, ("section 337") was violated due to the importation into the United States, sale for

importation, or sale in the United States after importation of certain infotainment systems, components thereof, and automobiles containing same that purportedly infringe one or more claims of U.S. Patent Nos. 6,937,187 ("the '187 patent"); 8,902,104 ("the '104 patent"); 7,512,752 ("the '752 patent"); 7,530,027 ("the '027 patent"); 8,284,844 ("the '844 patent"); and 7,437,583 ("the '583 patent") (collectively, "the Asserted Patents"). The notice of investigation named 15 respondents, including Toyota Motor Corporation of Aichi, Japan; Toyota Motor North America, Inc. of Plano, TX; Toyota Motor Sales, U.S.A., Inc. of Plano, TX; Toyota Motor Engineering & Manufacturing North America, Inc. of Plano, TX; Toyota Motor Manufacturing, Indiana, Inc. of Princeton, IN; Toyota Motor Manufacturing, Kentucky, Inc. of Erlanger, KY; Toyota Motor Manufacturing, Mississippi, Inc. of Tupelo, MS; Toyota Motor Manufacturing, Texas, Inc. of San Antonio, TX; Panasonic Corporation of Osaka, Japan; Panasonic Corporation of North America of Newark, NJ; DENSO TEN Limited of Kobe City, Japan; DENSO TEN AMERICA Limited of Torrance, CA; Renesas Electronics Corporation of Tokyo, Japan; Renesas Electronics America, Inc. of Milpitas, CA; and Japan Radio Co., Ltd. of Tokyo, Japan. *Id.* at 27349-50. The Office of Unfair Import Investigations was not named as a party. *Id.* at 27351. The complaint and notice of investigation were later amended to add ten more respondents, including Pioneer Corporation of Tokyo, Japan; Pioneer Automotive Technologies, Inc. of Farmington Hills, MI; DENSO Corporation of Aichi, Japan; DENSO International America, Inc. of Southfield, MI; DENSO Manufacturing Tennessee, Inc. of Maryville, TN; DENSO Wireless Systems America, Inc. of Vista, CA; u-blox AG of Thalwil, Switzerland; u-blox America, Inc. of Reston, VA; u-blox San Diego, Inc. of San Diego, CA; and Socionext Inc. of Kanagawa, Japan. Order No. 14 (Oct. 3, 2018), *not rev'd in relevant part*, Comm'n Notice (Nov. 1, 2018).

Certain patent claims were subsequently withdrawn and terminated from the investigation. *See* Order No. 20 (Jan. 31, 2019), *not rev'd*, Comm'n Notice (Feb. 19, 2019); Order No. 48 (June 5, 2019), *not rev'd*, Comm'n Notice (June 18, 2019); Order No. 49 (June 13, 2019), *not rev'd*, Comm'n Notice (June 28, 2019). The claims still at issue are claims 1-3, 5, and 9 of the '187 patent; claim 12 of the '104 patent; claims 1-2 and 4-8 of the '752 patent; claims 11 and 20 of the '027 patent; claims 11 and 13 of the '844 patent; and claims 17-18 and 25-26 of the '583 patent. *See* Comm'n Notice (June 28, 2019).

On November 13, 2019, the ALJ issued the FID finding no violation of section 337. *See* FID. The ALJ recommended that, if a violation was found, then the Commission should issue a limited exclusion order and cease and desist orders to certain domestic respondents.

On November 26, 2019, Broadcom filed a petition for review of the FID and the respondents filed a contingent petition for review. On December 4, 2019, Broadcom and the respondents filed responses to each other's petitions.

On December 16, 2019, Broadcom filed a submission on the public interest pursuant to Commission Rule 210.50(a)(4) (19 CFR 210.50(a)(4)). That same day, respondents Toyota Motor Corporation and its subsidiaries, Renesas Electronics Corporation and Renesas Electronics America, Inc., and Tier 1 Suppliers (DENSO Corporation, DENSO International America, Inc., DENSO Manufacturing Tennessee, Inc., and DENSO Wireless Systems America, Inc.; DENSO TEN Limited and DENSO TEN America Limited; Panasonic Corporation and Panasonic Corporation of North America; Pioneer Corporation and Pioneer Automotive

Technologies, Inc.) filed their submissions on the public interest pursuant to Commission Rule 210.50(a)(4) (19 CFR 210.50(a)(4)). On December 18, 2019, two non-parties, Peter Morici and the Reshoring Initiative, filed submissions on the public interest in response to the Commission's notice requesting such responses. 84 *Fed. Reg.* 64104 (Nov. 20, 2019).

Having reviewed the record in this investigation, including the ALJ's orders and FID, as well as the parties' petitions and responses thereto, the Commission has determined to review the FID in part, as follows.

With regard to the '583 patent, the Commission has determined to review the FID's construction of the term "at least one processor." The Commission has further determined to review the FID's infringement and technical prong findings regarding the '583 patent.

With regard to the '752 patent, the Commission has determined to review the FID's findings as to whether the asserted claims are invalid. The Commission has further determined to review whether the accused Pioneer head units meet the limitations of claims 2 and 5.

The Commission has determined not to review the remaining findings in the FID.

The Commission has also determined to extend the target date for completion of this investigation until April 30, 2020.

The parties are asked to provide additional briefing on the following issues regarding the '583 patent and '752 patent, with appropriate reference to the applicable law and the existing evidentiary record.

A. With regard to claims 25 and 26 of the '583 patent, if the Commission determines that the term "at least one processor" should be construed to mean, "at least one processor separate from the hardware control block," does this modified claim construction affect any other findings in the FID regarding the '583 patent? If there is a difference, please explain how it affects the FID's infringement, domestic industry technical prong, invalidity, or other findings. Is this modified claim construction supported by the intrinsic and/or extrinsic evidence?

B. With regard to the '752 patent, discuss whether there is a difference between the "data," which the FID finds is capable of being sent over the link disclosed in U.S. Patent No. 6,240,492 to Foster, et al. ("Foster"), versus the "data stored at the addresses in the memory from the lists of addresses in the memory" as claimed. If there is a difference, please explain the difference, including how it affects the validity of claim 8.

C. Discuss whether the link disclosed in Foster (*see* FID at 94) would need to be modified in order to meet the claim limitation "the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over said link" as required by claim 8 of the '752 patent. If modification is needed, how would Foster's link need to be modified to meet the claim 8 limitation?

D. Discuss whether the evidence of record supports a finding that Foster alone renders claims 1, 2, 4, 5, 7, and 8 of the '752 patent obvious. Further, please discuss *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019).

E. Discuss whether the scope of claims 2 and 5 of the '752 patent covers hardware only or also covers a combination of hardware and software. Please identify and explain how any controlling Federal Circuit precedent regarding the infringement standard for apparatus claims, such as the cases cited in the FID and the parties' briefing, applies to the evidence in the record in this investigation. In particular, please discuss at least *Telemac Cellular Corp. v. Topp Telecom, Inc.*, 247 F.3d 1316 (Fed. Cir. 2001).

The parties are requested to brief only the discrete issues identified above, with reference to the applicable law and evidentiary record. The parties are not to brief any other issues on review, which have already been adequately presented in the parties' previous filings.

In connection with the final disposition of this investigation, the statute authorizes issuance of: (1) an exclusion order that could result in the exclusion of the subject articles from entry into the United States, and/or (2) one or more cease and desist orders that could result in the respondent(s) 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 likely to do so. For background, see *Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843, Comm'n Op. at 7-10 (December 1994). In addition, if a party seeks issuance of any cease and desist orders, the written submissions should address that request in the context of recent Commission opinions, including those in *Certain Arrowheads with Deploying Blades and Components Thereof and Packaging Therefor*, Inv. No. 337-TA-977, Comm'n Op. (Apr. 28, 2017) and *Certain Electric Skin Care Devices, Brushes and Chargers Therefor, and Kits Containing the Same*, Inv. No. 337-TA-959, Comm'n Op. (Feb. 13, 2017). Specifically, if Complainants seek a cease and desist order against a respondent, the written submissions should respond to the following requests:

1. Please identify with citations to the record any information regarding commercially significant inventory in the United States as to each respondent against whom a cease and desist order is sought. If Complainants also rely on other significant domestic operations that could undercut the remedy provided by an exclusion order, please identify with citations to the record such information as to each respondent against whom a cease and desist order is sought.

2. In relation to the infringing products, please identify any information in the record, including allegations in the pleadings, that addresses the existence of any domestic inventory, any domestic operations, or any sales-related activity directed at the United States for each respondent against whom a

cease and desist order is sought.

3. Please discuss any other basis upon which the Commission could enter a cease and desist order.

The statute requires the Commission to consider the effects of any remedy upon the public interest. The public interest factors the Commission will consider include the effect that an exclusion order and/or cease-and-desist order 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.

If the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve, disapprove, or take no action on the Commission's determination. *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. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed if a remedy is ordered.

**WRITTEN SUBMISSIONS:** Parties to the investigation are requested to file submissions on the issues under review. In addition, the parties, interested government agencies, and any other interested persons are invited to file written submissions on the issues of remedy, the public interest, and bonding. Such initial written submissions should include views on the recommended determination by the ALJ on remedy and bonding.

In its initial written submission, complainant is also requested to identify the form of the remedy sought and to submit proposed remedial orders for the Commission's consideration. Complainant is also requested to state the date that the Asserted Patents expire, to provide the HTSUS subheadings under which the accused products are imported, and to supply identification information for all known importers of the products at issue in this investigation. Complainant is additionally requested to identify and explain, from the record, articles that are "components of" the subject products, and thus covered by the proposed remedial orders, if imported separately from the subject products.

Initial written submissions, including proposed remedial orders must be filed no later than the close of business on March 11, 2020. Reply submissions must be filed no later than the close of business on March 18, 2020. No further submissions on any of these issues will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file the original document electronically on or before the deadlines stated above and submit eight true paper copies to the Office of the Secretary pursuant to section 210.4(f) of the Commission's Rules of Practice and Procedure (19 CFR 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-1119") in a prominent place on the cover page and/or the first page. (*See* Handbook on Filing

Procedures, *https://www.usitc.gov/documents/handbook_on_filing_procedures.pdf*). Persons with questions regarding filing should contact the Secretary at (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 include a full statement of the reasons why the Commission should grant such treatment. *See* 19 CFR 201.6. Documents for which confidential treatment by the Commission is properly sought will be treated accordingly. All information, including confidential business information and documents for which confidential treatment is properly sought, submitted to the Commission for purposes of this Investigation may be disclosed to and used: (i) by the Commission, its employees and Offices, and contract personnel (a) for developing or maintaining the records of this or a related proceeding, or (b) in internal investigations, audits, reviews, and evaluations relating to the programs, personnel, and operations of the Commission including under 5 U.S.C. Appendix 3; or (ii) by U.S. government employees and contract personnel (all contract personnel will sign appropriate nondisclosure agreements) solely for cybersecurity purposes. 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 CFR Part 210.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: February 26, 2020

**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** **Inv. No. 337-TA-1119**

## PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the following parties as indicated, on February 26, 2020.

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

**On Behalf of Complainants Broadcom Corporation:**

John M. Caracappa, Esq.
**STEPTOE & JOHNSON LLP**
1330 Connecticut Avenue, N.W.
Washington, DC 20036

☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Renesas Electronics Corporation and Renesas Electronics America, Inc. :**

Daniel P. Muino, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 60000
Washington, DC 20006

☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing, Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing, Mississippi, Inc., Toyota Motor Manufacturing, Texas, Inc., Panasonic Corporation, Panasonic Corporation of North America, Denso Ten Limited, Denso Ten America Limited, Japan Radio Corporation, Denso Corporation, Denso International America, Inc., Denso Manufacturing Tennessee, Inc, and Denso Wireless Systems America, Inc.:**

Paul Steadman, Esq.
**DLA PIPER LLP**
444 West Lake Street
Suite 900
Chicago, IL 60606

☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Pioneer Corporation and Pioneer Automotive Technologies, Inc.**

Lora A. Brzezynski, Esq.
**FAEGRE DRINKER BIDDLE & REATH LLP**
1500 K Street, NW, Suite 1100
Washington, DC 20005

☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Socionext, Inc.**

G. Brian Busey, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW
Suite 6000
Washington, DC 20006

☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents u-blox AG, u-blox America, Inc., and u-blox San Diego, Inc.**

Smith Brittingham IV, Esq.
**FINNEGAN, HENDRESON, FARABOW, GARRETT & DUNNER LLP**
901 New York Avenue, NW
Washington, DC 20001

☐ 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 INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME** | **Inv. No. 337-TA-1119** |

# INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BONDING

Administrative Law Judge Dee Lord

(November 13, 2019)

**Appearances**:

*For Complainant Broadcom Corporation:*

John M. Caracappa, Boyd Cloern, Matthew N. Bathon, Brian P. Johnson, Katherine D. Cappaert, Scott M. Richey, Nigel Ray, Thomas Yebernetsky, Douglas R. Peterson, Bill Toth, and Li Quo of Steptoe & Johnson LLP in Washington, DC.

*For Respondents DENSO Corporation, DENSO International America, Inc., DENSO Manufacturing Tennessee, Inc., DENSO Wireless Systems America, Inc.; DENSO TEN Limited, DENSO TEN Limited America Limited, Japan Radio Co. Ltd., Panasonic Corporation, Panasonic Corporation of North America, Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing, Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing, Mississippi, Inc., and Toyota Motor Manufacturing, Texas, Inc.:*

Paul R. Steadman, Matthew D. Satchwell, Ferlillia V. Roberson, and Shuzo Maruyama of DLA Piper LLP in Washington, DC; Brian K. Erickson and Aaron G. Fountain of DLA Piper LLP in Austin, TX; Brent K. Yamashita and Erin McLaughlin of DLA Piper LLP in East Palo Alto, CA; and Kathryn Riley Grasso of DLA Piper LLP in San Diego, CA.

*For Respondents Pioneer Corporation and Pioneer Automotive Technologies, Inc.:*

John G. Smith, Brianna Lynn Silverstein, Lora A. Brzezynski, James R. Carpenter, Nick Colic, and Yodi S. Hailemariam of Drinker Biddle & Reath LLP in Washington, DC.

*For Respondents Renesas Electronics Corporation and Renesas Electronics America, Inc.:*

Mark L. Whitaker, Daniel P. Muino, G. Brian Busey, Lynn I. Levine, Fahd Hussein Patel, Mary Prendergast, and Aaron D. Rauh of Morrison & Foerster LLP in Washington, DC; and Yuka Teraguchi of Morrison & Foerster LLP in Tokyo, Japan.

*For Respondent Socionext Inc.:*

G. Brian Busey, Lynn I. Levine, and Aaron D. Rauh of Morrison & Foerster LLP in Washington, DC; and A. Max Olson and Akira Irie of Morrison & Foerster LLP in Tokyo, Japan.

*For Respondents u-blox AG, u-blox America, Inc., and u-blox San Diego, Inc.:*

Smith R. Brittingham, Elizabeth A. Niemeyer, Timothy J. May, and Ruohan Jack Li of Finnegan, Henderson, Farabow, Garrett & Dunner, LLP in Washington, DC.

Pursuant to the Notice of Investigation (Jun. 7, 2018) and Commission Rule 210.42, this is the administrative law judge's final initial determination and recommendation determination on remedy and bonding in the matter of *Certain Infotainment Systems, Components Thereof, and Automobiles Containing the Same*, Commission Investigation No. 337-TA-1119. 19 C.F.R. § 210.42(a)(1)(i).

For the reasons discussed herein, it is my final initial determination that there is no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain infotainment systems, components thereof, and automobiles containing the same, with respect to U.S. Patent No. 6,937,187 ("the '187 patent"); U.S. Patent No. 8,902,104 ("the '104 patent"); U.S. Patent No. 7,512,752 ("the '752 patent"); U.S. Patent No. 7,530,027 ("the '027 patent"); U.S. Patent No. 8,284,844 ("the '844 patent"); or U.S. Patent No. 7,437,583 ("the '583 patent").

## TABLE OF CONTENTS

The following abbreviations may be used in this Initial Determination:

| | |
|---|---|
| **Tr.** | Transcript |
| **WS** | Witness Statement |
| **DWS** | Direct Witness Statement |
| **RWS** | Rebuttal Witness Statement |
| **JX** | Joint Exhibit |
| **CX** | Complainant's exhibit |
| **CPX** | Complainant's physical exhibit |
| **CDX** | Complainant's demonstrative exhibit |
| **RX** | Respondent's exhibit |
| **RPX** | Respondent's physical exhibit |
| **RDX** | Respondent's demonstrative exhibit |
| **CPHB** | Complainant's pre-hearing brief |
| **CIB** | Complainant's initial post-hearing brief |
| **CRB** | Complainant's reply post-hearing brief |
| **RPHB** | Respondent's pre-hearing brief |
| **RIB** | Respondent's initial post-hearing brief |
| **RRB** | Respondent's reply post-hearing brief |
| **CMIB** | Complainant's initial *Markman* brief |
| **CMRB** | Complainant's rebuttal *Markman* brief |
| **RMIB** | Respondents' initial *Markman* brief |
| **RMRB** | Respondents' rebuttal *Markman* brief |

# I. BACKGROUND

## A. Procedural History

The Commission instituted this investigation in response to a complaint filed by Broadcom Corporation ("Broadcom") alleging violations of section 337 of the Tariff Act of 1930, as amended, by reason of infringement of certain claims of U.S. Patent No. 6,937,187 ("the '187 patent"); U.S. Patent No. 8,902,104 ("the '104 patent"); U.S. Patent No. 7,512,752 ("the '752 patent"); U.S. Patent No. 7,530,027 ("the '027 patent"); U.S. Patent No. 8,284,844 ("the '844 patent"); and U.S. Patent No. 7,437,583 ("the '583 patent"). The complaint named Respondents Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing, Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing, Mississippi, Inc., and Toyota Motor Manufacturing, Texas, Inc. ("Toyota"); Panasonic Corporation and Panasonic Corporation of North America ("Panasonic"); DENSO TEN Limited and DENSO TEN AMERICA Limited ( "DENSO TEN"); Renesas Electronics Corporation and Renesas Electronics America Inc. ("Renesas"); and Japan Radio Co., Ltd. ("JRC")

The Commission ordered that an investigation be instituted to determine "whether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of" the accused products by reason of infringement of the asserted claims "and whether an industry in the United States exists as required by subsection (a)(2) of section 337." Notice of Investigation at 2. The investigation was instituted upon publication of the Notice of Investigation in the *Federal Register* on Tuesday, June 12, 2018. 83 Fed. Reg. 27349-50 (2018); *see* 19 C.F.R. § 210.10(b).

On September 10, 2018, Broadcom filed a motion for leave to amend the Complaint and Notice of Investigation to add additional respondents, which was granted pursuant to Order No. 14 (Oct. 3, 2018), *not reviewed in relevant part by* Comm'n Notice (Nov. 1, 2018). The additional respondents added to the investigation are DENSO Corporation, DENSO International America, Inc., DENSO Manufacturing Tennessee, Inc., and DENSO Wireless Systems America, Inc. ("DENSO Corp."); Pioneer Corporation and Pioneer Automotive Technologies, Inc. ("Pioneer"); u-blox AG, u-blox America, Inc, and u-blox San Diego, Inc. ("u-blox"); and Socionext Inc. ("Socionext"). Order No. 14 at 12.

A *Markman* hearing was held in this investigation on February 5, 2019. Broadcom withdrew its allegations with respect to claims 1-10 of the '844 patent pursuant to Order No. 20 (Jan. 31, 2019), *not reviewed by* Comm'n Notice (Feb. 21, 2019).

An evidentiary hearing was held on June 3-7, 2019. During and after the evidentiary hearing, Broadcom withdrew its allegations with respect to claims 12 and 14 the '844 patent; claims 19-24 of the '583 patent; claims 3 and 9-10 of the '752 patent; claims 12-19 of the '027 patent; claims 4, 6-8, and 10 of the '187 patent; and claims 1-2, 5-11, 13, and 15-16 of the '104 patent. Order No. 48 (Jun. 5, 2019), *not reviewed by* Comm'n Notice (Jun. 18, 2019); Order No. 49 (Jun. 13, 2019), *not reviewed by* Comm'n Notice (Jun. 28, 2019).

The target date for the investigation has been extended to March 13, 2020, pursuant to Order No. 53 (Oct. 17, 2019), *not reviewed by* Comm'n Notice (Nov. 6, 2019).

### B. The Parties

#### 1. Complainant

The complainant is Broadcom Corporation ("Broadcom"). Notice of Investigation at 2. Broadcom was founded in 1991 in Los Angeles, California, and its principal place of business is

in San Jose, California. CIB at 4-5; Amended Complaint ¶¶ 13-14 (Oct. 5, 2018). Broadcom was acquired by Avago Technologies Limited in 2016. *Id.* Complainant Broadcom Corporation is a wholly-owned indirect subsidiary of an ultimate corporate parent now known as Broadcom Inc. *Id.*

### 2. Respondents

The respondents include Japanese automobile maker Toyota and several of Toyota's suppliers, Panasonic, DENSO TEN, DENSO Corp., and Pioneer, who supply head units for Toyota automobiles, and chipmakers Renesas, Socionext, and u-blox, whose products are incorporated into the accused head units.

#### a. Toyota

Toyota Motor Corporation is a Japanese corporation that is the worldwide parent corporation for other Toyota entities. RIB at 6; Toyota Response to Amended Complaint ¶ 20 (Nov. 28, 2018). Toyota Motor North America, Inc. and Toyota Motor Sales U.S.A., Inc. are California corporations headquartered in Plano, Texas. RIB at 6; Toyota Response to Amended Complaint ¶¶ 22-23. Toyota Motor Engineering & Manufacturing North America, Inc. is a Kentucky corporation headquartered in Plano, Texas. RIB at 6n.2; Toyota Response to Amended Complaint ¶ 24. Toyota Motor Manufacturing, Indiana, Inc. is an Indiana corporation headquartered in Princeton, Indiana. RIB at 6 n.2; Toyota Response to Amended Complaint ¶ 25. Toyota Motor Manufacturing, Kentucky, Inc. is a Kentucky corporation. RIB at 6 n.2; Toyota Response to Amended Complaint ¶ 26. Toyota Motor Manufacturing, Mississippi, Inc. is a Mississippi corporation. RIB at 6 n.2; Toyota Response to Amended Complaint ¶ 27. Toyota Motor Manufacturing, Texas, Inc. is a Texas corporation headquartered in San Antonio, Texas. RIB at 6 n.2; Toyota Response to Amended Complaint ¶ 28.

**b. Panasonic, DENSO TEN, DENSO Corp., and Pioneer**

Panasonic Corporation is a Japanese corporation that is the worldwide parent corporation for other Panasonic entities. RIB at 5; Panasonic Response to Amended Complaint ¶ 29. Panasonic Corporation of North America is a New Jersey corporation headquartered in Newark, New Jersey. Panasonic Response to Amended Complaint ¶ 31.

DENSO TEN Limited is a Japanese company, formerly known as Fujitsu Ten Limited, which is the worldwide parent corporation for other DENSO TEN entities. RIB at 5; DENSO TEN Response to Amended Complaint ¶ 33. DENSO TEN America Limited is a California corporation headquartered in Torrance, California. DENSO TEN Response to Amended Complaint ¶ 35.

DENSO Corporation is a Japanese corporation that is a supplier of automotive technology, systems, and components. DENSO Response to Amended Complaint ¶¶ 43-44. DENSO International America, Inc. is a Delaware corporation with its principal place of business in Southfield, Michigan, and it is the parent company for DENSO Corporation's North American operations. *Id.* ¶¶ 45-46. DENSO Manufacturing Tennessee, Inc. is a Tennessee corporation with its principal place of business in Maryville, Tennessee, which is DENSO Corporation's largest U.S. manufacturing facility. *Id.* ¶¶ 47-48. DENSO Wireless Systems America, Inc. was a California corporation that was shut down at the end of 2018. *Id.* ¶¶ 49-50; RIB at 5 n.1.

Pioneer Corporation is a Japanese company specializing in digital entertainment products. RIB at 5; Pioneer Response to Amended Complaint ¶¶ 51-52. Pioneer Automotive Technologies, Inc. is a wholly-owned subsidiary of Pioneer Corporation that sells automotive

systems and components to vehicle manufacturers. RIB at 5; Pioneer Response to Amended Complaint ¶¶ 53-54.

#### c. Renesas, JRC, Socionext, and u-blox

Renesas Electronics Corporation is a Japanese corporation that is the worldwide parent corporation for other Renesas entities. Renesas Response to Amended Complaint ¶ 37. Renesas Electronics America, Inc. is a California corporation with its principal place of business in Milpitas, California.

Japan Radio Co., Ltd. is a Japanese corporation that manufactures and sells radio communication equipment. RIB at 4; JRC Response to Amended Complaint ¶ 41.

Socionext Inc. is a Japanese corporation that designs and develops system-on-chip ("SoC") products. RIB at 4; Socionext Response to Amended Complaint ¶¶ 55-56.

u-blox AG is a Swiss corporation that creates wireless semiconductors and modules. RIB at 5; u-blox Response to Amended Complaint ¶¶ 57-58. u-blox America, Inc. is a Delaware corporation and wholly-owned subsidiary of u-blox AG, having its principal place of business in Reston, Virginia. RIB at 5; u-blox Response to Amended Complaint ¶ 59. u-blox San Diego, Inc. is a Delaware corporation with its principal place of business in San Diego, California. RIB at 5; u-blox Response to Amended Complaint ¶ 61.

### C. Products at Issue

#### 1. Domestic Industry

The domestic industry products ("DI products") are Broadcom's set top box ("STB") products, which are alleged to practice the '752 patent, '027 patent, and '844 patent; and Broadcom's Global Navigation Satellite System ("GNSS") products, which are alleged to practice the '187 patent and '104 patent. CIB at 15-16; RIB at 22.

### 2. Accused Products

The accused products are SoCs and GNSS processing chips, head units that incorporate these chips, and automobiles in which the head units are installed. CIB at 13-15. Broadcom accuses certain Renesas SoCs of infringing the '583 patent and the '752 patent. CIB at 14-15; RIB at 13. Broadcom accuses certain JRC and u-blox chips of infringing the '187 patent and the '104 patent. CIB at 14-15; RIB at 14. Broadcom accuses certain Panasonic head units that incorporate Renesas, JRC, and u-blox chips of infringing the '583 patent, '752 patent, '027 patent, '844 patent, '187 patent, and '104 patent. CIB at 13-14, Appendix B; RIB at 14-16. Broadcom accuses certain DENSO Corp. head units that incorporate Renesas and JRC chips of infringing the '583 patent and'187 patent. CIB at 14, Appendix B; RIB at 17. Broadcom accuses certain DENSO TEN head units that incorporate Renesas, Socionext, and JRC chips of infringing the '583 patent, '752 patent, '027 patent, '844 patent, and '187 patent. CIB at 14, Appendix B; RIB at 17-18. Broadcom accuses certain Pioneer head units incorporating Renesas and u-blox chips of infringing the '752 patent, '844 patent, '583 patent, '027 patent, '187 patent, and '104 patent. CIB at 14, Appendix 2; RIB at 19-21. Broadcom further accuses Toyota vehicles incorporating Panasonic, DENSO, DENSO TEN, and Pioneer head units of infringing each of the asserted patents. CIB at 13, Appendix 2; RIB at 21-22.

## D. Asserted Patents

Broadcom has asserted six patents in this investigation, which fall broadly into three categories: the '583 patent is related to electronics architecture; the '752 patent, '027 patent, and '844 patent have overlapping inventors who were Broadcom engineers working on electronics for video processing. The '187 patent and '104 patent were acquired by Broadcom from Global Locate, Inc. and relate to navigation satellite systems.

### 1. The '583 Patent

The '583 patent is entitled "Method and System for Flexible Clock Gating Control" and issued from an application filed on September 1, 2004. '583 patent (JX-0004), cover. The named inventor is Paul Lu, and the patent expires on October 15, 2025. Amended Complaint ¶ 93.

The '583 patent generally relates to a system for controlling clocks. '583 patent, Abstract. In the prior art, gate control hardware was used to reduce power consumption by selectively turning off logic gates supplying clock signals to unused devices. *Id.* at 1:35-2:4. This hardware is configured at the time of fabrication, however, and lacks "flexibility to disable or enable certain clocks when the customer has application scenarios that are not covered in the design phase." *Id.* at 2:9-11. To provide improved flexibility, the '583 patent discloses a processor and hardware based clock gating system, which allows for modifications to the clock-gating system after fabrication through the processor and associated clock gate registers. *Id.* at 5:4-11.

### 2. The '752 Patent

The '752 patent is entitled "Systems, Methods, and Apparatus for Pixel Fetch Request Interface" and issued from an application filed on May 25, 2006. '752 patent (JX-0005), cover. The named inventor is Alexander G. MacInnis, and the patent expires on January 23, 2027. Amended Complaint ¶ 78.

The '752 patent generally relates to a memory access unit, or MAU, that is an interface between clients that are requesting access to data in memory and a memory controller, which controls the access to the memory. '752 patent at 2:51-3:67. Certain features of the MAU are

directed to problems in the prior art related to accessing a variety of different, and potentially non-consecutive, addresses within a shared memory. *Id.* at 1:25-2:9.

### 3. The '027 Patent

The '027 patent is entitled "Graphics Display System with Graphics Window Control Mechanism" and issued from an application filed on July 18, 2003. '027 patent (JX-0006), cover. The named inventors are Alexander G. MacInnis, Chengfuh Jeffrey Tang, Xiaodong Xie, James T. Patterson, and Greg A. Kranawetter, and the patent expires on July 28, 2022. Amended Complaint ¶ 83.

The '027 patent describes an integrated circuit chip for processing graphics images to be displayed in windows. '027 patent, Abstract. The graphics chip includes a window controller that accesses graphic window descriptors, sorts according to relative depth, and sends header information to a display engine. *Id.* at 5:25-34.

### 4. The '844 Patent

The '844 patent is entitled "Video Decoding System Supporting Multiple Standards" and issued from an application filed on April 1, 2002. '844 patent (JX-0001), cover. The named inventors are Alexander G. MacInnis, Jose R. Alvarez, Sheng Zhong, Xiaodong Xie, and Vivian Hsiun, and the patent expires on January 29, 2031. Amended Complaint ¶ 88.

The '844 patent describes a system for decoding digital video data according to different standards by employing a processor, with one or more configurable "hardware accelerators." '844 patent, Abstract.

### 5. The '187 Patent

The '187 patent is entitled "Method and Apparatus for Forming a Dynamic Model to Locate Position of a Satellite Receiver" and issued from an application filed on June 13, 2003.

'187 patent (JX-0003), cover. The named inventors are Frank van Diggelen and Charles Abraham, and the patent expires on November 17, 2020. Amended Complaint ¶ 67. The '187 patent describes a method for estimating a GPS position by using a dynamic model. '187 patent, Abstract.

#### 6. The '104 Patent

The '104 patent is entitled "Method and Apparatus for Combining Measurements and Determining Clock Offsets Between Different Satellite Positioning Systems" and issued from an application filed on July 2, 2012. '104 patent (JX-0002), cover. The named inventor is Frank van Diggelen, and the patent expires on March 18, 2025. Amended Complaint ¶ 73. The '104 patent describes a method for estimating a location using multiple GNSS constellations. '104 patent, Abstract.

### E. Witness Testimony

I received testimonial evidence in this investigation in the form of witness statements, live testimony, and deposition designations.

#### 1. Fact Witnesses

Broadcom began the hearing by submitting witness statements for Broadcom employees Steven Terronez (CX-0001C) and Gautier Chapeaux (CX-0002C), who were not cross-examined by Respondents. Tr. 101. The first live witness at the hearing was Timothy Hellman, a Broadcom engineer. CX-0003C; Tr. 102-120.

Pioneer presented testimony from one its managers, Hidekazu Nishiwaki. RX-0317C; Tr. 620-35. JRC submitted a witness statement for its deputy general manager Katsuo Yui (RX-0019C), who was not cross-examined by Broadcom. Tr. 784. Socionext presented testimony from one of its employees, Makoto Nakahara. RX-0013C; Tr. 809-13.

### 2. Expert Witnesses

Broadcom presented testimony on remedy and the economic prong of domestic industry from Philip Green, who was qualified as an expert in economic analysis. CX-0007C; Tr. 122-43 (expert qualification at 124:20-125:9). For the '583 patent, Broadcom presented testimony from Bruce McNair, who was qualified as an expert in power management and clock gating. CX-0006C; CX-0012C; Tr. 143-98 (expert qualification at 145:24-146:6), 896-934 (rebuttal testimony). For the '844 patent, Broadcom presented testimony from Scott Acton, who was qualified as an expert in digital signal imaging and video. CX-0004C; CX-0010C; Tr. 198-224 (expert qualification at 199:25-200:200:6), 1007-32 (rebuttal testimony). For the '027 patent, Broadcom presented the testimony of Douglas Rodriguez, who was qualified as an expert in graphics and image processing. CX-0008C; CX-0013C; Tr. 273-356 (expert qualification at 274:16-23), 1005-07 (rebuttal testimony). For the '752 patent, Broadcom presented testimony from Marilyn Wolf, who was qualified as an expert in memory access and digital video processing. CX-0009C; CX-0014C; Tr. 248-72 (expert qualification at 250:10-17), 965-1004 (rebuttal testimony). For the '187 and '104 patents, Broadcom presented the testimony of Steven Goldberg, who was qualified as an expert in GNSS technology. CX-0005C; CX-0011C; Tr. 357-548 (expert qualification at 359:21-360:2), 1033-41 (rebuttal testimony).

Respondents presented testimony on the '583 patent from Robert Colwell, who was qualified as an expert in power management and clock gating. RX-0008C; Tr. 552-93 (expert qualification at 554:9-16). Respondents presented testimony on the '752 patent from Vivek Subramanian, who was qualified as an expert in memory access and digital video processing. Tr. 594-619 (expert qualification at 596:12-19). Respondents presented testimony on the '844 patent and the '027 patent from Jing Hu, who was qualified as an expert in video coding and

processing. RX-0009C; RX-0010C; Tr. 635-61 (expert qualification at 637:5-12). Respondents also presented testimony on the '844 patent and the '027 patent from Alan Bovik, who was qualified as an expert in image and video processing, streaming video, and digital television. RX-0001C; RX-0006C; Tr. 662-784 (expert qualification at 664:6-13). Respondents presented testimony regarding the '583 patent, '844 patent, and '027 patent from Steven Przybylski, who was qualified as an expert in digital systems and integrated circuit design. RX-0014C; Tr. 785-809 (expert qualification at 790:3-14). Respondents presented testimony regarding the '187 and '104 patents from Andrew Mayo, who was qualified as an expert in software source code, operating systems and control systems. RX-0012C; Tr. 816-50 (expert qualification at 817:6-13). Respondents also presented testimony regarding the '187 and '104 patents from Samuel Pullen, who was qualified as an expert in GNSS technology. RX-0017C; Tr. 851-70 (expert qualification at 854:9-15). Respondents presented testimony on remedy and the economic prong of domestic industry from Seth Kaplan, who was qualified as an expert in economic analysis. RX-0011C; Tr. 872-94 (expert qualification at 873:16-22.

### 3. Deposition Designations

The parties submitted designated deposition transcripts for numerous witnesses: JX-0028C (Ishiguro Dep. Tr.), JX-0029C (Mutoh Dep. Tr.), JX-0030C (Naruse Dep. Tr.), JX-0031C (Uemura Dep. Tr.), JX-0032C (Kagotani Dep. Tr.), JX-0033C (Toba Dep. Tr.), JX-0034C (Yokawa Dep. Tr.), JX-0035C (Ogasa Dep. Tr.), JX-0036C and JX-0037C (Washizu Dep. Tr.), JX-0038C and JX-0039C (Yui Dep. Tr.), JX-0040C (Matsuda Dep. Tr.), JX-0041C (Nakao Dep. Tr.), JX-0042C (Anzawa Dep. Tr.), JX-0043C (Furuyama Dep. Tr.), JX-0044C (Kawagishi Dep. Tr.), JX-0045C and JX-0046C (Abe Dep. Tr.), JX-0049C (Honda Dep. Tr.), JX-0050C and JX-0051C (Hotta Dep. Tr.), JX-0052C and JX-0053C (Igarishi Dep. Tr.),

JX-0054C (Kanemaru Dep. Tr.), JX-0055C (Matsubara Dep. Tr.), JX-0056C (Sato Dep. Tr.), JX-0057C and JX-0058C (Nagashima Dep. Tr.), JX-0059C and JX-0060C (Nakahara Dep. Tr.), JX-0061C (Hata Dep. Tr.), JX-0062C (Nishida Dep. Tr.), JX-0063C (Bryant Dep. Tr.), JX-0064C (Nigg Dep. Tr.), JX-0065C (Abraham Dep. Tr.), JX-0066C (Chapeaux Dep. Tr.), JX-0067C and JX-0068C (Hellman Dep. Tr.), and JX-0069C (Terronez Dep. Tr.).

## II. 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. 19 U.S.C. § 1337; *Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Commission Memorandum Opinion, 215 U.S.P.Q. 229, 231 (1981).

### A. Subject Matter Jurisdiction

Section 337 confers subject matter jurisdiction on the Commission to investigate, and if appropriate, to provide a remedy for, unfair acts and unfair methods of competition in the importation, the sale for importation, or the sale after importation of articles into the United States. *See* 19 U.S.C. §§ 1337(a)(1)(B) and (a)(2). The Commission has subject matter jurisdiction over this investigation based on Broadcom's allegations that the accused products are imported as part of Toyota automobiles. *See, e.g.,* Order No. 14 at 6-10 (discussing Broadcom's allegations of importation). Toyota, Panasonic, DENSO TEN, DENSO Corp., Pioneer, Renesas, JRC, and u-blox have stipulated to importation and do not contest the Commission's subject matter jurisdiction. RIB at 22; JX-0013C (DENSO Corp. stipulation); JX-0015C (DENSO TEN stipulation); JX-0017C (JRC stipulation); JX-0018C (Panasonic stipulation); JX-0020C (u-blox stipulation); JX-0022C (Pioneer stipulation); JX-0024C (Renesas stipulation); JX-0026C (Toyota stipulation). With respect to Socionext, Broadcom's allegations of importation are sufficient to

establish the Commission's subject matter jurisdiction. Amended Complaint ¶¶ 114-15; *see Amgen Inc. v. Int'l Trade Comm'n*, 565 F.3d 846, 854 (Fed. Cir. 2009) ("In this case, the Commission had jurisdiction as a result of Amgen's allegation that Roche imported an article . . . covered by the claims of a valid and enforceable United States patent.").

### B. Personal Jurisdiction

Respondents have submitted to the personal jurisdiction of the Commission by answering the Complaint and Notice of Investigation, participating in discovery, appearing at hearings, and filing motions and briefs. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, USITC Pub. No. 1948, Initial Determination at 4, 1986 WL 379287, *1 (Oct. 15, 1986), *not reviewed in relevant part by* Comm'n Action and Order, 1987 WL 450871 (Jan. 15, 1987).

### C. *In Rem* Jurisdiction

The Commission has *in rem* jurisdiction over the accused products by virtue of their importation into the United States. *See Sealed Air Corp. v. U.S. Int'l Trade Comm'n*, 645 F.2d 976, 985-86 (C.C.P.A. 1981) (holding that the ITC's jurisdiction over imported articles is sufficient to exclude such articles). As discussed above, Toyota, Panasonic, DENSO TEN, DENSO Corp., Pioneer, Renesas, JRC, and u-blox have stipulated to importation. The Commission also has *in rem* jurisdiction over the Socionext products that are contained in the DENSO TEN and Pioneer head units imported into the United States.

## III. IMPORTATION

### A. Legal Standard

The statute defines a violation of section 337 as "[t]he importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignee, of articles that . . . infringe a valid and enforceable United State patent." 19 U.S.C. § 1337(a)(1)(B). Accordingly, a necessary element of a finding that a respondent

violated section 337 requires proof that the respondent actually imported, sold for importation, or sold after importation the articles at issue. *Certain Carbon and Alloy Steel Products*, Inv. No. 337-TA-1002, Order No. 103 at 33 (Oct. 2, 2017), *not reviewed by* Comm'n Notice (Nov. 1, 2017). With respect to a sale for importation, the requirement is that a respondent knew or should have known that its sale of infringing articles to third parties would be subsequently imported into the United States. *See Certain Inkjet Ink Cartridges with Printheads & Components Thereof*, Inv. No. 337-TA-723, Initial Determination, 2011 WL 3489151, at *12 (June 10, 2011), *affirmed in relevant part by* Comm'n Op. (Dec. 1, 2011) ("To prove a 'sale for importation,' a complainant must prove that a respondent sold infringing articles and knew or should have known that those articles would be subsequently exported to the United States.").

**B. Importation Stipulations**

Toyota, Panasonic, DENSO TEN, DENSO Corp., Pioneer, Renesas, JRC, and u-blox have stipulated to importation of the accused products or have agreed not to contest that the importation requirement is satisfied. RIB at 22; JX-0013C (DENSO Corp. stipulation); JX-0015C (DENSO TEN stipulation); JX-0017C (JRC stipulation); JX-0018C (Panasonic stipulation); JX-0020C (u-blox stipulation); JX-0022C (Pioneer stipulation); JX-0024C (Renesas stipulation); JX-0026C (Toyota stipulation).

**C. Disputed Importation**

Broadcom identifies two Socionext SoCs, the [redacted] and [redacted], incorporated into [redacted] head units that are imported to the United States as part of Toyota automobiles. CIB at 21-22 (citing CX-0064C ([redacted] Interrogatory Responses; CX-0170C (Toyota Interrogatory Responses)). Broadcom contends that Socionext knew or should have known that its SoCs would be exported to the United States,

citing the importation of some Socionext products for demonstration at a trade show in the United States. JX-0006C (Nakahara Dep. Tr.) at 135:4-6. Broadcom also cites an interrogatory response, where Socionext was able to identify specific products that [redacted] "may incorporate . . . into its product(s) which are then sold to Toyota and incorporated into cars that are ultimately sold in the United States." CX-0154C at 21. Broadcom also cites the large sales volume of the [redacted] products as circumstantial evidence that Socionext should have known that its products would be exported to the United States. CIB at 22.

Socionext disputes Broadcom's allegations of importation, arguing that it sells its products to [redacted] in Japan but has no knowledge of their subsequent incorporation into Toyota vehicles that are imported into the United States. RIB at 23-24. Makoto Nakahara, a Socionext manager, testified: "We don't know what happens to these SoCs after we sell them to [redacted] in Japan. After [redacted] receives our SOCs, they make independent business decisions on what to do with the SoCs." RX-0013C (Nakahara WS) at Q/A 11. With respect to the Socionext products imported for U.S. trade shows, Socionext argues that these were not the accused products. RRB at 3. Mr. Nakahara confirmed that the [redacted] accused Socionext SoCs have never been imported by Socionext to the United States or sold by Socionext to a United States customer. JX-0060C (Nakahara Dep. Tr.) at 135-39, 186-90.

It is Broadcom's burden to establish importation, and on this record, the evidence is insufficient to support a finding that Socionext knew or should have known that the accused SoCs would be imported into the United States. The fact that Socionext attended a trade show in the United States where it demonstrated some related SoCs is not evidence of any knowledge regarding the importation of the accused products incorporated into automobiles at issue in this investigation. Socionext's interrogatory response identifying the accused products also fails to

establish the requisite knowledge regarding importation. The circumstantial evidence regarding sales volume is insufficient to make an inference about what Socionext knew or should have known. Accordingly, there is no violation of section 337 by Socionext because Broadcom has failed to prove a sale for importation.[1]

## IV. LEGAL STANDARDS

### A. Infringement

Section 337(a)(1)(B)(i) 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 consignee, of articles that – (i) infringe a valid and enforceable United States patent or a valid and enforceable United States copyright registered under title 17." 19 U.S.C. §1337(a)(1)(B)(i). The Commission has held that the word "infringe" in Section 337(a)(1)(B)(i) "derives its legal meaning from 35 U.S.C. § 271, the section of the Patent Act that defines patent infringement." *Certain Electronic Devices with Image Processing Systems, Components Thereof, and Associated Software*, Inv. No. 337-TA-724, Comm'n Op. at 13-14 (December 21, 2011).

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

[1] As discussed in the context of the '027 patent, *infra*, there is also no violation of section 337 by Socionext because no accused products infringe any valid claims of the '027 patent. Moreover, Broadcom does not accuse any Socionext product of infringement on its own and does not allege indirect infringement against Socionext.

### 1. Claim Construction

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996) (citation omitted). The construction of claims is simply a way of elaborating the normally terse claim language[] in order to understand and explain, but not to change, the scope of the claims." *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000) (alterations in original) (quoting *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991)). "[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Claim construction focuses mainly on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *See generally Phillips v. AWH Corp.*, 415 F.3d 1303, 1313-17 (Fed. Cir. 2005) (*en banc*). The words of a claim "'are generally given their ordinary and customary meaning,'" which is "the meaning that the term would have to a person of ordinary skill in art" as of the date that the patent application was filed. *Id.* at 1312-13 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)) (citations omitted). A person of ordinary skill in the art "is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id.* In some cases, "the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges." *Id.* at 1314. Often, however, "determining the ordinary and customary meaning of the claim requires

examination of terms that have a particular meaning in a field of art." *Id.* "[T]he court looks to 'those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean.'" *Id.* (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). Those sources include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id.*

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Id.* at 1312 (quoting *Innova*, 381 F.3d. at 1115)). "Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms." *Id.* at 1314. For example, "the context in which a term is used in the asserted claim can be highly instructive," and "[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term." *Id.*

"[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Id.* at 1315 (quoting *Vitronics*, 90 F.3d at 1582). "The longstanding difficulty is the contrasting nature of the axioms that (a) a claim must be read in view of the specification and (b) a court may not read a limitation into a claim from the specification." *Innova*, 381 F.3d at 1117.

In addition to the claims and the specification, the prosecution history should be examined if in evidence. "The prosecution history . . . consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent. Like the specification, the prosecution history provides evidence of how the PTO and the

inventor understood the patent." *Phillips*, 415 F.3d at 1317. "[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Id.*

If the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered. Extrinsic evidence "consists of all evidence external to the patent and the prosecution history, including inventor and expert testimony, dictionaries, and learned treatises." *Id.* at 1317. Extrinsic evidence is generally viewed "as less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.* at 1318. "The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence." *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

Although "[c]laim terms are generally given their plain and ordinary meanings to one of skill in the art when read in the context of the specification and prosecution history," there are two instances in which a court will depart from the plain and ordinary meaning. *Hill-Rom Service, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). The first is when a patentee acts as its own lexicographer. *Id.* "To act as its own lexicographer, a patentee must 'clearly set forth a definition of the disputed claim term.'" *Thorner v. Sony Comput. Entm't Am.*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (quoting *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). The second is when the patentee disavows the full scope of the claim term. *Id.* Disavowal can be effectuated by language in the specification or the prosecution history. *See Phillips*, 415 F.3d at 1316-17. "In either case, the standard for disavowal is exacting, requiring

clear and unequivocal evidence that the claimed invention includes or does not include a particular feature." *Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2017).

### 2. Direct and Indirect Infringement

Under 35 U.S.C. § 271(a), direct infringement of a patent consists of making, using, offering to sell, or selling the patented invention without consent of the patent owner.

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

Another form of indirect infringement is contributory infringement, defined in section 271(c) of the Patent Act: "Whoever offers to sell . . . or imports into the United States a component of a patented machine, . . . or a material or apparatus for use in practicing a patented

process, constituting a material part of the invention, knowing the same 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 noninfringing use, shall be liable as a contributory infringer." 35 U.S.C. § 271(c). The intent requirement for contributory infringement requires that respondent knows "that the combination for which [the] component was especially designed was both patented and infringing." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. at 763. A violation of section 337 based on contributory infringement requires that "the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1353 (Fed. Cir. 2010).

#### 3. Literal Infringement

Literal infringement requires the patentee to prove that the accused device contains each and every limitation of the asserted claim(s). *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004). "If even one limitation is missing or not met as claimed, there is no literal infringement." *Elkay Mfg. Co. v. EBCO Mfg. Co.*, 192 F.3d 973, 980 (Fed. Cir. 1999). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008).[2]

### B. Invalidity

It is the respondents' burden to prove invalidity, and the burden of proof never shifts to the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). "Under the patent statutes, a patent enjoys a presumption of

[2] Infringement can also be proven under the doctrine of equivalents. There are no allegations of infringement under the doctrine of equivalents in this investigation.

validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence . . . ." *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 100-114 (2011) (upholding the "clear and convincing" standard for invalidity).

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

**1. Anticipation**

Pursuant to 35 U.S.C. § 102, a patent claim is invalid as anticipated if:

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant;
>
> (b) 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;
>
> (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;
>
> (g)(2) before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it.

35 U.S.C. § 102 (2000).[3] "A patent is invalid for anticipation if a single prior art reference

[3] As explained in the revision notes and legislative reports in 35 U.S.C.A. § 100 (May 13, 2015), the language of 35 U.S.C. § 102 that was effective prior to the America Invents Act controls in this investigation.

discloses each and every limitation of the claimed invention. Moreover, a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted).

**2. Obviousness**

Section 103 of the Patent Act states:

> 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 negatived by the manner in which the invention was made.

35 U.S.C. § 103(a) (2000).[4]

"Obviousness is a question of law based on underlying questions of fact." *Scanner Techs.*, 528 F.3d at 1379. The underlying factual determinations include: "(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness." *Id.* (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). These factual determinations are often referred to as the "*Graham* factors."

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. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418-21 (2007). In *KSR*, the Supreme Court rejected the Federal Circuit's rigid application of the teaching-suggestion-motivation test. While the Court stated that "it can

[4] *See supra*, n.3.

be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," it described a more flexible analysis:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue . . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

*Id.* at 418. Applying *KSR*, the Federal Circuit has held that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device . . . and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007).

In addition to demonstrating that a reason exists to combine prior art references, the challenger must demonstrate that the combination of prior art references discloses all of the limitations of the claims. *Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-1374 (Fed. Cir. 2010), *abrogated on other grounds by Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014) (upholding finding of non-obviousness based on substantial evidence that the asserted combination of references failed to disclose a claim limitation); *Velander v. Garner*, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (explaining that a requirement for a finding of obviousness is that "all the elements of an invention are found in a combination of prior art references").

### C. Domestic Industry

In patent-based proceedings under section 337, a complainant must establish that an industry "relating to the articles protected by the patent . . . exists or is in the process of being established" in the United States. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement of section 337 consists of an "economic prong" and a "technical prong." *See, e.g., Alloc, Inc. v. Intl Trade Comm'n,* 342 F.3d 1361, 1375 (Fed. Cir. 2003). To meet the technical prong, the complainant must establish that it practices at least one claim of the asserted patent. *Certain Point of Sale Terminals and Components Thereof,* Inv. No. 337-TA-524, Order No. 40 at 17-18 (Apr. 11, 2005). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims." *Alloc*, 342 F.3d at 1375.

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

> For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned –
>
> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3).

## V. THE '583 PATENT

### A. Background and Specification

The '583 patent is entitled "Method and System for Flexible Clock Gating Control" and issued October 14, 2008. '583 patent (JX-0004), cover. The '583 patent describes a system for controlling clock signals by using software to control gates. *Id.*, Abstract. In the prior art,

hardware control logic was used to turn gates ON or OFF, but the '583 patent describes a processor that can more flexibly control gates by reading and writing to registers. *Id.* at 5:3-33. An exemplary clock signal control system is depicted in Figure 3 of the specification.

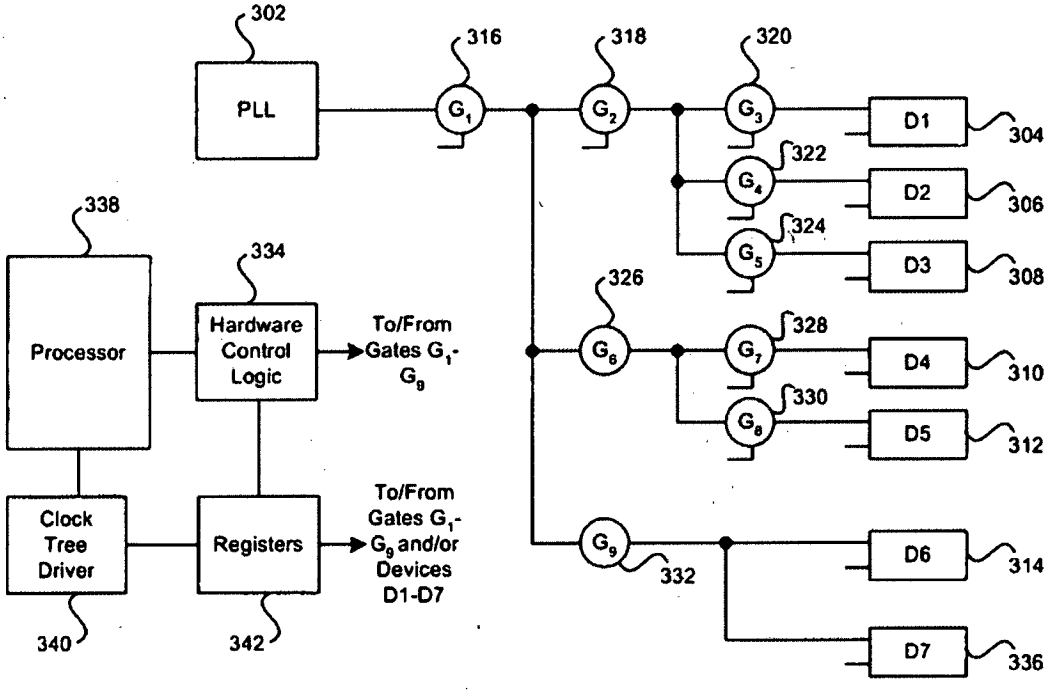


**FIG. 3**

*Id.*, Fig. 3. This system includes devices labeled D1 through D7, gates labeled G1 through G9, a processor 338, clock tree driver 340, hardware control logic 334, and registers 342. *Id.* at 4:63-5:5:2. In operation, the hardware control logic turns the gates on and off to supply clock signals to the devices, but the processor can also control the gates and devices through the clock tree driver and registers. *Id.* at 5:3-13. The benefit of this feature is that it allows the gates to be "more flexibly controlled in order to cover scenarios that were not anticipated when hardware control logic 334 was designed." *Id.*

### B. Level of Ordinary Skill in the Art

Broadcom's expert, Dr. Bruce McNair, submits that one of ordinary skill in the art for the '583 patent "would have a Bachelor's Degree in Electrical Engineering, Computer Science, or a similar discipline, with one or two years of experience in this or a related field" and "would also have been familiar with power management and processor clock control." CX-0006C at Q/A 22. Respondents' expert, Dr. Robert Colwell, offers his opinion that one of ordinary skill "would have had a Bachelor's Degree in Electrical Engineering, Computer Science, or a similar discipline, with at least two years of experience working with power management and processor clock control." RX-0003C at Q/A 132. Both experts submit that the differences between the two proposed standards for ordinary skill in the art would not affect their opinions. CX-0006C (McNair DWS) at Q/A 24; RX-0003C (Colwell DWS) at Q/A 134. For this initial determination, I adopt Dr. McNair's proposal for one of ordinary skill in the art, which includes qualifications that are agreed upon by both experts.

### C. Asserted Claims

Broadcom asserts claims 17-18 and 25-26 of the '583 patent. CIB at 37. Claim 17 is an independent claim, reciting:

> 17. A system for distributing clock signals within an electronic device, the system comprising:
>
> at least one processor that determines a status of at least one gate that controls flow of a clock signal to at least one device coupled to said at least one gate; and
>
> said at least one processor controls said at least one gate based on said determined status.

'583 patent at 7:38-8:2. Claim 18 depends from claim 17, adding a limitation: "wherein said at least one processor determines whether said at least one device coupled to said at least one gate is active or inactive." *Id.* at 8:3-5. Claim 25 is a separate independent claim, reciting:

> 25. A system for distributing clock signals within an electronic device, the system comprising:
>
> a clock tree having a plurality of gates;
>
> a hardware control logic block coupled to said clock tree that controls at least a portion of said plurality of gates;
>
> at least one register that is controlled by a clock tree driver; and
>
> at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block.

*Id.* at 8:28-37. Claim 26 depends from claim 25, adding a limitation: "wherein said processor via said clock tree driver asserts or de-asserts a current value of said at least one register." *Id.* at 8:38-40.

### D. Claim Construction

At the *Markman* hearing, the parties disputed the construction of "at least one processor" in claim 25. Although the parties previously agreed to the construction of several additional terms, they continue to raise disputes in their pre-hearing and post-hearing briefs regarding the application of these constructions.

#### 1. "at least one processor" (Claim 25)

The parties dispute the construction of the term "at least one processor" in claim 25.

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "at least one processor" (claim 25) | Plain and ordinary meaning | "processor adapted to execute code and separate from both the clock tree driver and the hardware control block." |

CIB at 35-36; RPHB at 54-56; CMIB at 12; CMRB at 5; RMIB at 11-13; RMRB at 5.

Respondents' proposed construction requires that the "at least one processor" be separate from the claimed "clock tree driver" and "hardware control logic block." RPHB at 54-56.

Respondents argue that the claim language and the specification separately recite these elements. *See, e.g.,* '583 patent, Fig. 3 (depicting Processor 338, Hardware Control Logic 334, and Clock Tree Driver 340). Respondents further cite the prosecution history of the '583 patent, where the applicant distinguished a prior art reference, Alben (RX-0142). With respect to the "clock tree driver" limitation, the applicant argued that "Alben clearly discloses that *the register array 12A is controlled by the CPU 4, and it is not controlled by a clock tree driver*, as recited by the Applicant in claim 25." JX-0012.00060, Applicant's Response at 14 (Mar. 2, 2007) (emphasis in original); *see* Markman Tr. at 62-66. Respondents argue that this prosecution history statement distinguishes the claimed clock tree driver from the "at least one processor."

Broadcom argues that Respondents' proposed construction improperly reads limitations from the specification into the claims and misreads the prosecution history. Broadcom points to permissive language in the specification, allowing that "[t]he processor 202 . . . may be adapted to execute code for the clock tree driver block 204," and "[t]he clock tree driver block 204 may comprise suitable logic and/or code." '583 patent at 4:1-4; *see* Markman Tr. at 31-32.

I agree with Broadcom that the term "at least one processor" should have its plain and ordinary meaning. Neither the specification nor the prosecution history of the '583 patent require the claimed processor to be separate from the clock tree driver and the hardware control logic block. The applicant's statement in the prosecution history faults the examiner for failing to identify a clock tree driver in Alben that controls a register array but does not clearly disclaim a clock tree driver that is implemented in software by a processor. The intrinsic record does not support the importation of Respondents' proposed limitations into the claim.

### 2. Previously Agreed Constructions

The parties previously agreed to construe "determines a status of at least one gate" in claim 17 to mean "determines for at least one gate whether said gate is ON or OFF." CIB at 35; RPHB at 49. The parties also agreed to construe "controls said at least one gate based on said determined status" in claim 17 to mean "turns said at least one gate ON or OFF depending on said determined status." CIB at 35; RPHB at 49. The parties disagree, however, regarding the application of these constructions. CIB at 36-37; RPHB at 50-51. These disputes are addressed below in the discussion of infringement for claim 17.

The parties previously agreed to construe "overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block" in claim 25 to mean "overwrites a status of OFF or ON for at least a portion of said plurality of gates which is controlled by said hardware control logic block, the previous status having been written by said hardware control logic block" CIB at 35; RPHB at 51. The parties disagree, however, regarding the application of this construction. RPHB at 51-54. This dispute is addressed below in the discussion of infringement and invalidity for claim 25.

## E. Infringement

Broadcom accuses products incorporating certain Renesas SoCs of infringing claims 17-18 and 25-26 of the '583 patent. CIB at 37. In particular, products incorporating Renesas SH7769 SoCs are accused of infringing claims 17 and 18,[5] and products incorporating Renesas

[5] The accused products incorporating Renesas SH7769 SoCs are DENSO Corp. head units installed in Toyota Lexus automobiles. CIB, Appendix 2 at 2.

R-Car Gen 2 SoCs are accused of infringing claims 25 and 26. *Id.*[6] Broadcom's infringement allegations are supported by the testimony of Dr. Bruce McNair. CX-0006C at Q/A 31-126.

### 1. Claims 17 and 18

Dr. McNair analyzed the operation of the [redacted] module in the Renesas SH7769 SoCs to offer his opinion that these products infringe claims 17 and 18 of the '583 patent. CX-0006C at Q/A 31-83.

#### a. Claim 17 preamble

There is no dispute that the SH7769 SoCs meet the limitations of the preamble of claim 17: "A system for distributing clock signals within an electronic device." Dr. McNair identifies the SH7769 User's Manual (JX-0101C), which describes the SoC or "System on a Chip." CX-0006C at Q/A 36. He further identifies a [redacted], described in the User's Manual, which [redacted] SH7769 [redacted] JX-0101C.552.

#### b. "at least one processor that determines a status of at least one gate that controls flow of a clock signal to at least one device coupled to said at least one gate"

Dr. McNair identifies the [redacted] as the alleged "at least one processor" in the SH7769 SoCs, and he reviewed source code for this processor. CX-0006C at Q/A 40. The agreed construction for "determines a status of at least one gate" is "determines for at least one gate whether said gate is ON or OFF." CIB at 35; RPHB at 49. Dr. McNair identifies a [redacted] in the SH7769 that indicates the operation state of a module: [redacted]. CX-0006C at Q/A 41. He reviewed

[6] The accused products incorporating Renesas [redacted] SoCs are Pioneer, Panasonic, and DENSO TEN head units installed in various Toyota automobiles. CIB, Appendix 2 at 2-4.

source code for the [redacted], identifying a [redacted] called [redacted] *Id.* at Q/A 42. He reviewed the SH7769 Hardware Manual showing a block diagram with a [redacted] connected to a [redacted]," with a [redacted]. *Id.* at Q/A 43. He further reviewed source code and prepared a demonstrative reflecting his understanding of the logical operation of the SH7769:

[redacted]

CDX-0004C.3. Dr. McNair identifies the [redacted]. CX-0006C at Q/A 45. He explains that [redacted] *Id.* He supports his opinion by citing testimony from Renesas witnesses describing a [redacted]. *Id.* at Q/A 46. He further identifies a portion of the SH7769 Hardware Manual describing [redacted], including [redacted] and a [redacted]. *Id.* at Q/A 47.

Respondents dispute whether Dr. McNair has shown that the SH7769 SoCs infringe this limitation, reading the claim to require that the accused register must reflect the status of the identified gate at any given time. RIB at 27-29. In particular, Respondents rely on their expert, Dr. Robert Colwell, who identifies certain [redacted] between the [redacted] that can cause the [redacted]. RIB at

27-29. Dr. Colwell explains that "the [redacted] RX-0008C at Q/A 43. In his opinion, the [redacted]. *Id.* at Q/A 44.

Respondents do not identify any support in the specification or file history, however, for importing an "any given time" requirement into this claim limitation. Dr. Colwell only offers a short, conclusory statement in support of the "any given time" requirement. RX-0008C at Q/A 41. Respondents cite several alleged admissions by Dr. McNair supporting the "any given time" requirement, but they do not explain how this testimony in supported by the intrinsic record. *See* RIB at 27-28 (citing Tr. at 168-69). The '583 patent does not recite an "any given time" requirement, and no such limitation will be read into the claims. Accordingly, the possibility that the accused [redacted] in certain circumstances does not preclude a finding of infringement of this limitation. *See Hilgraeve Corp. v. Symantec Corp.*, 265 F.3d 1336, 1343 (Fed. Cir. 2001) ("[I]n determining whether a product claim is infringed, we have held that an accused device may be found to infringe if it is reasonably capable of satisfying the claim limitations, even though it may also be capable of non-infringing modes of operation.").

Dr. McNair has shown that the [redacted], according to the source code and hardware manual for the SH7769, and this is sufficient to carry Broadcom's burden on infringement.

**c. "said at least one processor controls said at least one gate based on said determined status"**

Dr. McNair identifies the [redacted] as "writable control registers" for [redacted]. CX-0006C at Q/A 57. He cites the SH7769 hardware manual, which describes the operation of the [redacted] *Id.* (quoting JX-0101C.563). He further reviewed source code to confirm that the [redacted], explaining that [redacted] *Id.* at Q/A 58-60. In his opinion, the [redacted] based on his review of the SH7769 hardware manual, which describes a [redacted]. *Id.* at Q/A 61-62.

[redacted]

JX-0101C.1974. Dr. McNair further reviewed source code to confirm that the [redacted] is implemented as described in the manual. CX-0006C at Q/A 63-64.

Respondents argue that the [redacted]. RIB at 31-32. As Dr. McNair explained in the context of the "determines a status" limitation, however, the [redacted]. CX-0006C at Q/A 41-43.

Respondents further argue that the evidence cited by Broadcom only shows how to [redacted]. RIB at 33. The agreed construction for "controls said at least one gate based on said determined status" is "turns said at least one gate ON or OFF depending on said determined status." As Dr. Colwell explains, the [redacted] analyzed by Dr. McNair only shows how to [redacted]. RX-0008C at Q/A 56.

Dr. McNair may not have offered explicit testimony regarding the [redacted], but there is evidence in the record that the [redacted]. The hardware manual describes a [redacted] JX-0101C.1974. Dr. McNair relied on the hardware manual and witness testimony as evidence to show the [redacted] CX-0006C at Q/A 57. Although Dr. McNair did not analyze source code implementing the [redacted], the other source code in the record and the description in the hardware manual is sufficient to carry Broadcom's burden on infringement to show that processor turns the gate both ON and OFF. The Renesas SH7769 SoCs thus infringe each limitation of claim 17.

**d. Claim 18**

Dr. McNair identifies the reading of the [redacted] to meet the limitations of claim 18. CX-0006C at Q/A 69. Respondents

raise no non-infringement arguments for claim 18 that are distinct from those addressed above for claim 17. Accordingly, the SH7769 SoCs infringe claim 18.

**2. Claims 25 and 26**

Broadcom accuses four [redacted] SoC models of infringing claims 25 and 26 of the '583 patent: the [redacted]. CIB at 44-45. Dr. McNair reviewed Renesas hardware and software for these products to conclude that the [redacted] SoC is representative of all four products for the purposes of infringement. CX-0006C at Q/A 25-30.

**a. Claim 25 preamble**

There is no dispute that the [redacted] SoCs meet the limitations of the preamble of claim 25: "A system for distributing clock signals within an electronic device." Dr. McNair identifies the [redacted] hardware manual (JX-0090C), which describes the SoC or "System on a Chip." CX-0006C (McNair DWS) at Q/A 86. He further identifies a [redacted] *Id.*

**b. "a clock tree having a plurality of gates"**

Dr. McNair identifies a "clock tree" identified in the [redacted] hardware manual, including [redacted] CX-0006C at Q/A 89 (quoting JX-0090C.168). He further confirmed that each of these elements exist in the source code for the [redacted] SoCs. *Id.* at Q/A 90. Respondents do not dispute the clock tree limitation.

**c. "a hardware control logic block coupled to said clock tree that controls at least a portion of said plurality of gates"**

Dr. McNair analyzed the source code for the [redacted] SoCs to identify [redacted] that are used to [redacted]. CX-0006C at Q/A 93-94. He identifies a [redacted] in the SoCs as the claimed "hardware control logic block" that [redacted]

[redacted]. *Id.* at Q/A 96. Respondents do not dispute the hardware control logic block limitation.

**d. "at least one register that is controlled by a clock tree driver"**

Dr. McNair identifies a [redacted] in the source code for the [redacted] SoCs that is [redacted]. CX-0006C at Q/A 102. He cites references to the [redacted] in the hardware manual showing that [redacted] associated with different video decoding standards. *Id.* at Q/A 103. He further identifies a source code function that [redacted]. *Id.* at Q/A 105. Respondents only dispute this limitation under their proposed construction for "at least one processor," RIB at 40, which was rejected above.

**e. "at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block"**

Dr. McNair identifies an [redacted] in the [redacted] SoCs that [redacted] CX-0006C at Q/A 115-17. He identifies source code indicating that the [redacted] *Id.* at Q/A 118-20. In his opinion, this functionality infringes the "overwrites a status" limitation when the SoC [redacted]. *Id.* at Q/A 121.

Respondents argue that Dr. McNair has only identified a hypothetical scenario for overwriting a status and has not shown that a change in video decoding standards in the [redacted] SoCs is actually implemented by [redacted]. RIB at 37-38. According to Dr. Colwell, the [redacted]

[redacted]. RX-0008C at Q/A 103-04. At the hearing, Dr. McNair admitted that the alleged overwriting described in his witness statement would only occur when there is a change in the [redacted], and he could not identify any specific source code in the accused products where this sequence of events "actually happened." Tr. at 165-67.

Broadcom argues that it is not required to identify an instance where the claimed function is actually performed, citing *Silicon Graphics Inc. v. ATI Techs. Inc.*, where the Federal Circuit held that an apparatus claim could be infringed where "a product includes the structural means for performing a claimed function." 607 F.3d 784, 194-95 (Fed. Cir. 2010). In *Silicon Graphics*, the claim at issue required "a rasterization circuit coupled to the processor that rasterizes" primitives in a certain way and "a frame buffer coupled to the rasterization circuit for storing" certain data. *Id.* The court below had granted summary judgment of noninfringement because these functions could not be performed without an operating system (that was provided by Microsoft, a licensee to the patent), but the Federal Circuit reversed, finding that "[n]othing in the record suggests that the Microsoft Windows operating system provides anything other than a way to activate the accused product." *Id.* The Federal Circuit held that "[e]ven if the products cannot rasterize or store absent an operating system, they may include a rasterization circuit and a frame buffer for doing so." *Id.*

Respondents argue that *Silicon Graphics* is inapplicable to claim 25, citing *Nazomi Commc'ns, Inc. v. Nokia Corp.*, which held that infringement of an apparatus claim required both hardware and software capable of practicing the claimed functionality. 739 F.3d 1339, 1343-45 (Fed. Cir. 2014). In *Nazomi*, the Federal Circuit explicitly distinguished *Silicon Graphics*, narrowing the scope of that precedent to claim limitations that "contemplated that the claimed

hardware would be used in the environment of a standard operating system to perform the claimed processes." *Id.* at 1344-45. In contrast, the claims at issue in *Nazomi* included limitations that "recite specific claim functionalities that cannot be practiced in hardware alone and require enabling software." *Id.* at 1343.

The "overwrites a status" limitation of claim 25 is closer to the claim at issue in *Nazomi* than the claim at issue in *Silicon Graphics*. The accused [redacted] in the [redacted] SoCs does not merely require an operating system to perform the claimed function—both Dr. McNair and Dr. Colwell agree that software is required to implement an overwriting function. *See* Tr. at 167:2-5 (McNair: "Well, I think the example that I gave is when there's a change in [redacted]. I – that would cause this to happen. The software is certainly free to do that."); RX-0008C (Colwell RWS) at Q/A 106 ("Without any software analysis, Mr. McNair cannot show that any particular scenario is run on the hardware."). Without actually identifying software that performs the [redacted] described by Dr. McNair, Broadcom has thus failed to carry its burden to show infringement of this limitation.

Accordingly, Broadcom has not shown that the accused products infringe claim 25.

**f. Claim 26**

With respect to claim 26, Dr. McNair identifies the operation of the [redacted] in the [redacted] SoCs, explaining how this driver "asserts or de-asserts a current value of said at least one register." CX-0006C at Q/A 124-25. Respondents do not raise any separate non-infringement arguments with respect to this limitation, but the products have not been shown to infringe claim 26 because this claim depends on claim 25.

### 3. Direct and Indirect Infringement

Broadcom accuses Renesas and its customers of direct and indirect infringement of the '583 patent. CIB at 52-58. As discussed above, there is no infringement of the '583 patent by the accused Renesas [redacted] SoCs, and accordingly, there is no infringement by the Pioneer, Panasonic, and DENSO TEN head units incorporating these SoCs or the Toyota automobiles where these head units are installed. With respect to the Renesas SH7769 SoCs, Broadcom identifies Toyota [redacted] automobiles with DENSO Corp. head units incorporating the infringing SoCs. CIB, Appendix 2 at 2.

#### a. Direct Infringement

Broadcom accuses Renesas of direct infringement by making, selling, and/or importing the accused SH7769 SoCs. CIB at 52-53. Renesas has stipulated to the importation of the accused SoCs, including the SH7769. JX-0024C. Dr. McNair explains that the hardware source code he reviewed is compiled and sent to Renesas's customers as [redacted]. CX-0006C at Q/A 136-37 (citing JX-0045C (Abe Dep. Tr.) at 31-36). He further notes that while [redacted], he was not aware of any changes that would be relevant to the infringement analysis. *Id.* Renesas disputes Broadcom's allegation of direct infringement by arguing that it does not load infringing software code on its SoCs in the United States. RIB at 40; RRB at 15. That is not the relevant inquiry under section 337, however, which is concerned with the status of the articles at the time of importation, not whether software is installed after the articles are in the United States. *See Certain Electronic Devices with Image Processing Systems, Components Thereof, and Associated Software*, Inv. No. 337-TA-724, Comm'n Op. at 13-14 (Dec. 21, 2011) ("infringement, direct or indirect, must be based on the articles as imported to satisfy the requirements of section 337"). Renesas does

not dispute that it makes and sells its SoCs with the infringing software code, and Renesas has stipulated that it will not dispute Broadcom's allegations of importation and sale for importation. JX-0024C at ¶ 4. Accordingly, Renesas directly infringes claims 17 and 18 of the '583 patent at least by selling and importing the accused SH7769 SoCs.

Broadcom further accuses DENSO Corp. and Toyota of direct infringement by making, selling, and/or importing head units and automobiles incorporating the Renesas SH7769 SoCs. CIB at 56. Dr. McNair reviewed DENSO Corp. source code to confirm that the infringing software was compiled on certain DENSO Corp. products. CX-0006C at Q/A 157-66. He identifies the Toyota [redacted] as vehicles incorporating the head units with infringing SH7769 SoCs. DENSO Corp. and Toyota have stipulated to importation and do not dispute that these products incorporate the Renesas SoCs with infringing software. JX-0013C; JX-0026C; *see* RIB at 44; RRB at 18. Accordingly, DENSO Corp. and Toyota directly infringe claims 17 and 18 of the '583 patent at least by selling and importing products containing the accused SH7769 SoCs.

**b. Indirect Infringement**

Broadcom further accuses Renesas, DENSO Corp., and Toyota of indirect infringement under theories of induced and contributory infringement. CIB at 53-55, 57-58. Induced infringement requires evidence of "specific intent and action to induce infringement." *DSU Med. Corp. v. JMS Co., Ltd.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006). This intent requirement requires a showing of "knowledge that the induced acts constitute patent infringement." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011). The intent requirement for contributory infringement requires knowledge "that the combination for which [the] component was especially designed was both patented and infringing." *Id.* at 763. To satisfy this knowledge

requirement, Broadcom cites the complaint in this investigation, relying on the precedent in *Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, where the Commission held that "service of a section 337 complaint can be adequate to provide knowledge of the asserted patents" for the purpose of indirect infringement. Inv. No. 337-TA-910, Comm'n Op. at 40-43 (Oct. 30, 2015). Broadcom asserts that the service of the complaint established "knowledge of the patents and the theory of infringement," but the theory of infringement that was alleged in the complaint [redacted] in the Renesas R-Car H3/M3, R-Car H2, and R-Mobile A1 SoCs incorporated into DENSO TEN head units. *See* Complaint, Exhibit 90 ('583 patent infringement chart for Renesas components). Broadcom's infringement allegations for claims 17 and 18 are now based on the SH7769 SoC incorporated into DENSO Corp. head units, and there is no evidence in the record regarding Respondents' knowledge of this theory of infringement as now set forth by Dr. McNair.[7] Accordingly, Broadcom has failed to carry its burden with respect to indirect infringement.

**F. Domestic Industry**

Broadcom relies on its [redacted] to satisfy the domestic industry requirement of section 337. CIB at 58-65, Appendix 3. Dr. McNair analyzed these products in view of claims 25 and 26 of the '583 patent. CX-0006C at Q/A 174-209. He performed a detailed analysis of the [redacted], and there is no dispute that this product is representative of the other asserted Broadcom domestic industry products. *Id.* at Q/A 177-80.

[7] Dr. McNair's witness statement does not address indirect infringement, and Broadcom's pre-hearing brief failed to allege knowledge and intent when discussing indirect infringement of the '583 patent. CPHB at 112-23.

**1. Claim 25 Preamble**

There is no dispute that the Broadcom domestic industry products meet the limitations of the preamble of claim 25. Dr. McNair identifies the [redacted]. CX-0006C (McNair DWS) at Q/A 181.

**2. "a clock tree having a plurality of gates"**

Dr. McNair identifies a [redacted]. CX-0006C at Q/A 183-84 (citing CX-0578C; CPX-0047C). Respondents do not dispute the clock tree limitation.

**3. "a hardware control logic block coupled to said clock tree that controls at least a portion of said plurality of gates"**

Dr. McNair identifies [redacted]. CX-0006C at Q/A 186-91. He explains that there is a [redacted] *Id.* Respondents do not dispute the hardware control logic block limitation.

**4. "at least one register that is controlled by a clock tree driver"**

Dr. McNair identifies [redacted] CX-0006C at Q/A 194-96. Respondents dispute this limitation under their proposed construction for "at least one processor," RIB at 50, which was rejected above. Respondents also argue that the software [redacted] identified by Broadcom is not contained in Broadcom's identified domestic industry products but instead [redacted]

[redacted]. RIB at 50-51. Respondents' expert, Dr. Steven Przybylski, explains that the [redacted]. RX-0014C at Q/A 20 (citing RX-0337C.22 [redacted]. In particular, Respondents argue that [redacted] cited by Dr. McNair [redacted] RIB at 51.

Broadcom does not dispute that the claimed [redacted] CIB at 62. Both parties cite *Certain Mobile Devices, Associated Software, and Components Thereof* ("*Mobile Devices*"), where an administrative law judge considered the domestic industry requirement in the context of Microsoft software provided for use on mobile devices, reaching different conclusions for different asserted patents. Inv. No. 337-TA-744, Initial Determination at 196-206 (Dec. 20, 2011), *not reviewed in relevant part by* Comm'n Op. (May 18, 2012). In *Mobile Devices*, the administrative law judge found that Microsoft could rely on its domestic industry expenditures in developing operating systems for third-party mobile phones because the operating systems were "specifically tailored to meet the specifications and demands of each mobile device," which requires a "significant" amount of work, including "close collaboration with mobile device manufacturers" and "additional support after the operating system has been loaded on to the mobile devices." *Id.* at 198-99. With respect to one asserted patent, however, the administrative law judge found that the technical prong of the domestic industry requirement was not satisfied where Microsoft "failed to actually provide any evidence regarding the software actually on the phones it identified . . . ." *Id.* at 203. Microsoft relied on "example code" provided to its customers but its expert did not "conduct[]

any examination or analysis of the third-party software that is necessary to implement the claimed invention or in any way confirm[] how the devices it relies on actually operate." *Id.* at 204-05. The administrative law judge found that this record only established "a hypothetical device," which is not sufficient to meet the technical prong. *Id.* at 205-06. The Commission affirmed the initial determination in relevant part, and the Federal Circuit addressed this issue on appeal, affirming the determination that there was "insufficient proof that the '762 patent covers the articles on which Microsoft relied to prove a domestic industry." *Microsoft Corp. v. Int'l Trade Comm'n, et al*, 731 F.3d 1354, 1363-64 (Fed. Cir. 2013).

Broadcom argues that it has a relationship with its customers that is similar to Microsoft's in *Mobile Devices*, citing the testimony of its engineer, Timothy Hellman, who explained that

[redacted]. CX-0003C at Q/A 54-60. [redacted]

[redacted] Tr. at 805. [redacted]

The gaps in the record here are similar to the problems identified in *Mobile Devices*, where the failure to identify any customer phones running the software at issue was fatal to Microsoft's domestic industry arguments. *See Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d

at 1363 ("[A] witness testifying as Microsoft's representative under Fed.R.Civ.P. 30(b)(6) could not identify a single third-party mobile-device manufacturer that implemented Microsoft's example driver-layer code.").[8] [redacted]. This is insufficient to satisfy the domestic industry requirement, however, which requires that a complainant's investments "relate to actual 'articles protected by the patent.'" *Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d at 1361-62 (quoting 19 U.S.C. § 1337(a)(2), (3)). Broadcom has failed to identify any actual articles practicing the "clock tree driver" limitation of claim 25 and has thus failed to satisfy the technical prong of the domestic industry requirement for this claim.

**5. "at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block"**

[redacted]. CX-0006C at Q/A 201. [redacted]

[8] For other asserted patents in *Mobile Devices* where Microsoft was found to have satisfied the domestic industry requirement, Microsoft had been able to identify specific mobile phones running the Microsoft software. Inv. No. 337-TA-744, ID at 201 ("The ALJ finds that Microsoft has shown that mobile devices running Windows Mobile 6.5, such as the LG Fathom, practice claim 1 of the '133 patent.").

[redacted] *Id.* at Q/A 203.

Respondents dispute the practice of this limitation, arguing that the claim requires overwriting the status of the same gate that was previously written. RIB at 45-49. According to the analysis of Respondents' expert, Dr. Steven Przybylski, [redacted]. RX-0014C at Q/A 30. [redacted] *Id.* at Q/A 31. Dr. Przybylski states that "[i]t is clear from the specification of the '583 patent that if an upstream gate is off, that does not impact the status of a downstream gate, i.e., whether there is an active clock coming into a downstream gate is not a status of the downstream gate." *Id.* There is no citation to any portion of the '583 patent specification in Dr. Przybylski's witness statement, however, and Respondents do not cite any intrinsic evidence in support of their interpretation of this claim language. *See* RIB at 45-49; RRB at 19-22.

Respondents do not appear to dispute that Dr. McNair [redacted]. *See* CRB at 22-24. According to the plain language of the claim, this operation "overwrites a status," and Respondents have not shown that any additional limitations must be satisfied. Accordingly, Broadcom's [redacted].

As discussed above, however, Broadcom has not identified [redacted] and accordingly, the technical prong of the domestic industry requirement is not satisfied for claim 25.

### 6. Claim 26

Dr. McNair identifies the [redacted] CX-0006C at Q/A 208. There is no dispute with respect to this limitation, but because no domestic industry products have not been shown to practice claim 25, there are no domestic industry products that practice claim 26.

## G. Invalidity

Respondents contend that claims 25 and 26 of the '583 patent are anticipated by U.S. Patent No. 6,938,176 to Alben *et al.* (RX-0142, "Alben"). RIB at 52-57. Respondents further contend that claims 17 and 18 are rendered obvious in view of U.S. Patent No. 5,764,968 to Ninomiya (RX-0106, "Ninomiya") and U.S. Patent No. 6,593,929 to Van Hook *et al.* (RX-0160, "Van Hook"). RIB at 57-68.[9]

### 1. Anticipation (Claims 25 and 26)

Respondents rely on the testimony of Dr. Colwell to support their contention that claims 25 and 26 are anticipated by Alben. RX-0003C at Q/A 101-31. Alben was cited and discussed during prosecution of the '583 patent, but Respondents argue that the examiner misinterpreted several limitations, which have been construed more broadly in the context of the present investigation. RIB at 52-53. Broadcom submits that the examiner correctly issued claims 25 and 26 over Alben, relying on the rebuttal testimony of Dr. McNair. CX-0012C at Q/A 59-93.

[9] On November 8, 2019, Renesas filed a corrected unopposed motion for judicial notice of USPTO decisions granting institution of *inter partes* reviews of the '583 patent and '752 patent (Motion Docket No. 1119-054), which is hereby GRANTED. The USPTO instituted an *inter partes* review of the '583 patent in view of Alben, Ninomiya, Van Hook, and other references. USPTO PTAB Case No. IPR2019-01039, Granting Institution (Nov. 6, 2019).

**a. Claim 25 preamble**

There is no dispute that Alben anticipates the preamble of claim 25, as Alben discloses PLL clock generators for distributing clock signals to several subsystems. RX-0142, Fig. 1; *see* RX-0003C (Colwell DWS) at Q/A 109.

**b. "a clock tree having a plurality of gates"**

Alben explicitly describes a "device clock tree," with gates at "the root of the tree" and "each branch of the tree." RX-0142 at 6:41-46. Alben further depicts a clock tree in Figure 1, and there is no dispute that the "clock tree" limitation of claim 25 is anticipated. *See* RX-0003C (Colwell DWS) at Q/A 110-11.

**c. "a hardware control logic block coupled to said clock tree that controls at least a portion of said plurality of gates"**

Alben discloses a "control unit" that is coupled to the clock tree described above, which controls the flow of clock signals to several gates described in the specification and depicted in Figure 1. RX-0142 at 5:1-29, Fig. 1; *see* RX-0003C (Colwell DWS) at Q/A 112-13. There is no dispute that Alben anticipates the "hardware control logic block" limitation of claim 25.

**d. "at least one register that is controlled by a clock tree driver"**

For the "at least one register" of claim 25, Respondents identify register 12A, which is described in the specification of Alben: "in a class of embodiments, register array 12A of control unit 12 . . . includes a two-bit host register . . . for each of subsystems 16, 18, 20, and 22." RX-0142 at 7:56-60. Alben further discloses that "[s]ystem software can write a two-bit word to each "PM_SYBSYSTEM_CONTROL" register to indicate the power management mode for the corresponding subsystem." RX-0142 at 7:60-63. Dr. Colwell explains that register 12A is a host register written by host slave unit 15 in accordance with instructions issued from CPU 4. RX-0003C at Q/A 119. Under Broadcom's construction for the "at least one processor limitation,"

adopted above, Dr. Colwell submits that the claimed "clock tree driver" is embodied in Alben's "system software" running on CPU 4. *Id.* at Q/A 122. Broadcom does not dispute that Alben's register 12A anticipates the "at least one register" limitation.

**e. "at least one processor that overwrites a status of at least a portion of said plurality of gates which is controlled by said hardware control logic block"**

For the "at least one processor" limitation of claim 25, Respondents identify Alben's CPU 4, which includes "system software" that "intervenes . . . in cases in which the device does not have sufficient information to seek the most appropriate power state, and in cases in which a user wishes to override the automatic mechanisms." RX-0142 at 2:52-58. Dr. Colwell explains that Alben's CPU is a processor that selects a power management mode and can then overwrite the previously written status. RX-0003C at Q/A 127-30. For example, Dr. Colwell cites portions of Alben's specification describing a change of the mode of control unit 12 to either FULLPOWER or SUSPENDED. *Id.* at Q/A 128 (citing Alben at 7:52-8:24). He further cites embodiments where the CPU places control unit 12 in AUTOMATIC mode, turning a clock gate OFF to conserve battery, followed by a change to FULLPOWER mode that overwrites a status to force the clock gate ON. *Id.* at Q/A 129 (citing Alben at 2:48-3:11, 8:15-22). He cites another embodiment where the clock gate is ON in AUTOMATIC mode but a change to SUSPENDED mode overwrites a status to force the clock gate OFF. *Id.* at Q/A 130 (citing Alben at 3:11-16, 8:26-36).

Broadcom argues that Respondents are making the same arguments regarding Alben that were addressed during the prosecution of the '583 patent. CIB at 70-74. When the examiner cited Alben during prosecution, Broadcom argued that the examiner was relying on Alben's "control unit 12" as both the "at least one processor" and the "control logic block" of claim 25.

JX-0012.61, Reply to Office Action at 15 (Mar. 2, 2007). The examiner found Broadcom's arguments to be "persuasive" and the patent subsequently issued. *Id.* at .75, Office Action at 7 (May 10, 2007). Broadcom argues that Respondents' identification of CPU 4 as the "at least one processor" fails to overcome the issue that was addressed during prosecution, because any alleged overwriting is still performed by the control unit 12. CIB at 72-74. According to Dr. McNair, Alben's CPU 4 can only affect the status of a gate through the registers of control unit 12. CX-0012C at Q/A 79-80.

Respondents argue that Alben's CPU 4 was not identified as the "at least one processor" during prosecution and accordingly this argument was not previously considered by the USPTO. RRB at 25. In addition, Respondents argue that the agreed construction for this limitation does not preclude a processor that uses the hardware control logic block for overwriting. *Id.* at 25-26. The agreed construction only requires that the processor "overwrites a status of OFF or ON for at least a portion of said plurality of gates which is controlled by said hardware control logic block, the previous status having been written by said hardware control logic block." RIB at 55-56.

Although it is not explicitly required by the parties' agreed construction, I agree with Broadcom that the plain language of the claims and the specification of the '583 patent are consistent with a requirement that the claimed overwriting by the processor is not performed by the hardware control logic block. *See* CIB at 72-74. The term "overwrites" connotes an action that overrules or overrides the control of the gates by the hardware control logic block. This is consistent with the specification, which describes the operation of the processor as one where "the processor may intercede . . . ." '583 patent at 5:8-13. The specification consistently describes a distinct path for the processor and clock tree driver to control the gates, separate from the hardware control logic block. *Id.* at 5:3-13, Fig. 3. A change in gate status that uses the

same hardware control logic block cannot satisfy the overwriting limitation, and accordingly, Alben does not anticipate claim 25.

**f. Claim 26**

There is no separate dispute with respect to the limitations of claim 26, but because Alben does not anticipate claim 25, it also does not anticipate claim 26.

**2. Obviousness (Claims 17 and 18)**

Respondents rely on the testimony of Dr. Colwell to support their contention that claims 17 and 18 are obvious over Ninomiya in view of Van Hook. RX-0003C at Q/A 40-64. Ninomiya is a patent for a computer clock system that issued in June 1998. RX-0106. Van Hook is a patent for a video game system that issued in July 2003. RX-0160.

**a. Claim 17 preamble**

There is no dispute that Ninomiya discloses a system for distributing clock signals in accordance with the preamble of claim 17. *See* RX-0003C (Colwell DWS) at Q/A 48.

**b. "at least one processor that determines a status of at least one gate that controls flow of a clock signal to at least one device coupled to said at least one gate"**

Dr. Colwell identifies "at least one processor" in CPU 11 of Ninomiya, citing descriptions of the CPU writing clock drive control information into clock drive control register 122. RX-0003C at Q/A 50 (citing RX-0106 at 4:57-67, Fig. 1). Ninomiya further discloses that control register 135 "can be read/write-accessed by the CPU 11" and "[t]herefore, clock supply can be controlled in units of banks by the information programmed in the clock drive control register 135." RX-0106 at 9:50-59. Dr. Colwell explains that CPU 11 can thus "write to clock drive control register 135 to turn ON or OFF clock gates that provide clock signals to memory devices." RX-0003C at Q/A 51.

Respondents concede that Ninomiya does not disclose CPU 11 reading from the clock drive registers to "determine a status of at least one gate" but contend that this limitation is obvious in view of Van Hook. RIB at 61-62. Dr. Colwell identifies a register in Van Hook that is read by a processor to determine whether another processor has been halted. RX-0003C at Q/A 53 (citing RX-0160, Fig. 7J). Dr. Colwell explains that this determination is related to a clock signal. *Id.* at Q/A 54. He offers his opinion that one of ordinary skill would have combined the clock drive control of Ninomiya with the status reading functionality of Van Hook because "determining a gate status before writing to a register would save Ninomiya's CPU 11 from having to write to a register that already had the value that CPU 11 sought to write, thereby preventing unnecessary writes to the control registers." *Id.* at Q/A 55. He identifies evidence that control register writes using the processor in Ninomiya would be slow because of serialization and submits that one of ordinary skill would have been motivated to reduce unnecessary writes. *Id.* at Q/A 56-59.

Broadcom argues that Respondents have failed to carry their burden to show a motivation to combine Ninomiya with Van Hook. CIB at 66-68. Dr. McNair's rebuttal testimony criticizes Dr. Colwell's suggested combination, explaining that adding the additional read step would be counter to Ninomiya's explicit goal of reducing "wasteful power consumption." CX-0012C at Q/A 35 (citing RX-0106, Abstract). The motivation to avoid unnecessary writes is not disclosed in Ninomiya or any prior art cited by Respondents, and Dr. Colwell conceded on cross-examination that Ninomiya does not disclose any need for an additional read of the gate status. Tr. at 592-93.

I agree with Broadcom that Dr. Colwell's purported motivation to combine Ninomiya with Van Hook appears to be constructed in hindsight, using the status determination step of the

'583 patent to guide his opinions rather than the disclosures in the prior art. *See Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008) ("In other words, Mylan's expert, Dr. Anderson, simply retraced the path of the inventor with hindsight, discounted the number and complexity of the alternatives, and concluded that the invention [] was obvious. Of course, this reasoning is always inappropriate for an obviousness test . . . ."). The motivation to combine identified by Dr. Colwell—reducing unnecessary writes—is not discussed in Ninomiya or any other reference that he identifies. Even if Dr. Colwell had identified some evidence to support his suggested motivation, he does not does not explain why adding an additional read step would have been the appropriate choice for modifying Ninomiya—As Dr. McNair explains, this particular modification would be contrary to the explicitly stated goal of reducing power consumption. For these reasons, Dr. Colwell's opinions fail to meet Respondents' burden to prove obviousness of this limitation.

**c. "said at least one processor controls said at least one gate based on said determined status"**

Dr. Colwell relies on the same combination of Ninomiya with Van Hook to render obvious the limitation requiring that the processor control the gate "based on said determined status." RX-0003C at Q/A 62-63. For the reasons discussed above, Respondents have failed to meet their burden on obviousness for this combination.

**d. Claim 18**

Dr. Colwell identifies a disclosure in Ninomiya that meets the limitation of claim 18 requiring that the processor determine whether a device is active or inactive. RX-0003C at Q/A 64. There is no dispute with respect to this limitation, but Respondents have failed to show that claim 18 is invalid because it depends on claim 17.

### e. Secondary Considerations of Non-Obviousness

Broadcom argues that secondary considerations of non-obviousness in commercial success and licensing further support the finding that claims 17 and 18 of the '583 patent are not obvious. CIB at 75; CRB at 30. Broadcom offers no evidence of nexus between the claims at issue and the asserted secondary considerations, however. Broadcom relies on the commercial success of its [redacted]. *See* CX-0006C (McNair DWS) at Q/A 174-209 (only offering opinions that Broadcom products practice claims 25 and 26 of the '583 patent). In addition, [redacted]. Accordingly, none of the secondary considerations identified by Broadcom affect the obviousness analysis for the '583 patent.

## VI. THE '752 PATENT

### A. Background and Specification

The '752 patent is entitled "Systems, Methods, and Apparatus for Pixel Fetch Request Interface" and issued March 31, 2009. '752 patent (JX-0005), cover. The specification of the '752 patent notes that conventional memory, such as dynamic random access memory (DRAM), is designed to allow for easy access to consecutive memory locations. *Id.* at 1:24-58. Certain

applications may not tend to access memory consecutively, however, such as video encoding and decoding. *Id.* at 1:59-2:4. The invention described in the '752 patent is embodied in a memory access unit (MAU), which is an interface between clients requesting access to data in memory and a memory controller that controls access to the memory. *Id.* at 3:13-19. In one embodiment, the MAU comprises a queue for access requests and logic for generating lists of addresses from the requests and reordering the lists of addresses to optimize access to the memory. *Id.* at 3:20-34. For video decoding, the specification explains that the MAU can "relieve the internal video decoding modules . . . from the burden of knowing the detail of the memory pixel data arrangement and access protocol." *Id.* at 6:16:20.

### B. Level of Ordinary Skill in the Art

Broadcom has proposed that one of ordinary skill in the art for the '752 patent would have had a Bachelor's Degree in Electrical Engineering, Computer Science, or a similar discipline, with one to two years of experience in this or a related field, including familiarity with memory access and digital video processing. CX-0009C (Wolf DWS) at Q/A 21. Respondents agree with Broadcom's proposal but submit that one of ordinary skill in the art should have two years of experience with memory access and digital video processing. *Id.* at Q/A 22. Both Broadcom's expert, Dr. Marilyn Wolf, and Respondents' expert, Dr. Vivek Subramanian, submit that the difference between the parties' proposals are minor and would have no impact on their opinions. *Id.* at Q/A 23; RX-0005C (Subramanian DWS) at Q/A 37. For the purposes of this initial determination, I adopt Broadcom's proposed level of ordinary skill in the art, without the specific experience requirements proposed by Respondents.

### C. Asserted Claims

Broadcom asserts infringement of claims 1, 2, 5, 7, and 8 of the '752 patent, and further asserts claims 4 and 6 for domestic industry. CIB at 79, 95. Claim 1 is the only asserted independent claim, reciting:

> 1. A memory access unit for accessing data for a module, said memory access unit comprising:
>
> an output port for providing access requests for lists of addresses in a memory over a link to a memory controller; and
>
> a queue for queuing the access requests for the lists of addresses.

'752 patent at 8:61-67. Claim 2 depends from claim 1, reciting:

> 2. The memory access unit of claim 1, further comprising:
>
> an input port for receiving requests for blocks of pixels from a motion prediction processing unit; and
>
> logic for generating the lists of addresses from the requests for blocks of pixels, wherein the lists of addresses correspond to addresses in a memory that store pixels in the blocks of pixels.

*Id.* at 9:1-7. Claim 4 depends from claim 2, adding a limitation "wherein the logic generates the access requests based on the list of addresses and based on row-bank accesses needed to access the addresses." *Id.* at 9:13-16. Claim 5 also depends from claim 2, adding a limitation "wherein the logic generates the access requests based on the list of addresses and based on sizes of each of the requests for blocks of pixels from the motion prediction processing unit." *Id.* at 9:17-20. Claim 6 depends from claim 1, adding a limitation "wherein the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over a bus shared with one or more clients." *Id.* at 9:21-24. Claim 7 also depends from claim 1, adding a limitation "wherein the addresses are non-contiguous." *Id.* at 9:25-26. Claim 8 also depends from claim 1, adding a limitation "wherein the memory access unit receives data stored at the

addresses in the memory from the lists of addresses in the memory over said link." *Id.* at 9:27-30.

### D. Claim Construction

The parties disputed the construction of two phrases from claim 1 at the *Markman* hearing: "access requests for lists of addresses in a memory" and "a link to a memory controller."

#### 1. "access requests for lists of addresses in a memory"

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "access requests for lists of addresses in a memory" | memory access requests for data stored in memory at one or more addresses | memory access requests, each of which is a request that includes a list of multiple memory addresses |

The parties dispute the construction of the phrase "access requests for lists of addresses in a memory." Both Broadcom and Respondents purport to rely on the plain and ordinary meaning of this claim language, but they dispute whether the "lists of addresses" must comprise multiple memory addresses. CIB at 76-78; CRB at 30-32; CMIB at 14-15; CMRB at 6-7; RRB at 28-30; RMIB at 14-15; RMRB at 6-7.

The parties dispute whether the plain and ordinary meaning of the term "lists of addresses" requires more than one address. Respondents argue that the claim language recites plural "lists" and plural "addresses," which should require more than one address in a list. RMIB at 14. Broadcom contends that the plain and ordinary meaning of "lists" only requires one or more items and identifies the specification's use of the plural "addresses" to refer to "one or more DRAM word addresses." *Id.* at 7:36-40. *See* CMIB at 15 n.5. In *Yodlee, Inc. v. Plaid Techs., Inc.*, the U.S. District Court for the District of Delaware addressed very similar claim language, finding that a "list of addresses" could comprise only one address, holding that "a 'list'

is not limited to sets including multiple elements, but rather refers to the set of elements associated with the topic of the list, which may be just one." C.A. No. 14-1445-LPS, 2016 WL 204372, *6-*7 (D.Del. Jan. 15, 2016). At hearing, Respondents' expert, Dr. Subramanian, admitted that the plain and ordinary meaning of "lists of addresses" could include lists with only one address. Tr. at 604-05. I thus agree with Broadcom that the plain and ordinary meaning of the term "lists of addresses" includes lists of one (or more) addresses.

Respondents contend that the specification of the '752 patent only provides examples of lists containing multiple addresses, discussing the problem in the prior art as one of addressing non-consecutive memory locations. *See, e.g.,* '752 patent at 1:59-2:4, 2:63-67, 3:49-52, 5:20-23, 6:50-52. Although I agree with Respondents that the specification is consistent with "lists of addresses" containing multiple addresses,[10] the Federal Circuit has held that is "not enough that the only embodiments, or all of the embodiments, contain a particular limitation." *Thorner v. Sony Computer Entm't America LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012). In *Phillips*, the court recognized consistent precedent that "expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment." 415 F.3d at 1323. In *Thorner*, the Federal Circuit held that the plain and ordinary meaning of a claim term controls unless the patentee acts as his own lexicographer or there is a disavowal of claim scope. 669 F.3d at 1365. Respondents identify consistent disclosures of lists with multiple addresses in the specification but fail to identify an explicit

[10] Broadcom purports to identify examples in the specification where single addresses are referenced: "the memory controller 110 provides data from the memory that is stored at the address requested," *id.* at 3:7-10, and "streaming of DRAM word address requests." *Id.* at 6:45-46. *See* CMIB at 15; *Markman* Tr. at 75. The examples cited by Broadcom are merely incidental references to single addresses, however—none of these examples identifies an embodiment where the claimed list only comprises a single address. *See Markman* Tr. at 82-83.

definition for "lists" of addresses or any disclaimer of lists with a single address. There is no evidence that the term "lists of addresses" has a special meaning in the context of this patent or in the field of computer memory or digital video processing. Accordingly, the plain and ordinary meaning controls, and the claimed "lists" may contain one or more addresses.

The other claims of the '752 patent are consistent with the plain and ordinary meaning for this term. Respondents cite the references to a singular "list" of plural "addresses" in claims 3, 4, and 5 to argue that each list must have plural addresses. RMIB at 14. But as discussed above, the ordinary meaning of "list of addresses" includes a list with only one address. Respondents further argue that claim 3 requires that certain addresses be removed from the list while others remain, which would require more than one address in the list. RMIB at 15. Dependent claims are typically narrower in scope than the claims from which they depend, however—the fact that claim 3 requires more than one address does not restrict claim 1 to the same scope. Similarly, the addition of a "non-contiguous" limitation in claim 7 suggests that claim 1 is not limited to the non-contiguous embodiments described in the specification. Claims 9 and 10 refer to "at least one address from the lists of addresses," which is consistent with the ordinary meaning of "lists of addresses" requiring at least one address.

For the reasons discussed above, I agree with Broadcom that the ordinary meaning of the term "access requests for lists of addresses in a memory" only requires one or more addresses in a list. Broadcom's proposed language explicating this ordinary meaning is problematic, however, because it reads out the requirement for "lists." Accordingly, this term shall be

construed to mean memory access requests for data stored in memory, wherein each request includes a list with at least one memory address.[11]

### 2. "a link to a memory controller"

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "a link to a memory controller" | a connection to a memory controller | a non-shared bus from the memory access unit to a memory controller |

The parties dispute the construction of the phrase "a link to a memory controller." Respondents seek to limit the claimed link to a non-shared bus, while Broadcom submits that no such construction is necessary. CRB at 32-34; CMIB at 16-19; CMRB at 8-9; RIB at 70-73; RRB at 30-31; RMIB at 15-18; RMRB at 7-9.

Respondents argue that the specification of the '752 patent only depicts a link between the memory access unit and memory controller that is a non-shared bus, identified as link 112.

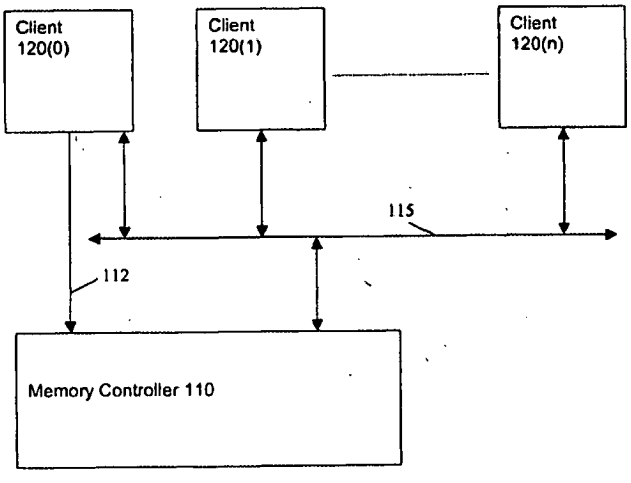


**FIGURE 1**

[11] In Respondents' post-hearing brief, they argue that the ordinary meaning for "list" requires a structure that is capable of enumerating more than one item. RIB at 70. This argument is addressed *infra* in the context of infringement.

'752 patent, Fig. 1. The specification states that "[t]he link 112 can comprise, for example, but not limited to, a point-to-point link, or another bus." *Id.* at 3:1-2. Respondents argue that the link 112 is distinct from the shared bus 115, which is used by multiple clients. This link is described in contrast to a shared bus in the embodiment depicted in Figures 2 and 3. *See Id.* at 3:41-43 ("[T]he memory access unit 200 can receive the data requests over a shared bus, in contrast to the request link for transmitting the requests to the memory controller."), 3:47-55 ("The memory controller 300 comprises a port 305 for receiving access requests for lists of addresses in a memory over a link from a particular client, e.g., memory access unit 200. The memory controller 300 also includes other port(s) 310 for receiving requests for accessing the memory over a shared bus from one or more other clients."). In Figures 6 and 7, the link is labeled PFRI for "pixel fetch request interface," which is described as a "point-to-point link." *Id.* at 6:23-24.

Broadcom identifies a statement in the last paragraph of the specification that describes another option for the PFRI, however. CMIB at 17-18. This paragraph describes "modifications . . . to adapt a particular situation or material to the teachings of the present invention without departing from its scope." '752 patent at 8:42-44. With respect to the PFRI, the specification states that "the PFRI can be designed to support multiple requesters, e.g., memory access units MAU, by sharing the PFRI interface and preferably including multiple queues inside the memory controller." *Id.* at 8:47-50. Respondents attempt to reconcile this embodiment with their proposed construction by arguing that a group of memory access units can be considered one memory access unit, RMRB at 8, *Markman* Tr. at 86, but this defies the language of the proposed construction, which requires a "non-shared bus." The central premise of Respondents' argument thus fails—the specification is not limited to "links" between a memory access unit

and a memory controller that are "non-shared." Instead, the specification places no strict requirements on links, allowing that "[t]he link 112 can comprise, for example, but not limited to, a point-to-point link, or another bus." '752 patent at 3:1-2.

The prosecution history of the '752 patent further confirms that the claimed link is not limited to a "non-shared bus." In the first office action during prosecution, the examiner cited prior art that disclosed a shared bus to anticipate the claimed link. JX-0009.00051, Office Action at 2 (Mar. 24, 2008) (citing U.S. Patent Application Publication 2003/0106053); *see* CMIB at 18-19. In response, the applicant added a requirement for a "direct link" in application claims 5 and 12 (which later issued as claim 11) but did not amend the "link" limitation of claim 1, instead adding a new limitation requiring a queue. JX-0009.00096-98, Amendment and Response (June 24, 2008); *see* CMIB at 19. The examiner thus read the "link" limitation to include a shared bus, and the applicant did not contest this interpretation of the claims. The link limitation of claim 11 was narrowed to a "direct link," which implies that the link limitation of claim 1 remains broad.

For the reasons discussed above, I find that Broadcom's proposed construction is more consistent with the claims, specification, and file history, and accordingly, "a link to a memory controller" is construed to have its plain and ordinary meaning, which is a connection to a memory controller.

**E. Infringement**

Broadcom accuses products incorporating certain Renesas SoCs of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 78-79. In particular, products incorporating Renesas [redacted] SoCs are accused of infringing each asserted claim. *Id.* The accused Renesas SoCs are incorporated into Panasonic, Pioneer, and DENSO TEN head

units that are installed in all of the accused Toyota vehicles. Broadcom's infringement allegations are supported by the testimony of Dr. Marilyn Wolf. CX-0009C at Q/A 28-198.

Dr. Wolf offers separate infringement opinions for each group of Renesas SoCs. The accused [redacted] products are the [redacted]. CIB at 78 n.10. Dr. Wolf analyzed the [redacted] as a representative product for all of the [redacted] products. CX-0009C at Q/A 30-32. She found similarities between the [redacted] products and the [redacted] products but provided a separate limitation-by-limitation analysis. *Id.* at Q/A 79-84. She also found similarities between the [redacted] products and the other accused products and provided a separate limitation-by-limitation analysis. *Id.* at Q/A 123-27.

**1. [redacted] products**

Broadcom accuses the [redacted] products of infringing claims 1, 2, 5, 7, and 8 of the '752 patent, relying on a limitation-by-limitation analysis performed by Dr. Wolf. CX-0009C at Q/A 36-78.

**a. Claim 1 Preamble**

Dr. Wolf identifies a controller called the [redacted] in the [redacted] products as the claimed memory access unit, citing the specification for the [redacted]. CX-0009C at Q/A 41 (citing CX-0510C). She further cites testimony from Renesas witness Katsushige Matsubara, who explained how the [redacted]. *Id.* (citing JX-0055C at 72-82). There is no dispute with respect to the preamble of claim 1.

**b. "an output port for providing access requests for lists of addresses in a memory"**

Dr. Wolf identifies [redacted]. CX-0009C at Q/A 46 (citing, *e.g.*, CX-0512C at 2-6, CX-0514C at 10-12). She cites

Renesas documentation, deposition testimony, and source code to support her description of these [redacted]. *Id.* at Q/A 46-47. In her opinion, the [redacted] are "access requests for lists of addresses in a memory." *Id.* at Q/A 48.

There is no dispute with respect to the operation of the accused products, but Respondents argue that this limitation is not infringed. RIB at 73-77. In the opinion of Respondents' expert, Dr. Vivek Subramanian, [redacted] RX-0018C at Q/A 18-37. Although this opinion primarily relies upon Respondents' proposed construction for "lists of addresses," which was rejected above, Dr. Subramanian also testifies that his understanding of the plain and ordinary meaning of "list" is "something that can hold multiple entries." *Id.* at Q/A 39. Under this reading of the claim language, Dr. Subramanian does not believe the accused products infringe because [redacted] *Id.* at Q/A 40.

Although Dr. Subramanian offers some reasoning to support his interpretation of the term "list," his opinion is not supported by any evidence that is tied to the patent—only by analogy to a "grocery list." RX-0018C at Q/A 39. The word "list" is not a technical term or a special term of art where expert opinion would carry significant weight. *See Phillips*, 415 F.3d at 1318 ("[E]xtrinsic evidence in the form of expert testimony can be useful to a court . . . to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular

meaning in the pertinent field."). On this record, I thus decline to adopt any additional requirement into this limitation that requires the capability for multiple addresses.[12]

Accordingly, I find that the [redacted] of the [redacted] products infringe the limitation requiring "access requests for lists of addresses in a memory" by [redacted]

**c. "over a link to a memory controller"**

Dr. Wolf identifies the [redacted] between the [redacted] in the [redacted] products as the infringing "link to a memory controller." CX-0009C at Q/A 51. She explains that memory access requests are provided [redacted] *Id.* She cites Renesas deposition testimony, documents and source code in support of her opinion. *Id.* at Q/A 53-56. She concludes from these documents that [redacted] *Id.* at Q/A 55.

Respondents only dispute this limitation under their proposed construction for "a link to a memory controller," which was rejected above. RIB at 78-81; RRB at 30-31. Accordingly, the [redacted] products infringe this limitation.

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[12] Because the record is undeveloped with respect to Respondents' proposed requirement that a list be "capable" of holding multiple addresses, it is not clear whether the accused products would infringe even under Dr. Subramanian's reading of the term "list." Broadcom argues that the [redacted]. *See* CPHB at 174-75; CX-0009C (Wolf DWS) at Q/A 49-60. Although I agree with Respondents that Broadcom's argument would fail under a claim construction that literally requires multiple addresses in a list, *see* RRB at 32, [redacted]

**d. "a queue for queuing the access requests for the lists of addresses"**

Dr. Wolf identifies the [redacted] as the infringing "queue for queuing the access requests." CX-0009C at Q/A 59. She cites Renesas deposition testimony, documents and source code in support of her opinion, concluding that [redacted] *Id.* at Q/A 61. Respondents do not dispute infringement of this limitation.

For the reasons discussed above, the [redacted] products thus infringe each limitation of claim 1 of the '752 patent.

**e. Claim 2**

With respect to claim 2, Dr. Wolf identifies the [redacted] in the [redacted] products that [redacted]. CX-0009C at Q/A 66-67. Dr. Wolf further identifies hardware code for the [redacted] products that [redacted]. *Id.* at Q/A 68-69. These opinions are supported by Renesas deposition testimony, documents and source code. *See, e.g.,* JX-0055C (Matsubara Dep. Tr.) at 72-75, 80; CX-0512C ([redacted] Specification) at 2-6; JX-0093C ([redacted] Specification) at 7-17. Respondents do not separately dispute infringement of these limitations.

Accordingly, the [redacted] products infringe claim 2 of the '752 patent.

**f. Claim 5**

With respect to claim 5, Dr. Wolf cites Renesas deposition testimony, documents and source code showing that the [redacted]

[redacted]. CX-0009C at Q/A 72 (citing, *inter alia*, JX-0055C (Matsubara Dep. Tr.) at 72-75, 79-80; CX-0512C ([redacted] Specification) at 2-6; JX-0093C [redacted] Specification) at 7-17). She explains that these requests from the [redacted] meet the limitations of claim 5 because they [redacted]. *Id.* Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 5 of the '752 patent.

**g. Claim 7**

With respect to claim 7, Dr. Wolf identifies hardware code for the [redacted] products that include [redacted]. CX-0009C at Q/A 75. Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 7 of the '752 patent.

**h. Claim 8**

With respect to claim 8, Dr. Wolf cites Renesas documents and source code showing that the [redacted]. CX-0009C at Q/A 78 (citing CX-0512C ([redacted] Specification) at 2-6; JX-0093C ([redacted] Specification) at 7-17). Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 8 of the '752 patent.

**2. [redacted] products**

Broadcom accuses the [redacted] products of infringing claims 1, 2, 5, 7, and 8 of the '752 patent, identifying similarities between the [redacted] in the [redacted] SoCs and the corresponding [redacted] in the [redacted] SoCs. *See* CX-0009C (Wolf DWS) at Q/A 82. Broadcom relies on a

limitation-by-limitation infringement analysis performed by Dr. Wolf. CX-0009C at Q/A 84-122.

**a. Claim 1 Preamble**

Dr. Wolf identifies the [redacted] in the [redacted] products as the claimed memory access unit, citing the specification for the [redacted]. CX-0009C at Q/A 48 (citing CX-0522C). She further cites testimony from Mr. Matsubara, who explained how the [redacted]. *Id.* (citing JX-0055C at 101-102). There is no dispute with respect to the preamble of claim 1.

**b. "an output port for providing access requests for lists of addresses in a memory"**

Dr. Wolf identifies [redacted]. CX-0009C at Q/A 93 (citing JX-0096C ([redacted] Manual) at 15-27; CX-0524C ([redacted] Specification) at 7-10). She further cites source code to support her description of these [redacted]. *Id.* at Q/A 94. In her opinion, the [redacted] *Id.* at Q/A 93. Dr. Wolf explains that the [redacted]. *Id.* at Q/A 96 (citing CX-0524C at 18, 33).

Respondents dispute infringement of this limitation but do not raise any arguments that are different from those discussed above in the context of the [redacted] products. RIB at 73-77. Accordingly, because the construction for "lists of addresses" only requires one or more addresses, the access requests of the [redacted] of the [redacted] products infringe the limitation requiring "access requests for lists of addresses in a memory" by including a [redacted].

**c. "over a link to a memory controller"**

Dr. Wolf identifies the [redacted] in the [redacted] products as the infringing "link to a memory controller." CX-0009C at Q/A 98. She explains that "[t]he [redacted]" *Id.* She cites Renesas deposition testimony, documents and source code in support of her opinion. *Id.* at Q/A 100-101. Respondents only dispute this limitation under their proposed construction for "a link to a memory controller," which was rejected above. RIB at 78-81; RRB at 30-31. Accordingly, the [redacted] products infringe this limitation.

**d. "a queue for queuing the access requests for the lists of addresses"**

Dr. Wolf identifies the [redacted] as the infringing "queue for queuing the access requests." CX-0009C at Q/A 103. She cites Renesas deposition testimony, documents and source code in support of her opinion, concluding that the [redacted] in the [redacted] products uses a [redacted] in the same way as the [redacted] in the [redacted] products. *Id.* at Q/A 105-107. Respondents do not dispute infringement of this limitation.

For the reasons discussed above, the [redacted] products thus infringe each limitation of claim 1 of the '752 patent.

**e. Claim 2**

With respect to claim 2, Dr. Wolf identifies the [redacted] in the [redacted] products, which [redacted] in the [redacted] products. CX-0009C at Q/A 110-111. Dr. Wolf further identifies hardware code that [redacted]

[redacted]. *Id.* at Q/A 111, 113. These opinions are supported by Renesas deposition testimony, documents and source code. *See, e.g.*, JX-0055C (Matsubara Dep. Tr.) at 72-75, 80, 101-102; CX-0522C ([redacted] Specification) at 8-9, 12-29; CX-0524C ([redacted] Specification) at 7-10, 17-25; JX-0096C ([redacted] Manual) at 15. Respondents do not separately dispute infringement of these limitations.

Accordingly, the [redacted] products infringe claim 2 of the '752 patent.

**f. Claim 5**

With respect to claim 5, Dr. Wolf cites Renesas deposition testimony, documents and source code showing that the [redacted] in the [redacted] products [redacted], similar to the operation of the [redacted] in the [redacted] products. CX-0009C at Q/A 116. She explains that these [redacted] from the [redacted] meet the limitations of claim 5 because they include the size of the block of pixels being requested. *Id.* Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 5 of the '752 patent.

**g. Claim 7**

With respect to claim 7, Dr. Wolf identifies hardware code for the [redacted] products corresponding to a [redacted] that "calculates addresses for access requests, where the addresses are non-contiguous." CX-0009C at Q/A 119. Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 7 of the '752 patent.

**h. Claim 8**

With respect to claim 8, Dr. Wolf cites Renesas documents and source code showing that the [redacted]. CX-0009C at Q/A 122 (citing CX-0524C ([redacted] Specification) at 7-10, 17-25; JX-0096C ([redacted] Manual) at 15-27). Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 8 of the '752 patent.

**3. [redacted] Products**

Broadcom accuses the [redacted] products of infringing claims 1, 2, 5, 7, and 8 of the '752 patent, identifying similarities between the [redacted] and [redacted] in the [redacted] SoCs and the corresponding [redacted] and [redacted] in the [redacted] SoCs. *See* CX-0009C (Wolf DWS) at Q/A 126. Broadcom relies on a limitation-by-limitation infringement analysis performed by Dr. Wolf. CX-0009C at Q/A 127-174.

**a. Claim 1 Preamble**

Dr. Wolf identifies the [redacted] in the [redacted] products as the claimed memory access unit, citing the specification for the [redacted]. CX-0009C at Q/A 130 (citing CX-0522C). She further cites testimony from Mr. Matsubara, who explained how the [redacted]. *Id.* (citing JX-0055C at 101-102). There is no dispute with respect to the preamble of claim 1.

**b. "an output port for providing access requests for lists of addresses in a memory"**

Dr. Wolf identifies [redacted]. CX-0009C at Q/A 135 (citing CX-0531C ([redacted] Manual) at 4-19; CX-0524C ([redacted]

[redacted] Specification) at 7-10). She further cites source code to support her description of these [redacted]. *Id.* at Q/A 136. In her opinion, the [redacted] are "access requests for lists of addresses in a memory." *Id.* at Q/A 135. Dr. Wolf explains that the [redacted]. *Id.* at Q/A 138 (citing CX-0524C at 18, 33).

Respondents dispute infringement of this limitation but do not raise any arguments that are different from those discussed above in the context of the [redacted] products. RIB at 73-77. Accordingly, because the construction for "lists of addresses" only requires one or more addresses, the [redacted] of the [redacted] products infringe the limitation requiring "access requests for lists of addresses in a memory" by [redacted].

**c. "over a link to a memory controller"**

Dr. Wolf identifies the [redacted] between the [redacted] in the [redacted] products as the infringing "link to a memory controller." CX-0009C at Q/A 143. She explains that "[t]he [redacted] *Id.* She cites Renesas deposition testimony, documents and source code in support of her opinion. *Id.* at Q/A 43-44. Respondents only dispute this limitation under their proposed construction for "a link to a memory controller," which was rejected above. RIB at 78-81; RRB at 30-31. Accordingly, the [redacted] products infringe this limitation.

**d. "a queue for queuing the access requests for the lists of addresses"**

Dr. Wolf identifies the [redacted] for the [redacted] as the infringing "queue for queuing the access requests." CX-0009C at Q/A 151. She cites Renesas deposition testimony, documents and source code in support of her opinion, concluding that the [redacted] in the [redacted] products uses a [redacted] in the same way that as the [redacted] in the [redacted] products. *Id.* at Q/A 150-52. Respondents do not dispute infringement of this limitation.

For the reasons discussed above, the [redacted] products thus infringe each limitation of claim 1 of the '752 patent.

**e. Claim 2**

With respect to claim 2, Dr. Wolf identifies the [redacted] in the [redacted] products, which operates in the same way as the [redacted] in the [redacted] and [redacted] products. CX-0009C at Q/A 157-58, 162-63. Dr. Wolf further identifies hardware code that [redacted]. *Id.* at Q/A 159, 164. These opinions are supported by Renesas deposition testimony, documents and source code. *See, e.g.,* JX-0055C (Matsubara Dep. Tr.) at 72-75, 80, 101-102; CX-0522C ([redacted] Specification) at 8-9, 12-29; CX-0524C ([redacted] Specification) at 7-10, 17-25; JX-0096C ([redacted] Manual) at 15. Respondents do not separately dispute infringement of these limitations.

Accordingly, the [redacted] products infringe claim 2 of the '752 patent.

**f. Claim 5**

With respect to claim 5, Dr. Wolf cites Renesas deposition testimony, documents and source code showing that the [redacted] in the [redacted] products [redacted]

[redacted], similar to the operation of the [redacted] in the R-Car Gen 2 products and the [redacted] in the [redacted] products. CX-0009C at Q/A 167. She explains that these requests from the [redacted] meet the limitations of claim 5 because they [redacted]. *Id.* Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 5 of the '752 patent.

**g. Claim 7**

With respect to claim 7, Dr. Wolf identifies hardware code for the [redacted] products corresponding to a [redacted] that "calculates addresses for access requests, where the addresses are non-contiguous." CX-0009C at Q/A 170. Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 7 of the '752 patent.

**h. Claim 8**

With respect to claim 8, Dr. Wolf cites Renesas documents and source code showing that the [redacted]. CX-0009C at Q/A 174 (citing CX-0524C ([redacted] Specification) at 7-10, 17-25; JX-0096C ([redacted] Manual) at 15-27). Respondents do not separately dispute infringement of this limitation.

Accordingly, the [redacted] products infringe claim 8 of the '752 patent.

**4. Infringement by Panasonic, DENSO TEN, Pioneer, and Toyota**

Broadcom accuses head units containing the infringing Renesas SoCs of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 93-95. Broadcom further accuses Toyota vehicles incorporating these head units of infringing these claims. *Id.*

**a. Panasonic**

Broadcom accuses Panasonic head units containing R-Car Gen 2 SoCs of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 93, Appendix 2 at 7. Dr. Wolf cites Renesas deposition testimony describing the software and hardware that is implemented and sold to customers, such as Panasonic. CX-0009C at Q/A 175-78. Respondents do not raise any non-infringement arguments for these products separate from their arguments discussed above for the Renesas SoCs. RIB at 81. Accordingly, the accused Panasonic head units infringe claims 1, 2, 5, 7, and 8 of the '752 patent.

**b. DENSO TEN**

Broadcom accuses DENSO TEN head units containing R-Car Gen 2 SoCs and R-Mobile A1 SoCs of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 93, Appendix 2 at 8. Dr. Wolf cites Renesas deposition testimony describing the software and hardware that is implemented and sold to customers. CX-0009C at Q/A 179-84. Respondents do not raise any non-infringement arguments for these products separate from their arguments discussed above for the Renesas SoCs. RIB at 81. Accordingly, the accused DENSO TEN head units infringe claims 1, 2, 5, 7, and 8 of the '752 patent.

**c. Pioneer**

Broadcom accuses Pioneer head units containing [redacted] of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 94-95, Appendix 2 at 5-6. Dr. Wolf cites Renesas deposition testimony describing the software and hardware that is implemented and sold to customers. CX-0009C at Q/A 185-90. Respondents do not raise any non-infringement arguments for the [redacted] products separate from their arguments discussed above for the Renesas SoCs. RIB at 81-82.

Respondents dispute infringement of claims 2 and 5 for Pioneer head units containing [redacted] SoCs, however. *Id.* Specifically, Respondents argue that the accused Pioneer head units do not include video decoding functionality and thus do not infringe the limitations requiring "requests for blocks of pixels from a motion prediction processing unit." *Id.* Respondents rely on the source code analysis of Dr. Jing Hu, who determined that video decoding functionality of the [redacted] SoCs is disabled in the Pioneer head units and that a [redacted] source code library that would be necessary for [redacted] is not [redacted]. RX-0009C at Q/A 83. Broadcom argues that claims 2 and 5 are apparatus claims that do not require the actual performance of any actions for infringement. CIB 94. The missing source code libraries do not merely result in certain infringing actions not being performed, however—without this source code, the accused products do not have the capability to infringe these claims. *See* RRB at 33-34. The Federal Circuit has held that non-infringement is appropriate in these circumstances, where the asserted claims "recite specific claim functionalities that cannot be practiced in hardware alone and require enabling software." *Nazomi*, 739 F.3d at 1343.

Accordingly, the accused Pioneer head units containing [redacted] SoCs infringe claims 1, 2, 5, 7, and 8 of the '752 patent, but the accused Pioneer head units containing [redacted] SoCs only infringe claims 1, 7, and 8.

**d. Toyota**

Broadcom accuses Toyota vehicles incorporating the accused Panasonic, DENSO TEN, and Pioneer head units of infringing claims 1, 2, 5, 7, and 8 of the '752 patent. CIB at 93-94, Appendix 2 at 5. Respondents do not raise any non-infringement arguments for these products separate from their arguments discussed above for the Renesas SoCs and the accused head units.

RIB at 82. Accordingly, the accused Toyota vehicles that incorporate the infringing head units also infringe the same claims of the '752 patent.

#### 5. Indirect Infringement

Broadcom accuses Renesas, Panasonic, DENSO TEN, Pioneer, and Toyota of indirect infringement, relying on the same arguments that it asserted in the context of the '583 patent. CIB at 93-95. As discussed above, however, Broadcom has failed to carry its burden with respect to the knowledge and intent requirements for induced and contributory infringement.[13]

### F. Domestic Industry

Broadcom identifies two groups of domestic industry products that practice claims 1, 2, 4, 5, 6, and 7 of the '752 patent. CIB at 95. Dr. Wolf identifies the [redacted]. CX-0009C at Q/A 200-03; *see* CIB at 95 n.20, n.21. She further provides claim-by-claim analyses of each group of products, finding that they practice claims 1, 2, 4, 5, 6, and 7 of the '752 patent. *Id.* at Q/A 206-43. There is no dispute from Respondents that the asserted domestic industry products practice these claims. RIB at 82.

#### 1. [redacted] Products

Broadcom relies on a claim-by-claim analysis performed by Dr. Wolf to show that the [redacted] practice claims 1, 2, 4, 5, 6, and 7 of the '752 patent. CX-0009C at Q/A 206-26.

[13] Dr. Wolf's witness statement does not address indirect infringement, and Broadcom's pre-hearing brief failed to allege knowledge and intent when discussing indirect infringement of the '752 patent. CPHB at 205-08.

**a. Claim 1**

To meet the limitations of claim 1, Dr. Wolf identifies [redacted]. CX-0009C at Q/A 209. Dr. Wolf identifies [redacted]. *Id.* at Q/A 211. She explains that [redacted]. *Id.* at Q/A 211-12. Dr. Wolf further explains [redacted]. *Id.* at Q/A 214-15. She identifies [redacted]. *Id.* at Q/A 217. There is no dispute with respect to these limitations, and accordingly, the [redacted] practice claim 1 of the '752 patent.

**b. Claims 2, 4, 5**

With respect to claim 2, Dr. Wolf identifies [redacted]. CX-0009C at Q/A 220. In addition, she identifies [redacted]. *Id.* at Q/A 222. With respect to claim 4, [redacted]. *Id.* at Q/A 224. There is no dispute with respect to these limitations, and accordingly, [redacted] practice claims 2, 4, and 5 of the '752 patent.

**c. Claims 6 and 7**

With respect to claim 6, Dr. Wolf identifies evidence that [redacted]. *Id.* at Q/A 226. There is no dispute with respect to these limitations, and accordingly, the [redacted] products practice claims 6 and 7 of the '752 patent.

**2. [redacted] Products**

Broadcom relies on a claim-by-claim analysis performed by Dr. Wolf to show that the BCM7405 products practice claims 1, 2, 4, 5, 6, and 7 of the '752 patent. CX-0009C at Q/A 227-43.

**a. Claim 1**

To meet the limitations of claim 1, Dr. Wolf identifies [redacted] *Id.* at Q/A 236. There is no dispute with respect to these limitations, and accordingly, the [redacted] practice claim 1 of the '752 patent.

**b. Claims 2, 4, 5**

With respect to claim 2, Dr. Wolf identifies [redacted]. *Id.* at Q/A 241. There is no dispute with respect to these limitations, and accordingly, the [redacted] practice claims 2, 4, and 5 of the '752 patent.

**c. Claims 6 and 7**

With respect to claim 6, Dr. Wolf identifies evidence [redacted]. *Id.* at Q/A 243. There is no dispute with respect to these limitations, and accordingly, the [redacted] practice claims 6 and 7 of the '752 patent.

**G. Invalidity**

Respondents contend that all of the asserted claims of the '752 patent are anticipated by U.S. Patent No. 6,240,492 (RX-0109, "Foster") or are obvious in view of Foster or U.S. Patent Pub. No. 2003/0106053 (RX-0124, "Sih") in combination with additional prior art. *Id.* at 83-123. These contentions are supported by the opinions of Dr. Subramanian (RX-0005C).[14]

[14] The USPTO instituted an *inter partes* review of the '752 patent in view of Foster, Sih, and Rovati. USPTO PTAB Case No. IPR2019-01041, Granting Institution (Nov. 6, 2019). *See supra* n.9.

### 1. Anticipation by Foster

Foster is a U.S. Patent that issued on May 29, 2001, naming inventors Eric M. Foster, Steven B. Herndon, and Chuck H. Ngai and assignee International Business Machines Corporation. RX-0109, cover. The background of Foster's specification describes the integration of multiple functions onto a single system chip, pointing to an MPEG video decoder system as an example. *Id.* at 1:29-36. Foster explains that such a system generally needs to access external memory and describes existing approaches for implementing dedicated and shared memory. *Id.* at 1:36-2:10. Foster identifies "a need in the art for a memory interface for a functional unit of an integrated system which allows the functional unit to simultaneously access both dedicated memory and shared memory through multiple ports." *Id.* at 2:31-37. The invention claimed by Foster implements a "lookahead request generator" that allows for "reordering of memory requests at a request dispatcher in order to optimize bandwidth on the communications link coupling the memory interface to dedicated memory." *Id.* at 5:37-49.

Respondents contend that Foster anticipates claims 1, 2, 4, 5, 7, and 8 of the '752 patent, relying on the opinions of Dr. Subramanian. RIB at 83-97 (citing RX-0005C at Q/A 40-94). For the reasons discussed below, I agree that Foster anticipates claims 1, 2, 4, and 7.

#### a. Claim 1 Preamble

Dr. Subramanian identifies Foster's memory interface 28 as the claimed "memory access unit," explaining that this interface accesses a dedicated memory 26 via a memory controller 24. RX-0005C at Q/A 47 (citing RX-0109 at 6:28-34). There is no dispute with respect to the preamble of claim 1.

**b. "an output port for providing access requests for lists of addresses in a memory"**

Foster discloses that "[t]he memory interface has multiple memory ports, with one memory port being coupled to the shared system data bus, and one memory port coupled to the dedicated memory for sending requests thereto." RX-0109 at 2:62-65. In one embodiment, depicted in Figure 2, Foster states that "the HDTV video decoder again includes two memory ports, with port 1 being coupled to dedicated bus 22 for accessing dedicated memory 26 through dedicated memory controller 24, and port 2 coupled to the general system bus 16 for accessing shared memory 20 through common memory controller 18." *Id.* at 6:28-34.

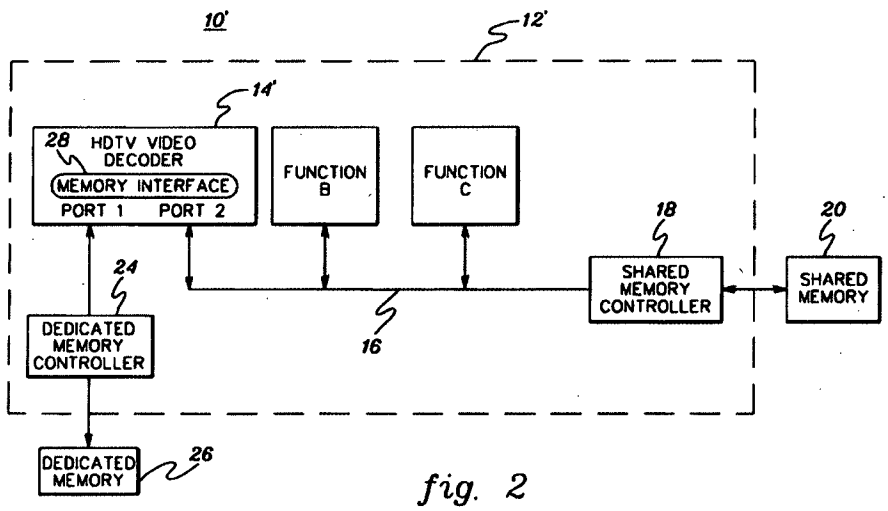


*fig. 2*

RX-0109, Fig. 2. Dr. Subramanian submits that Foster's memory interface forwards memory fetch requests to memory controllers via these two disclosed ports. RX-0005C at Q/A 52.

Broadcom disputes Respondents' argument that this limitation is anticipated. Relying on the testimony of Dr. Wolf, Broadcom argues that the description of "multiple memory ports" in column 2 of Foster's specification describes a direct connection to memory, not to a memory controller. CRB at 39 (citing Tr. (Wolf at 979-80)). With respect to Figure 2, Dr. Wolf submits that the two disclosed ports are depicted as part of HDTV video decoder 14, not memory

interface 28. CX-0014C at Q/A 23. Dr. Wolf's reading of Foster is overly restrictive, however. The figures are functional in nature, and comparing Figure 2 to Figure 1 makes it clear that the labeled "port 1" and "port 2" are ports of the memory interface 28. *See* RX-0109, Fig.1 at 6:9-10 ("Note that FIGS. 1 & 2 depict dual memory ports by way of example."). The disclosed ports connect the memory interface to dedicated and shared memory controllers and thus anticipate the "output port" limitation of the '752 patent.

Dr. Subramanian further submits that these output ports provide access requests for lists of addresses in a memory, pointing to an embodiment of the memory interface 28 depicted in Figure 4. RX-0005C (Subramanian DWS) at Q/A 53.

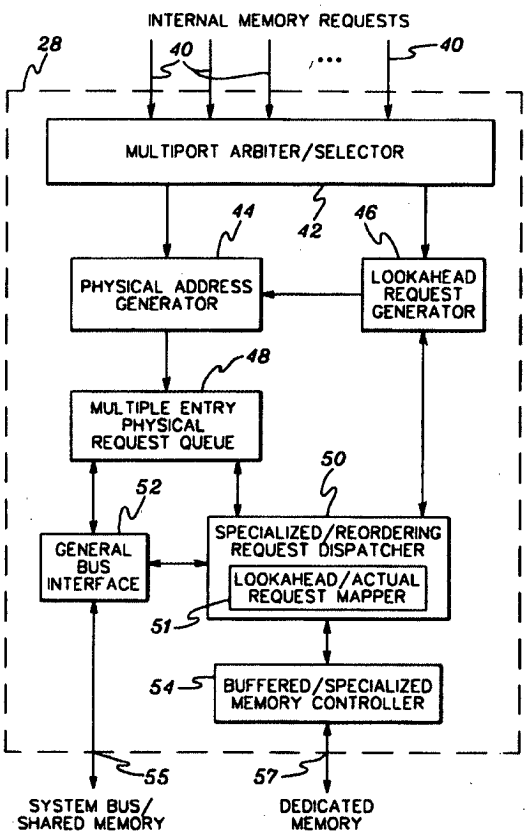


*fig. 4*

RX-0109, Fig. 4. The specification of Foster explains that memory requests "are initially received at a multi-port arbiter/selector 42," and then "[e]ach selected request is forwarded to a physical address generator 44 where the logical address associated with the request is converted to a physical address for accessing memory space in one of the memories coupled to the memory interface." *Id.* at 7:58-65. In an example application described in Foster, "a motion compensation unit may be generating requests for a block of data it is processing. This processing typically generates a series of eight requests with each address separated by a fixed value." *Id.* at 9:32-35. Comparing these disclosures to the claims of the '752 patent, Dr. Subramanian explains that Foster's motion compensation unit generates eight memory access requests, with each request comprising at least one address. RX-0005C at Q/A 53.

Broadcom argues that the memory interface depicted in Figure 4 is a separate embodiment from the integrated system depicted in Figures 1 and 2. CIB at 96-97. The memory interface is labeled with the number 28 in each of the figures, however, and Foster explicitly describes Figure 4 as an embodiment of the invention described earlier in the specification: "One embodiment of a memory interface incorporating the above-noted aspects of the present invention is shown in FIG. 4." RX-0109 at 7:54-55. Broadcom identifies an alleged discrepancy between the figures whereby the specialized memory controller 54 is depicted inside the memory interface in Figure 4 while it is outside the memory interface in Figures 1 and 2. CIB at 97; *see* CX-0014C (Wolf RWS) at Q/A 35 (identifying connection to dedicated memory rather than a memory controller). In Foster's description of Figure 1, however, there is an explicit disclaimer that the dedicated memory controller "can be external or internal." RX-0109 at 5:67-6:1. The specification makes it clear that Figure 4 is not a separate and distinct embodiment from Figures 1 and 2 but that it merely provides additional details and variations on the same integrated

system. A prior art reference disclosing such options "can anticipate a claim even if it does not expressly spell out all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would at once envisage the claimed arrangement or combination." *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (internal quotations removed). Dr. Subramanian's reading of the cumulative embodiments in Foster's specification meets this standard, and there is no basis for precluding elements described in Figures 1, 2, and 4 from being combined for anticipation.

Broadcom further argues that the example of eight memory requests described in Foster refers to internal memory requests received by the memory interface, not the claimed access requests provided through an output port. CIB at 98-99; *see* CX-0014C (Wolf RWS) at Q/A 23. As Dr. Subramanian explains, however, the specification in Foster describes the way that these internal memory requests are converted to physical addresses in memory that would then be output to a memory controller in accordance with the memory interface of Figure 4 and the integrated system of Figure 2. RX-0005C at Q/A 53. These disclosures are sufficient to enable one of ordinary skill in the art to understand how Foster's converted requests would be provided through the disclosed output ports, meeting the limitations of the claim. *See Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1379 (Fed. Cir. 2001) ("[A]nticipation does not require actual performance of suggestions in a disclosure. Rather, anticipation only requires that those suggestions be enabling to one of skill in the art."). Accordingly, Foster anticipates the limitation requiring "an output port for providing access requests for lists of addresses in a memory."

**c. "over a link to a memory controller"**

Foster discloses both a shared bus and a dedicated bus coupled to ports of the memory interface: "one port couples via a dedicated bus to dedicated memory, while another port couples via a general system bus to shared memory." RX-0109 at 5:35-37. In Figures 1 and 2, these buses are connected to memory controllers: "A first memory port is coupled to the general system bus 16, while (in this example) a second memory port connects to a dedicated bus 22 coupled to dedicated memory 26 directly through a dedicated memory controller 24." *Id.* at 5:63-67. The specification also provides that the memory port 55 in Figure 4 can be connected to a memory controller through a general system bus: "Bus interface 52 couples through a memory port 55 to a general system bus. As shown in FIGS. 1 & 2, the general system bus can couple to a shared memory through a common memory controller." *Id.* at 8:42-45.
Dr. Subramanian identifies the dedicated bus 22 as a "link to a memory controller" under both parties' constructions for this term. RX-0005C at Q/A 65.

Broadcom's only rebuttal argument is that Figure 2 does not include a label identifying dedicated bus 22. RIB at 99; CX-0014C (Wolf RWS) at Q/A 30. It is clear from Foster's specification, however, that the same dedicated bus is depicted in both Figures 1 and 2, and this bus would be compatible with the memory interface depicted in Figure 4. Under the construction for a "link to a memory controller" adopted above, both the dedicated bus and the general system bus of Foster would anticipate this limitation.

**d. "a queue for queuing the access requests for the lists of addresses"**

Foster discloses that "[t]he dedicated memory is preferably optimized for maximum bandwidth by employing a large queue of multiple memory requests from several decoder pipelines within the video decoder." RX-0109 at 7:41-44. When describing the operation of the

memory interface depicted in Figure 4, Foster states: "The physical address requests are then pooled logically in multiple queues, (each queue corresponding to one memory port) in a multi-entry physical request queue 48." *Id.* at 8:11-14. Dr. Subramanian explains that these disclosed queues anticipate the '752 patent's queue limitation. RX-0005C at Q/A 66.[15]

Broadcom argues that the queue in Figure 4's memory interface is from an embodiment that is separate from the integrated system in Figure 2. CIB at 100-02. As discussed above, however, Foster contains multiple disclosures explaining how these embodiments are compatible. *See, e.g.*, RX-0109 at 7:54-56 ("One embodiment of a memory interface incorporating the above-noted aspects of the present invention is shown in FIG. 4"). Moreover, Foster's first reference to "a large queue of multiple memory requests" appears in column 7 of Foster's specification before any reference to Figure 4. *Id.* at 7:41-44. There is no basis for confining Foster's queue to a particular embodiment or separating the memory interface of Figure 4 from the integrated system of Figure 2.

Broadcom further argues that Foster fails to disclose that "the access requests" provided by the claimed output port are placed in the queue. CIB at 102-103; CX-0014C (Wolf RWS) at Q/A 36. But this is precisely how Foster describes its queues, with "each queue corresponding to one memory port." RX-0109 at 8:11-14. Foster explicitly describes two queues for two types of access requests corresponding to its two output ports: "[A] first queue might be reserved for

[15] Dr. Subramanian further identifies a queue analyzer depicted in Figure 6 as an alternative queue that anticipates this limitation. RX-0005C at Q/A 67. Foster describes the functionality of this queue analyzer and states that "[t]he reordered requests are transferred to the dedicated memory controller port." RX-0109 at 9:54-55. Because this queue analyzer is also a queue for the same physical address requests, I agree with Respondents that it is an alternative disclosure that anticipates this limitation for the same reasons discussed in this section with respect to Foster's physical request queue.

physical address requests to be transferred to shared memory via a general bus interface 52, while a second queue is reserved for physical address requests to be forwarded to dedicated memory." RX-0109 at 8:14-18. The address requests in the first queue are routed through bus interface 52, which "couples through memory port 55 to a general system bus." *Id.* at 8:42-43. The address requests in the second queue are sent to a specialized memory controller and "through a dedicated memory port 57 to dedicated memory." *Id.* at 8:36-38.[16] These address requests are the same "access requests" described above in the context of the "output port" limitation, and accordingly, Foster's queues anticipate this limitation of the '752 patent.

For the reasons discussed above, Foster thus anticipates each limitation of claim 1 of the '752 patent.

**e. Claim 2**

With respect to claim 2, Respondents point to Foster's "motion compensation unit." RIB at 90-92. In particular, Foster discloses that "[t]he requesting unit in a video decoder implementation might comprise a motion compensation unit, a display unit, an I/O unit or an audio unit." RX-0109 at 8:60-62. In addition, "a motion compensation unit may be generating requests for a block of data it is processing." *Id.* at 9:32-33. As an example of a "requesting unit," the disclosed motion compensation unit provides requests to Foster's memory interface. *See id.* at 7:56-58 ("This memory interface 28 receives request signals on multiple buses 40 from requesting units (not shown) within the associated functional unit of the integrated system.").

[16] Although the internal memory controller would not meet the limitations of claim 1 of the '752 patent, as discussed above, Foster explicitly states that the dedicated memory controller "can be external or internal." RX-0109 at 5:67-6:1.

Dr. Subramanian explains that a motion compensation unit is equivalent to the "motion prediction processing unit" in claim 2. RX-0005C at Q/A 69.

There is no dispute that Foster thus discloses a memory access unit with an input port for receiving requests from a motion prediction processing unit, but Broadcom argues that the requests are not "for blocks of pixels," as required by claim 2. CIB at 103-04; CX-0014C (Wolf RWS) at Q/A 39. The disclosure in Foster describes a "block of data," without specifying pixels, but Dr. Subramanian explains that this is a reference to pixel data. RX-0005C at Q/A 69. The motion compensation unit is described in the context of a "video decoder implementation," RX-0109 at 8:60-62, and I agree with Respondents that one of ordinary skill in the art would understand Foster's "block of data" to inherently refer to a block of image data meeting the claim limitation requiring "blocks of pixels."

Claim 2 further requires "logic for generating the lists of addresses from the requests for blocks of pixels, wherein the lists of addresses correspond to addresses in a memory that store pixels in the blocks of pixels," and Dr. Subramanian identifies Foster's physical address generator to meet this limitation. RX-0005C at Q/A 72. Foster discloses that "the access patterns of video decoders are relatively known since the processors work on a block-by-block or macroblock-by-macroblock basis." RX-0109 at 7:38-41. "Each selected request is forwarded to a physical address generator 44 where the logical address associated with the request is converted to a physical address for accessing memory space in one of the memories coupled to the memory interface." *Id.* at 7:61-65. Moreover, as discussed above, Foster states that "a

motion compensation unit may be generating requests for a block of data it is processing." *Id.* at 9:32-33.[17] Foster thus discloses this limitation of claim 2.

For the reasons discussed above, Foster thus anticipates claim 2 of the '752 patent.

**f. Claim 4**

Claim 4 adds an additional limitation to claim 2, "wherein the logic generates the access requests based on the list of addresses and based on row-bank accesses needed to access the addresses," and Dr. Subramanian points to the operation of a reordering request dispatcher described in Foster. RX-0005C at Q/A 75-77. In particular, Foster describes "a memory chip with two banks (each bank 512 bytes)" where "the request dispatcher reorders the requests so that each operation goes to the opposite bank, thus fully utilizing the data transfer channel and maximizing the bandwidth available." RX-0109 at 10:15-19, Table I, Table II. This re-ordering is based on the address and bank information for each request, and there is no dispute that Foster anticipates this limitation.

For the reasons discussed above, Foster thus anticipates claim 4 of the '752 patent.

**g. Claim 5**

Claim 5 adds an additional limitation to claim 2, "wherein the logic generates the access requests based on the list of addresses and based on sizes of each of the requests for blocks of pixels from the motion prediction processing unit," and Dr. Subramanian identifies certain "burst" requests described in Foster to meet this limitation. RX-0005C at Q/A 78-80. First,

[17] Broadcom argues that Foster's present tense description of the "requests for a block of data it is processing" suggests that the block of data is already being processed and not being requested, as required by claim 2. CIB at 103-04. In the context of this paragraph in Foster, however, it is clear that the "processing" that is described includes generating the claimed requests: "This processing typically generates a series of eight requests with each address separate by a fixed value." RX-0109 at 9:33-35.

Dr. Subramanian points to the lookahead request generator 46, which "receives requesting unit/burst information from the arbiter/selector 42," as shown in Figure 5. RX-0109 at 8:56-58. Foster states: "This information comprises identifying information, for example, on the requesting unit, the size of the request, as well as the logical address." *Id.* at 8:58-60. This information is then used "to generate speculative lookahead requests via a logical address generator 62." *Id.* at 8:64-66.

Broadcom argues that the lookahead request generator does not generate "the access requests" that were identified in the context of claims 1 and 2. CIB at 104-05. As explained by Dr. Wolf, the lookahead request generator attempts to predict requests before they are received, generating "speculative lookahead requests" that are separate from the "physical address requests" generated from memory requests input to the memory interface. CX-0014C at Q/A 51. I agree with Broadcom that these lookahead requests cannot meet the limitations of claim 2, which require that the generated addresses "correspond to addresses in a memory that store pixels in the blocks of pixels." Accordingly, Foster's disclosure of a lookahead request generator does not anticipate claim 5.

As an alternative for meeting this limitation, Dr. Subramanian identifies a disclosure at the end of Foster's specification discussing additional applications for the invention. RX-0005C at Q/A 80. Specifically, "[f]or shared memory, the data requests must be compliant with the established system bus protocol, and are optimized for short bursts to avoid dominating the bus (and preventing other devices from accessing memory)." RX-0109 at 12:7-9. On the other hand, "[f]or dedicated memory, data requests can be re-ordered or even pre-fetched on speculation, and must be optimized for long bursts in alternating banks to fully utilize all available access time and minimize overhead." *Id.* at 12:9-13. Broadcom disputes Dr. Subramanian's opinions

regarding these disclosures in Foster. CRB at 43. In particular, Broadcom argues that Foster only describes adjusting the size of bursts based on the destination for the requests, while claim 5 requires generating access requests based on the size of the requests. *Id.* I agree with Broadcom that the adjustment of burst size described in Foster does not meet the limitations of claim 5, and Respondents have thus failed to show that this claim is anticipated by Foster.

**h. Claim 7**

Claim 7 depends from claim 1, further requiring that "the addresses are non-contiguous." Dr. Subramanian submits that the operation of Foster's specialized/reordering request dispatcher and lookahead/actual request mapper will result in non-contiguous addresses because access requests will be removed when they correspond to previously generated lookahead requests. RX-0005C at Q/A 84. As disclosed in Foster, "actual requests are mapped to previously generated speculative or lookahead requests to ensure that an actual request is not dispatched which may already have been executed as a lookahead request." RX-0109 at 8:21-27. In rebuttal, Dr. Wolf misconstrues Dr. Subramanian's analysis of this limitation, focusing on the list of addresses generated by the lookahead/actual request mapper rather than the access requests provided through the output port. *See* CX-0014C (Wolf RWS) at Q/A 57. Broadcom argues that Dr. Subramanian fails to identify any explicit disclosure of non-contiguous addresses, but "a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003). Here, Dr. Subramanian has explained how one of skill in the art would understand that the disclosed operation of the lookahead/actual request mapper would necessarily result in access requests for

non-contiguous addresses in memory. This is sufficient to show that this limitation is inherent in Foster, and accordingly, Foster anticipates claim 7 of the '752 patent.

**i. Claim 8**

Claim 8 depends from claim 1, further requiring that "the memory access unit receives data stored at the addresses in the memory from the lists of addresses in the memory over said link." As discussed above, Foster discloses the claimed "link" in dedicated bus 22 and general system bus 16. Foster further provides that "the depicted data buses in practice may each comprise an associated read bus and write data bus." RX-0109 at 6:16-18. Dr. Subramanian points to Foster's Figure 3, which depicts memory data paths going to and from the memory interface 28. RX-0005C at Q/A 93. On cross-examination, Dr. Wolf admitted that the arrows in Foster's figures indicate that data is provided in both directions. Tr. 994.

Based on these disclosures, I agree with Respondents that Foster discloses a memory access unit that is capable of receiving data over a link. But Foster does not explicitly disclose that the memory access unit actually "receives data stored at the addresses in the memory from the lists of addresses in the memory." *See* CIB at 104-05; CX-0014C (Wolf RWS) at Q/A 63. These disclosures thus show that the system in Foster may be capable of practicing the claimed limitation, but this evidence is not sufficient to show that Foster anticipates this claim.

**2. Obviousness in view of Foster**

Respondents also contend that Foster renders obvious claims 1, 2, 4, 5, 7, and 8 of the '752 patent, alone or in combination with additional prior art references. RIB at 98-104. For the reasons discussed below, I agree that Foster renders obvious claims 1, 2, 4, 7, and 8.

**a. Claims 1, 2, and 4**

With respect to claims 1, 2, and 4, I agree with Respondents that Foster alone renders these claims obvious, for the same reasons discussed above in the context of anticipation. In addition to the substantive disclosures discussed above, Foster provides explicit guidance for how one of ordinary skill in the art would combine the various features that it discloses, explicitly stating that the memory interface depicted in Figure 4 can be incorporated in the system depicted in Figures 1 and 2. RX-0109 at 7:54-56 ("One embodiment of a memory interface incorporating the above-noted aspects of the present invention is shown in FIG. 4."). In addition, Foster discloses that the lookahead request generator, specialized/reordering request dispatcher, and buffered/specialized memory controller 54 depicted in Figures 5, 6, and 7 can be incorporated into the same system, describing the additional features and benefits of this combination. *Id.* at 8:51-55 ("By way of further detail, FIGS. 5, 6 & 7 depict (in accordance with this invention) embodiments of a lookahead request generator 46, a specialized/reordering request dispatcher 50, and a buffered/specialized memory controller 54, respectively."). Foster also explicitly describes variations that would be known to one of ordinary skill in the art, including statements that a memory controller "can be external or internal," *Id.* at 5:67-7:1, and that memory requests can come from "a motion compensation unit, a display unit, an I/O unit or an audio unit." *Id.* at 5:60-63. Foster's specification includes numerous references to the processing of video data, which would necessarily require accessing blocks of pixels from memory. *See, e.g., Id.* at 7:13-20 ("an application that requires decoding of the highest format HDTV video (i.e., 1080 lines, interlaced), would use a full 8 Mbytes of private memory and approximately another 4-8 Mbytes of shared memory.") at 7:38-40 ("the access patterns of video decoders are relatively known since the processors work on a block-by-block or macroblock-by-

macroblock basis."). It is thus clear from these disclosures that each limitation of claims 1, 2, and 4 of the '752 patent is obvious in view of Foster.

**b. Claim 5**

With respect to claim 5, Respondents contend that the claim is obvious in view of Foster in combination with U.S. Patent Publication No. 2002/00331179 A1, published on March 14, 2002, naming inventors Fabrizio Rovati, Danilo Pau, and Emiliano Piccinelli (RX-0151, "Rovati"). RIB at 101-02. Rovati is entitled "Coprocessor Circuit Architecture, for instance for Digital Encoding Applications," and it describes a circuit for processing digital image data that includes a motion vector controller block for generating motion vector values based on image data, an address generator block for extracting addresses from the motion vector values, a predictor fetch block for retrieving data from those addresses, and additional components for processing that data.. RX-0151, Abstract; *see* RX-0005C (Subramanian DWS) at Q/A 57.

Dr. Subramanian submits that "it was well known that access requests were generated based on the size of the requested blocks of pixels and the restrictions imposed on the transaction." RX-0005C at Q/A 82. He suggests that one of ordinary skill in the art would be motivated to combine Foster and Rovati because both references relate to memory access for a motion compensation function required for video encoding and decoding. RX-0005C at Q/A 62, 83. In reference to claim 5, Dr. Subramanian notes that both Foster and Rovati are concerned with limitations on bandwidth. *Id.* at Q/A 83. Foster describes using its request dispatcher to "maximize the bandwidth available" in a memory chip with two banks. RX-0109 at 10:11-21. Rovati describes a "bandwidth cap," identifying a register that "will tell how many blocks the stage is allowed to request to the main memory." RX-0151, ¶ [0153]. "Once this limit is reached, the refill engine will not perform any refill of the cache, thus not exceeding the allowed

peak bandwidth in every macroblock period." *Id.* Respondents contend that the implementation of Rovati's bandwidth cap in the system of Foster would render claim 5 obvious because Rovati's refill engine decides whether to dispatch requests based on their size and the bandwidth available. RRB at 44; *see* RX-0005C (Subramanian DWS) at Q/A 82.

Broadcom argues that Rovati's "bandwidth cap" does not meet the limitations of claim 5 because it only throttles the outbound memory requests based on the available bandwidth, which is allegedly different from generating access requests based on the size of the requests for blocks of pixels. CIB at 107-08 (citing CX-0014C (Wolf RWS) at Q/A 54). I agree with Respondents, however, that Rovati's refill engine decides whether to output a request based on the size of the request and the available bandwidth, and this would meet the limitations of claim 5.

Broadcom further argues that Respondents have failed to establish that a person of ordinary skill would combine Rovati's bandwidth cap with the system disclosed in Foster and has not shown that the combination would have a reasonable expectation of success. CIB at 108-09. I agree with Broadcom that Dr. Subramanian's testimony regarding a motivation to combine is unsupported and conclusory. Dr. Subramanian's testimony relies on contentions that both references are related to image encoding and decoding, both references discuss restrictions on data transfer, and Rovati's "refill logic" would prevent bandwidth restrictions from being exceeded. RX-0005C at Q/A 83. But the restrictions on data transfer disclosed in Foster and Rovati are not the same—Foster identifies a problem "that sequential accesses to the same memory bank are slower than sequential accesses to alternate banks." RX-0109 at 10:11-13. Rovati identifies a "bandwidth cap" for requesting blocks from memory. RX-0151, ¶ [0153]. Dr. Subramanian offers no credible reason that the system in Foster would benefit from being modified to address the "bandwidth cap" identified in Rovati, merely stating (without evidence)

that "such restrictions were common." RX-0005C at Q/A 83. This is insufficient to meet Respondents' burden to prove obviousness by clear and convincing evidence.

**c. Claim 7**

As discussed above, Dr. Subramanian offers an opinion that Foster discloses the "non-contiguous" limitation based on the reordering of requests in response to previously generated lookahead requests. RX-0005C at Q/A 84. For the same reasons that these disclosures anticipate claim 7, Foster also renders claim 7 invalid for obviousness.

Respondents further contend that claim 7 is obvious in view of Foster in combination with U.S. Patent No. 6,075,899 (RX-0133, "Yoshioka"). RIB at 102-04. Yoshioka is a patent that issued in June 2000, naming inventors Kosuke Yoshioka, Makoto Hirai, Tokuzo Kiyohara, and Kozo Kimura, assigned to Matsushita Electrical Industrial Co., Ltd. of Japan. RX-0133, cover. The patent describes an invention that "relates to an image decoding apparatus used for decoding both video and still images and to an image memory." RX-0133 at 1:9-11.
Dr. Subramanian identifies a memory access unit in Yoshioka that "is responsible for reading all of the pixels needed for the reference picture used by the compensation control unit." RX-0005C at Q/A 89 (citing RX-0133 at 17:29-36, 15:7-9). Yoshioka explicitly describes a method for accessing certain reference pixels located on different "pages" of memory. *Id.* (citing RX-0133 at 25:9-14, 26:22-27). Dr. Subramanian explains that these pixels are stored in non-contiguous locations in memory, meeting the limitation of claim 7. *Id.* at Q/A 91. He submits that one of ordinary skill in the art would be motivated to combine Foster and Yoshioka because both references disclose memory access units that are designed to facilitate access to memory for a motion compensation function as part of video encoding or decoding. *Id.* at Q/A 92.
Dr. Subramanian identifies Foster's explicit disclosure of an embodiment where a motion

compensation unit "generates a series of eight requests with each address separated by a fixed value." RX-0109 at 9:32-35. He explains that Yoshioka provides additional details for the operation of a motion compensation unit that would be known by one of ordinary skill in the art, including the use of reference pixels located in non-contiguous locations in memory. RX-0005C (Subramanian DWS) at Q/A 92.

Broadcom argues that one of ordinary skill would not have been motivated to use Yoshioka's system to access reference image pixels. CIB at 109-10 (citing CX-0014C (Wolf RWS) at Q/A 60). Broadcom's narrow reading of Foster relies on arguments similar to those rejected above in the context of anticipation. As discussed above, although the requests generated by the motion compensation unit are not the access requests claimed in the '752 patent, Foster discloses how these internal memory requests are converted to access requests specifying physical addresses in memory. *See* RX-0005C (Subramanian DWS) at Q/A 53. Dr. Subramanian further explains how the requests for reference pixels described in Yoshioka would result in access requests for addresses that are non-contiguous in the system described in Foster. RX-0005C at Q/A 92. The use of reference pixels for motion compensation is described by Yoshioka as part of the known MPEG standard. RX-0133 at 1:26-2:11. Foster also discloses motion compensation processing and references the same MPEG standard. *See* RX-0109 at 1:33-35 (referencing an "MPEG video decoder system"), 9:32-33 (describing the operation of a "motion compensation unit"). Based on these disclosures, I agree with Respondents and Dr. Subramanian that modifying Foster's memory interface to output such requests would have been obvious to one of ordinary skill in the art.

Broadcom further argues that there is insufficient evidence that the combination of Foster and Yoshioka would have a reasonable expectation of success, CIB at 110, but Dr. Subramanian

clearly explains how the system of Foster is compatible with the motion processing described in Yoshioka. RX-0005C at Q/A 90-92.

For the reasons discussed above, I thus find that Respondents have carried their burden to show that claim 7 is obvious in view of Foster alone, or Foster in combination with Yoshioka.

**d. Claim 8**

As discussed above in the context of anticipation, Foster discloses that its data buses "may each comprise an associated read bus and write data bus." RX-0109 at 6:16-18. In Dr. Subramanian's opinion, these disclosures are sufficient for Foster to meet the limitation in claim 8 requiring that "the memory access unit receives data stored at the addresses in the memory for the lists of addresses in the memory." *Id.* Although these disclosures are insufficient for anticipation, Dr. Subramanian's testimony makes a convincing case for obviousness by explaining how one of ordinary skill in the art would recognize that Foster's memory interface is capable of receiving the requested data. RX-0005C at Q/A 93. Figure 3 depicts a limited number of data paths for the system in Foster, including two-way paths between the memory interface and the memory. RX-0109, Fig. 3. Both Dr. Subramanian and Dr. Wolf agree that this figure indicates that memory data can be sent and received from the memory interface. RX-0005C (Subramanian DWS) at Q/A 93; Tr. 993-94 (Wolf). Based on these disclosures and expert testimony, it is clear that receiving the requested data at the memory interface would be one of a finite number of identified, predictable options. Accordingly, Foster renders claim 8 invalid for obviousness.

**3. Obviousness in view of Sih**

Sih is a U.S. patent application that was published in June 2003, naming inventors Gilbert C. Sih and Yushi Tian and assignee Qualcomm Incorporated. RX-0124, cover. Sih describes a

video direct memory access (VDMA) controller that accesses video data from memory in response to requests. *Id.*, Abstract. Sih was cited by the examiner during the prosecution of the '752 patent for both obviousness and anticipation. JX-0009.00049-54, Office Action (Mar. 24, 2008). In response to this rejection, Broadcom added the "queue" limitation to claim 1, and the patent subsequently issued. JX-0009.00096-98, Amendment and Response (June 24, 2008).

Respondents contend that Sih renders obvious claims 1, 2, 4, 5, 6, 7, and 8 of the '752 patent in combination with several other prior art references. RIB at 105-22. For the reasons discussed below, I find that claims 1, 2, 4, 5, and 7 are obvious in view of Sih.

### a. Claim 1 Preamble

Dr. Subramanian identifies Sih's VDMA controller 26 as the claimed "memory access unit." RX-0005C at Q/A 99. Sih provides that a "processor 30 and DSP 28 issue VDMA controller 26 access commands specifying multidimensional blocks of video data, which VDMA controller 26 translates into single dimensional storage addresses." RX-0124, ¶ [0033]. A block diagram of these components in depicted in Figure 3 of Sih.

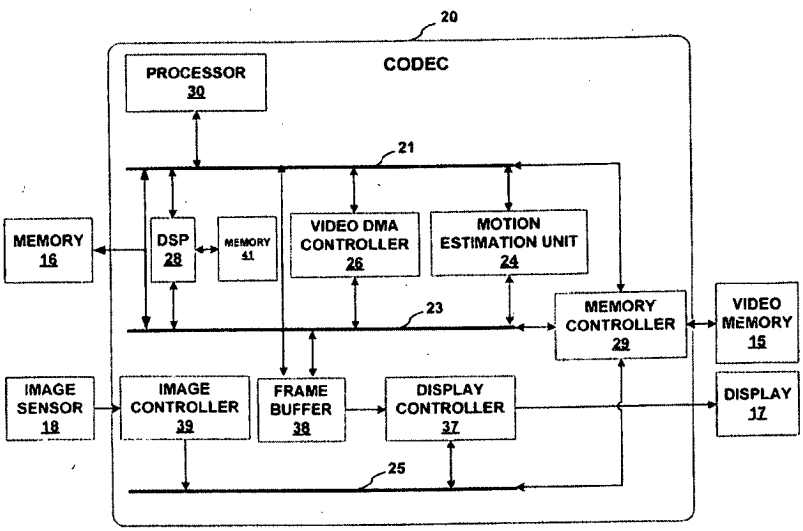


FIG. 3

RX-0124, Fig. 3. There is no dispute with respect to the preamble of claim 1.

**b. "an output port for providing access requests for lists of addresses in a memory"**

Sih provides that a "processor 30 and DSP 28 issue VDMA controller 26 access commands specifying multidimensional blocks of video data, which VDMA controller 26 translates into single dimensional storage addresses." RX-0124, ¶ [0033]. Sih further states that "VDMA controller 26 resides on both processor bus 21 and DSP bus [23], and is capable of transferring data between any memory of CODEC 20 including external memory 16, video memory 15, DSP memory 41, and memory (not shown) within motion estimation unit 24." *Id.* Dr. Subramanian identifies several example access commands for the VDMA described in Sih. RX-0005C at Q/A 103 (citing RX-0124, ¶¶ 33, 36-43). Although there is no explicit identification of an output port in Sih, Dr. Subramanian submits that one of ordinary skill would read the description of access commands in Sih to understand that the VDMA controller provides access requests with memory addresses through an appropriate output port. *Id.*

Broadcom argues that the identified disclosures in Sih fail to identify "access requests for lists of addresses in a memory" as claimed in the '752 patent. CIB at 111-13. As Dr. Wolf explains, Sih only explicitly describes the commands that are sent to the VDMA controller rather than requests that are output from the VDMA controller. CX-0014C at Q/A 68. Dr. Wolf submits that Dr. Subramanian's testimony "is not supported by any explanation or analysis that would form the proper basis for an obviousness argument." *Id.* at Q/A 69. This rebuttal testimony is legal argument rather than expert opinion, however, and Dr. Wolf does not explain why she believes that Dr. Subramanian's opinion is unsupported. He cites Sih's disclosure that the VDMA controller receives commands that it "translates into single dimensional storage addresses." RX-0124, ¶ [0033]. He further cites disclosures in Sih indicating that video data is

retrieved based on the addresses provided by the VDMA controller. RX-0005C at Q/A 104. This evidence shows that the existence of access requests output from the VDMA controller is inherent in Sih—under the construction adopted above for "access requests for lists of addresses in a memory," an access request meeting this limitation need only include a list with at least one memory address. The VDMA controller clearly receives commands to generate such requests, which specify "single dimensional storage addresses." The "output port" limitation is thus inherently disclosed in Sih.

**c. "over a link to a memory controller"**

Dr. Subramanian identifies the DSP bus 23 as the claimed "link," connecting the VDMA controller 26 to memory controller 29. RX-0005C at Q/A 105-06. Sih provides that the VDMA controller resides on the processor bus and DSP bus, and "is capable of transferring data between any memory of CODEC 20, including external memory 16, video memory 15, DSP memory 41, . . ." RX-0124, ¶ [0033]. Sih also states: "Memory controller 29 arbitrates access to video memory 15 between processor bus 21, DSP bus 23, and input/output (I/O) bus 25." *Id.*, ¶ [0031].

Broadcom argues that there is no explicit disclosure in Sih of access requests provided over the DSP bus from the VDMA controller to the memory controller. CIB at 113-14; CX-0014C (Wolf RWS) at Q/A 75. But for the same reasons discussed above with respect to the claimed access requests, the disclosures show that this limitation is inherent in Sih. The VDMA controller in Sih receives commands that it "translates" into addresses in memory, the memory controller in Sih controls access to memory, and the DSP bus in Sih connects the VDMA controller to the memory controller. RX-0124, ¶¶ [0031], [0033], Fig. 3. Broadcom offers no alternative interpretation of these disclosures that casts any doubt on Dr. Subramanian's opinion that the requested addresses would be sent from the VDMA controller to the memory controller

over the DSP bus. Accordingly, Respondents have met their burden to show that the "link" limitation is disclosed in Sih.

**d. "a queue for queuing the access requests for the lists of addresses"**

With respect to the "queue" limitation of claim 1, Respondents rely on a combination of Sih with Foster. RIB at 109-10. As discussed above, Foster explicitly discloses a queue for access requests that anticipates this limitation. Dr. Subramanian submits that a person of ordinary skill would have been motivated to implement Foster's queue in the system of Sih because of the large amount of data necessary for motion prediction and to maximize the bandwidth utilization of Sih's memory controller. RX-0005C at Q/A 117. Sih explicitly recognizes that using an additional bus that allows for simultaneous access to various components "increase[es] the overall bandwidth of the digital video device." RX-0124, ¶ [0031]. The memory in Foster "is preferably optimized for maximum bandwidth by employing a large queue of multiple memory requests from several decoder pipelines within the video decoder." RX-0109 at 7:41-44.

Broadcom argues that the optimization described in Foster would not be applicable to the system in Sih because Foster is concerned with reordering requests between memory banks, while Sih does not disclose multi-bank memories. CIB at 117; CX-0014C (Wolf RWS) at Q/A 84. In reply, Respondents argue that most memories used in video encoding and decoding at the time of the '752 patent used multi-bank configurations, citing Dr. Subramanian's testimony and the explicit disclosures in Foster and Yoshioka. RRB at 48 (citing RX-0005C at Q/A 45, 121, 123). The fact that multi-bank memories were common in this field is confirmed by the background section of the '752 patent, which describes dynamic random access memory (DRAM) used in integrated circuits at the time, explaining: "A DRAM can comprise any number

of banks, although four is typical." '752 patent at 1:39-40. The evidence in Foster, Yoshioka, and the background of the '752 patent thus corroborates Dr. Subramanian's opinion that multi-bank memories would have been well-known to persons of ordinary skill in the art and likely used for the system in Sih. I further agree with Respondents that one of ordinary skill in the art would have been motivated to optimize bandwidth for the system in Sih, and that Foster discloses one way to improve optimization for multi-bank memories by implementing a queue.

Broadcom further argues that Respondents have failed to establish that there would be a reasonable expectation of success in combining Sih with the queue disclosed in Foster. CIB at 117-18. Although Dr. Subramanian does not directly opine on this question, he identifies a queue that is already implemented in Sih as command buffer 70. RX-0005C at Q/A 113-14; *see* RX-0124, ¶ [0057]. Moreover, he notes that both Sih and Foster implement standard video encoding and decoding processes with motion compensation functions. *Compare* RX-0109, col: 1:33-35 (describing an example MPEG video decoder system), 9:32-33 (describing an example where "a motion compensation unit may be generating requests for a block of data it is processing") *to* RX-0124, ¶ [0004] (describing MPEG standards), ¶¶ [0048]-[0049] (describing the operation of "motion estimation unit 24"). The fact that a queue was implemented in Sih and that Sih and Foster implement the same video standards is evidence that there would be a reasonable expectation of success implementing Foster's queue in the system disclosed in Sih. Accordingly, I find that the "queue" limitation of the '752 patent is rendered obvious by Sih in view of the teachings in Foster.

For the reasons discussed above, claim 1 of the '752 patent is invalid for obviousness in view of Sih in combination with Foster.

**e. Claim 2**

Respondents contend that the limitations of claim 2 are disclosed in Sih. RIB at 110-12. With respect to the "input port" of claim 2, Respondents point to Sih's disclosure that "processor 30 and DSP 28 issue VDMA controller 26 access commands specifying multidimensional blocks of video data, which VDMA controller 26 translates into single dimensional storage addresses." RX-0124, ¶ [0033]. Dr. Subramanian further explains that processor 30, DSP 28, and motion estimation unit 24 operate as a "motion prediction processing unit" that sends requests to the VDMA controller. RX-0005C at Q/A 118.

With respect to the "logic" of claim 2, Dr. Subramanian explains that the VDMA controller generates lists of addresses from the requests. *Id.* at Q/A 119. In particular, Sih discloses that "[p]rocessor 30 and DSP 28 program VDMA controller 26 by issuing commands that include a set of parameters specifying the block to transfer," and "[i]n response, VDMA controller 26 performs all address calculations necessary to transfer non-contiguous video data from video memory 15 to internal memory of motion estimation unit 24." RX-0124, ¶¶ [0035], [0045]. Dr. Subramanian further explains that Sih's disclosures make it clear that the addresses "correspond to addresses in a memory that store pixels in the blocks of pixels." RX-0005 at Q/A 120.

Broadcom argues that the requests sent to the VDMA controller are not "requests for blocks of pixels," as required by claim 2. CIB at 118; CX-0014C (Wolf RWS) at Q/A 91. Broadcom's arguments are directly contradicted by disclosures in Sih, however, describing the commands sent to the VDMA controller as "specifying multidimensional blocks of video data." RX-0124, ¶ [0033]. In an earlier part of the specification describing the invention, Sih states that "[t]he CODEC of source device 4, for example, operates on blocks of pixels within the sequence

of video images in order to encode the video data." RX-0124, ¶ [0024]. These limitations are thus explicitly disclosed in Sih, and accordingly, claim 2 of the '752 patent is invalid for obviousness in view of Sih in combination with Foster.

**f. Claim 4**

Respondents contend that the limitations of claim 4 are disclosed in Sih or are obvious in view of Sih in combination with Yoshioka. RIB at 112-14. Dr. Subramanian explains that memory used for video decoding at the time of the '752 patent almost always used multiple banks. RX-0005C at Q/A 121. As discussed above, I find this testimony to be credible based on the corroborating evidence in Foster, Yoshioka, and the background of the '752 patent. Broadcom argues, however, that access requests do not necessarily need to include bank information even if multi-bank memory is used. CIB at 118-19; CX-0014C (Wolf RWS) at Q/A 98. Respondents' argument does not rest on a claim that bank information is necessary, however, only that it would be obvious to one of skill in the art. The disclosures in Foster and Yoshioka indicate that including bank information in access requests is obvious and unremarkable. In particular, Foster assumes that bank information is provided, describing a reordering of requests between banks. RX-0109 at 10:15-19, Table I, Table II. In Yoshioka, the requests for blocks of data explicitly include bank and row information. *See* RX-0005C (Subramanian DWS) at Q/A 122 (citing RX-0133, Figs. 7A, 15A, 15B, Fig. 19, cols. 5:9-14, 26:22-27, 32:23-29). Based on these disclosures, claim 4 of the '752 patent is invalid for obviousness in view of Sih in combination with Foster and/or Yoshioka.

**g. Claim 5**

Respondents contend that Sih discloses the limitations of claim 5, citing the disclosure that the commands issued to the VDMA controller include parameters including the "Video

block width" and the "Video block length." RX-0124, ¶¶ [0035], [0036], [0037]. As discussed above, these commands are translated into the claimed "access requests" by the VDMA controller. *See Id.*, ¶ [0033] ("[P]rocessor 30 and DSP 28 issue VDMA controller 26 access commands specifying multidimensional blocks of video data, which VDMA controller 26 translates into single dimensional storage addresses."). Dr. Subramanian further explains that the access requests in Sih must necessarily access multidimensional video data of a particular size, citing Sih's description of the operation of the CODEC, which "divides a video image frame to be transmitted into macroblocks comprising a number of smaller image blocks." RX-0005C at Q/A 125-26 (quoting RX-0124, ¶ [0024]).

Broadcom argues that merely identifying length and width parameters is insufficient to meet the limitations of claim 5. CRB at 51. But Sih further discloses that "the video block width and video block length are used to define the dimensions of the desired rectangular block in bytes." RX-0124, ¶ [0044]. In addition, "[t]he source and destination memory word widths allow VDMA controller 26 to determine whether data packing is necessary when transferring the data." *Id.* These disclosures explicitly describe how access requests are generated in Sih based on the sizes of the requests for blocks of pixels, and accordingly, claim 5 of the '752 patent is invalid for obviousness in view of Sih in combination with Foster.[18]

[18] Respondents further contend that the limitations of claim 5 are obvious in view of Sih in combination with Rovati, but Respondents' case for combining these references fails for the same reasons discussed in the context of claim 5 with respect to Foster. Dr. Subramanian only offers conclusory testimony that "Sih and Rovati are both directed to image encoding and decoding," identifying generic references to "bandwidth" in each reference. RX-0005C at Q/A 127. Respondents and Dr. Subramanian fail to identify any credible motivation for implementing the "refill logic" of Rovati in the system of Sih, and this alternative theory for obviousness does not meet the clear and convincing standard.

**h. Claim 6**

Respondents contend that the additional limitations of claim 6 are disclosed in Sih. RIB at 116-17. Dr. Subramanian identifies Sih's processor bus 21 as the claimed "bus shared with one or more clients," explaining that it connects the motion estimation unit 24, video memory 15, and the VDMA controller 26. RX-0005C at Q/A 129. Sih discloses that "VDMA controller 26 may copy one or more blocks of video data from video memory 15 to motion estimation unit 24." RX-0124, ¶ [0033]. Dr. Subramanian explains that copying the video data is "essentially the same from a hardware and firmware perspective as 'receiving' the data and forwarding it on." RX-0005C at Q/A 130. Broadcom argues, however, that copying video data cannot satisfy the claim limitation requiring that the memory access unit "receives data." CIB at 121-22. According to Dr. Wolf, "[a] component that receives data and then forwards that data onto another component would need different programming, whether that is in hardware or firmware, when compared to a component that does not receive the data but instead just direct[s] the data to go from memory to the requesting component, which is how Sih operates." CX-0014C at Q/A 108. On this record, it is unclear whether Sih's VDMA controller receives the video data that it copies, and Dr. Subramanian cites no evidence for his opinion that copying the data is "essentially the same" as receiving it. Respondents have thus failed to meet their clear and convincing burden to show that claim 6 is obvious in view of Sih.

In the alternative, Respondents contend that claim 6 is obvious in view of Sih in combination with U.S. Patent No. 6,697,882 (RX-0078, "Matsui"). RIB at 118-120. Matsui is a patent that issued in February 2004, naming inventor Nobuako Matsui and assignee Canon Kagushiki Kaisha. RX-0078, cover. Dr. Subramanian explains that Matsui discloses a rendering processor that uses multiple DMA controllers that read and write data between memory and

other clients. RX-0005C at Q/A 133-135. In his opinion, Matsui shows that Sih's VDMA controller could have been modified to receive video data before sending it to the motion estimation unit using a well-known design choice with predictable results. *Id.* at Q/A 136. I agree with Broadcom, however, that Respondents have failed to identify any motivation to combine Sih with Matsui—Dr. Subramanian does not identify any benefit to implementing Matsui's processes for accessing memory. *See* CIB at 121-22; CX-0014C (Wolf RWS) at Q/A 111. Moreover, although Matsui's disclosure supports Dr. Subramanian's opinion that receiving video data in a controller is a choice for data transfer that would have been known to one of skill in the art, a single example is not sufficient to establish that implementing this process would have been a simple "design choice." *See Polaris Industries, Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 n.4 (Fed. Cir. 2018) ("The Board failed to consider that merely stating that a particular placement of an element is a design choice does not make it obvious. Instead, the Board must explain why a person of ordinary skill in the art would have selected these components for combination in the manner claimed.").

Respondents have thus failed to show that claim 6 of the '752 patent is obvious in view of Sih.

**i. Claim 7**

With respect to claim 7, Respondents identify Sih's disclosure that "VDMA controller 26 performs all address calculations necessary to transfer non-contiguous video data from video memory 15 to internal memory of motion estimation unit 24." RX-0124, ¶ [0045].. As explained by Dr. Subramanian, these calculations are referenced earlier in Sih when describing "the high-number of address calculations that is typically required to access video data due to the non-sequential manner in which video data is typically stored." RX-0005C at Q/A 138 (quoting RX-

0124, ¶ [0034]. Broadcom argues that this disclosure fails to show that the VDMA controller generates "access requests" for the non-contiguous data. CIB at 122-23; CX-0014C (Wolf RWS) at Q/A 114. As discussed above, however, it would be obvious to one of skill in the art that the VDMA controller generates such requests, and the additional disclosures identified by Dr. Subramanian show that the requests would include non-contiguous addresses. Accordingly, claim 7 of the '752 patent is invalid for obviousness in view of Sih in combination with Foster.

**j. Claim 8**

With respect to claim 8, Respondents rely on the same disclosures in Sih identified above for claim 6. RIB at 120-21. These arguments for obviousness of claim 8 fails for the same reasons discussed above for claim 6—there is insufficient evidence that one of ordinary skill in the art would read Sih to disclose that the VDMA controller "receives data stored at the addresses in the memory." Dr. Subramanian cites the disclosures describing the copying of blocks of video data from memory to the motion estimation unit, RX-0005C at Q/A 140, but Sih does not disclose that the VDMA controller receives this data.

In the alternative, Respondents contend that Sih renders claim 8 obvious in combination with Foster. RIB at 121-22. As discussed above, Foster discloses data buses that accommodate reading and writing between a memory interface and memory controllers, and these disclosures are sufficient to render claim 8 obvious. Dr. Subramanian suggests that one of ordinary skill would have been motivated to implement Foster's dedicated bus in the system of Sih. RX-0005C at Q/A 143-46. He does not explain how the teachings of Foster would lead one of ordinary skill in the art to incorporate the receiving of data in Sih's VDMA controller, however. Respondents have thus failed to show that Sih renders claim 8 obvious, alone or in combination with Foster.

### 4. Secondary Considerations of Non-Obviousness

Broadcom argues that the commercial success of products practicing the '752 patent are evidence of non-obviousness. CIB at 124. Broadcom engineer Tim Hellman suggests that [redacted] CX-0014C at Q/A 123.

I agree with Respondents, however, that the evidence cited by Broadcom fails to establish a nexus between the commercial success of its products and the alleged invention of the '752 patent. *See* RIB at 122-23. The Federal Circuit has required "[a] nexus between the merits of the claimed invention and evidence of secondary considerations . . . in order for the evidence to be given substantial weight in an obviousness decision." *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 668 (Fed. Cir. 2000). Broadcom relies entirely on its own documents and the testimony of its own employee—there is no objective evidence for why its customers chose Broadcom's products over those of its competitors. Moreover, Broadcom's claim [redacted]

[redacted]. *See* CIB at 166, 200. Moreover, Mr. Hellman's testimony is [redacted], which is the wrong timeframe for obviousness—such evidence is not "a useful indicator of whether the invention would have been obvious to such persons at the time it was made." *Vulcan Eng'g Co. v. Fata Aluminium, Inc.*, 278 F.3d 1366, 1373 (Fed. Cir. 2002); *see also Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1378 (Fed. Cir. 2012) ("These objective criteria thus help turn back the clock and place the claims in the context that led to their invention."). Broadcom has identified no reliable evidence showing that the commercial success of its products is related to the features claimed in the '752 patent, and accordingly, this evidence does not meaningfully impact the obviousness determinations set forth above.

## VII. THE '027 PATENT

### A. Background and Specification

The '027 patent is entitled "Graphics display system with graphics window control mechanism" and issued May 5, 2009. '027 patent (JX-0006), cover. The '027 patent describes a system for displaying graphics images in windows. *Id.*, Abstract. In particular, the alleged invention organizes graphics images into windows and orders the display of the windows by depth, blending graphics images using transparency information. *Id.* at 2:7-15, 15:41-47. Information about the windows is contained in a header packet, which is passed from a window controller to a display engine. *Id.* at 15:48-56.

### B. Level of Ordinary Skill in the Art

Broadcom's expert, Dr. Jeffrey J. Rodriguez, submits that one of ordinary skill in the art for the '027 patent "would have had at least a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, with one to two years of experience

in digital signal, image and video processing." CX-0008C at Q/A 13. Respondents have proposed that ordinary skill in the art would require four years of experience in implementing hardware and software based graphics processors. *Id.* at Q/A 14; RX-0001C (Bovik DWS) at Q/A 23 (citing RDX-0001.003). Both Dr. Rodriguez and Respondents' expert, Dr. Alan Bovik, submit that the differences between the proposed levels of ordinary skill in the art do not affect their opinions. CX-0008C (Rodriguez DWS) at Q/A 15; RX-0001C (Bovik DWS) at Q/A 24. Because only Dr. Rodriguez offered any substantive testimony addressing the level of ordinary skill in the art, I adopt Broadcom's proposal. *See* CX-0008C (Rodriguez DWS) at Q/A 16

### C. Asserted Claims

Broadcom asserts claims 11 and 20 of the '027 patent. CIB at 127. Claim 11 is an independent claim, reciting:

> 11. A system for processing graphics images, comprising:
>
> a window controller for obtaining data that describes windows in which the graphics images are displayed, and for sorting the data in accordance with respective depths of the windows;
>
> a display engine for blending the graphics images using alpha values associated with the graphics images; and
>
> a memory for storing the graphics images,
>
> wherein the window controller transmits header packets to the display engine, each header packet containing at least a portion of the data, said portion describing at least one of the windows, and
>
> wherein the graphics images are transferred from the memory to the display engine responsive to said header packets.

'027 patent at 60:3-17. Claim 20 depends from claim 11, adding a limitation: "wherein the display engine comprises a graphics converter for receiving the graphics images, wherein the graphics converter is capable of placing the graphics images into a common format." *Id.* at 60:48-51.

## D. Claim Construction

In the *Markman* process, the parties disputed the constructions of three claim terms.

### 1. "window controller" (claim 11)

The parties dispute the construction of the term "window controller" in claim 11.

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "window controller" | plain and ordinary meaning | "hardware component specifically designed to control windows" |

CMIB at 20-23; CMRB at 9-11; RMIB at 19-22; RMRB at 10-12; RPHB at 204-05.

Respondents argue that the "window controller" must be a distinct hardware component that is separate from the claimed "display engine" and "memory," and must perform specialized tasks for controlling windows. The specification of the '027 patent describes a "window controller 56" that is separate from a "memory controller 54," "display engine 58," and other components. '027 patent at 4:16-19.

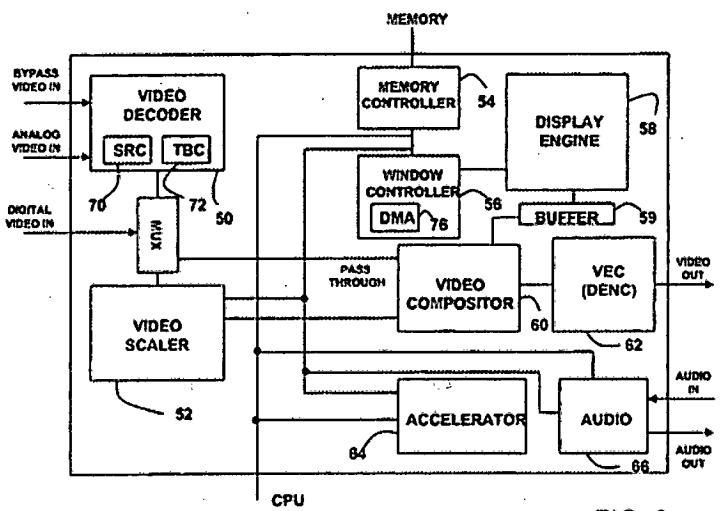


FIG. 2

*Id.*, Fig. 2. The specification further provides that the window controller "performs window sorting at each display," "selects a window descriptor with the smallest window layer value to be

processed," and "transfers the graphics data for the bottom-most graphics window to be processed first." '027 patent at 17:17-60. Respondents further cite the prosecution history, where the applicant argued "that the actions 'sorting the data' is performed 'using', and 'transmitting header packets' is 'from', the same structure, 'the window controller'." JX-0010.01400, Resp. to Office Action at 3 (Apr. 14, 2008).

Broadcom argues that the '027 patent describes the window controller more broadly. The architecture of the invention is depicted at a high level in Figure 1, and the specification states: "the graphics display system according to the present invention is preferably contained in an integrated circuit 10." '027 patent at 3:46-48, Fig. 1. The specification further states that "the graphics display system performs all graphics, video and audio functions assigned to it by software." *Id.* at 4:8-13. The '027 patent describes Figure 2 as "a block diagram of certain functional blocks of the system," *Id.* at 2:22-23, not a schematic depicting specific hardware. Broadcom thus argues that a "window controller" could be embodied in a variety of hardware, including as software implemented on a general processor.

I agree with Broadcom that there is no basis for limiting the claimed "window controller" of the '027 patent to any distinct or specialized hardware. Neither the specification nor the prosecution history contains any definition or disclaimer for the "window controller." Accordingly, this term shall have its plain and ordinary meaning, requiring only a component that controls windows.

### 2. "sorting the data in accordance with respective depths of the windows" (claim 11)

The parties dispute the construction of the term "sorting the data in accordance with respective depths of the windows" in claim 11.

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "sorting the data in accordance with respective depths of the windows" | plain and ordinary meaning | "using a sorting algorithm to sort the data in accordance with respective depths of the windows" |

CMIB at 23-25; CMRB at 11-12; RMIB at 22-23; RMRB at 12-13; RPHB at 205.

Respondents argue that the claimed "sorting" requires an algorithm, citing the description of sorter 304 in the specification, which states: "The sorting may be implemented using binary tree sorting or any other suitable sorting algorithm." '027 patent at 17:66-18:2. This specification language is not definitional, however, merely stating that sorting "may be implemented" using an algorithm. This is insufficient to import an "algorithm" limitation into the claim. Respondents' proposed construction otherwise tracks the claim language and accordingly, there is no construction necessary for this term.

### 3. "header packet" (claim 11)

The parties dispute the construction of the term "header packet" in claim 11.

| Claim Term | Broadcom's Proposed Construction | Respondents' Proposed Construction |
|---|---|---|
| "header packet" | plain and ordinary meaning | "identification or control information packet placed at the beginning of its corresponding window's graphic images" |

CMIB at 25-27; CMRB at 12-14; RMIB at 23-24; RMRB at 13-14; RPHB at 205-07.

Respondents' proposed construction is based on a dictionary definition that was cited by Broadcom in its *Markman* briefing—the IEEE Dictionary defines a "header" as either "[a] block

of comments placed at the beginning of a computer program or routine" or "[i]dentification or control information placed at the beginning of a file or message." CMRB at 14.[19] Respondents argue that all of the definitions for "header" cited by the parties include the concept of information being placed at the beginning of a message or file. RPHB at 206-07. Respondents argue that the claim language itself also supports such a construction, indicating that header packets are transmitted before the graphics images are transferred "responsive to said header packets." '027 patent at 60:11-17. The specification states: "A header packet preferably indicates the start of graphics data for one graphics window." *Id.* at 15:57-58.

Broadcom agrees that a "header packet" corresponds to a specific window and contains information relating to that window, but opposes a construction that requires the header packets to "precede" or "identify" the graphics data. Broadcom argues that the information in the header packet corresponds to the window rather than the graphics data, and I agree that this interpretation is more consistent with the claim language. Claim 11 requires that "each header packet contain[] at least a portion of the data, said portion describing at least one of the windows." '027 patent at 60:11-14. The "at least a portion of the data" refers to the "data that describes windows" at the beginning of the claim. *Id.* at 60:4-5. I agree with Respondents that the claim language further requires that the header packet precede the graphics images, but there is no basis for imposing any additional limitations beyond the requirement that the graphics images are transferred "responsive to said header packets."

[19] Prior to the *Markman* hearing, Respondents had proposed a different construction for header packet: "a packet that precedes and identifies the corresponding window's graphics data that follows." RMIB at 23.

Accordingly, a "header packet" shall be construed to mean identification or control information for a window that is transmitted prior to the graphics images for the window.

### E. Infringement

Broadcom accuses certain DENSO TEN, Panasonic, and Pioneer head units of infringing claims 11 and 20 of the '027 patent. CIB at 127, Appendix 2 at 9-11. In particular, the accused products for the '027 patent are DENSO TEN, Panasonic, and Pioneer head units incorporating Renesas [redacted] SoCs and [redacted] head units incorporating Socionext [redacted] SoCs. *Id.* Broadcom's infringement allegations are supported by the testimony of Dr. Jeffrey J. Rodriguez. CX-0008C at Q/A 27-205.

#### 1. Infringement by [redacted] Products

Dr. Rodriguez performed separate analyses for the DENSO TEN, Panasonic, and Pioneer head units incorporating Renesas [redacted] SoCs. CX-0008C at Q/A 34-83, 129-205. In their post-hearing briefs, Broadcom and the Respondents address the alleged infringement of these products together. CIB at 130-43; RIB at 124-33. Respondents rely on rebuttal expert testimony from Dr. Alan Bovik (RX-0007C) and Dr. Jing Hu (RX-0010C).

##### a. Claim 11 preamble

There is no dispute that the accused head units incorporating [redacted] SoCs comprise a "system for processing graphics images," meeting the preamble language of claim 11. Dr. Rodriguez cites Renesas deposition testimony and the user manuals for [redacted] SoCs, describing specifications for "graphics" and "video processing." CX-0008C at Q/A 38, 132, 168 (citing JX-0052C (Igarashi Dep. Tr.) at 114-15, JX-0120C, JX-0090C).

**b. "a window controller for obtaining data that describes windows in which the graphics images are displayed"**

Dr. Rodriguez identifies [redacted] in the [redacted] SoCs running [redacted]. CX-0008C at Q/A 41, 135, 171. He cites specifications and user manuals, deposition testimony, and source code describing the operation of the [redacted] SoCs with respect to displaying windows. *Id.* at Q/A 42-44, 136-38, 172-74 (citing JX-0090C, CX-0966C, JX-0054C (Kanemaru Dep. Tr.) at 73-75, CPX-1605C, CPX-1302C, CPX-1591C, CPX-1713C). Respondents only dispute infringement of this limitation under their proposed construction for "window controller," which was rejected above. *See* RRB at 54.

**c. "sorting the data in accordance with respective depths of the windows"**

Dr. Rodriguez's infringement analysis for the "sorting" limitation relies on the [redacted] pointing to a section of source code for the Renesas products that [redacted]. CX-0008C at Q/A 45, 138, 173 (citing CPX-1612C, CPX-1302C, CPX-1713C). This sorting is depicted in a Renesas specification, [redacted] (the accused "windows") are sorted based on the [redacted].

[redacted]

JX-0080C.0034 ([redacted] Specification at 28). Respondents argue, however, that the accused products never sort windows using the [redacted]. RIB at 125-27. Relying on the source code analysis of Dr. Hu, Respondents submit that the [redacted]

[redacted] in the accused head units incorporating [redacted] SoCs. RX-0010C at Q/A 42-43. Dr. Hu identifies a function called [redacted] in the source code for the Panasonic, DENSO TEN, and Pioneer products. *Id.* at Q/A 43 (citing RPX-0159C, RPX-0234C, RPX-0136C, RPX-0195C). She explains that these [redacted], and accordingly, the source code cited by Dr. Rodriguez does not [redacted]. *Id.* at Q/A 44. She explains that the [redacted] *Id.* at Q/A 45.

Broadcom argues that whether the accused products actually [redacted] is legally irrelevant. CIB at 133-34; CRB at 57. Broadcom cites *Fantasy Sports Properties, Inc. v. Sportsline.com, Inc.*, where the Federal Circuit held that there was a material dispute regarding infringement where infringing software could be activated by a user. 287 F.3d 1108, 1118 (Fed. Cir. 2002). The Federal Circuit held that "although a user must activate the functions programmed into a piece of software by selecting [infringing] options, the user is only activating means that are already present in the underlying software." *Id.* But the court further held that "in order to infringe the [] patent, the code underlying an accused fantasy football game must be written in such a way as to enable a user of that software to utilize the function of awarding bonus points for unusual plays such as out-of-position scoring, without having to modify that code." *Id.* With respect to the [redacted] products, Dr. Rodriguez has identified evidence that the Renesas SoCs could have been designed to [redacted], but the source code confirms that this design was not implemented in the accused products. In contrast to the accused functionality in *Fantasy Sports Properties*, the claimed sorting cannot be enabled by a user of one of accused Panasonic, DENSO TEN, or Pioneer head units. There is no evidence that Toyota or the driver of a Toyota vehicle has any access to the [redacted]—according to Dr. Hu, enabling [redacted]

[redacted]. *See* RX-0010C at Q/A 42-45. Where a source code modification would be necessary to enable the infringing functionality, the precedent in *Fantasy Sports Properties* supports a finding of non-infringement.

In the alternative, Broadcom argues that the accused products infringe the sorting limitation based on the [redacted] that Dr. Hu and Dr. Bovik concede is used for [redacted] CIB at 133; CRB at 57-58. Respondents disagree, citing Dr. Bovik's testimony explaining that the [redacted], and the accused products do not [redacted]. RRB at 55-56 (citing Tr. (Bovik) at 754-56, 760). In the Renesas specification cited by Broadcom, the [redacted]. *See* Tr. (Bovik) at 755:20-756:2 (referencing JX-0080.0034, Figure 3.2: [redacted]. Dr. Bovik further testified that he [redacted] *Id.* at 756:3-6. I find Dr. Bovik's testimony to be consistent with the description of "sorting" in the specification, '027 patent at 17:66-18:2, and the ordinary meaning for this term, which requires [redacted]. Accordingly, the accused [redacted] products do not infringe the "sorting" limitation of claim 11.

**d. "a display engine for blending the graphics images using alpha values associated with the graphics images"**

Dr. Rodriguez identifies a [redacted] and a [redacted] collectively form a [redacted] for blending the graphics. CX-0008C at Q/A 55, 142, 178. Mr. Abe, a Renesas witness, admitted that [redacted], which are [redacted] JX-0052 (Abe Dep. Tr.) at 114-15. There is no dispute with respect to infringement of the "display engine" limitation.

**e. "a memory for storing the graphics images"**

Dr. Rodriguez identifies a [redacted] in the [redacted] SoCs and [redacted] in the accused head units. CX-0008C at Q/A 58, 144, 181. There is no dispute with respect to infringement of the "memory" limitation.

**f. "the window controller transmits header packets to the display engine, each header packet containing at least a portion of the data, said portion describing at least one of the windows"**

As discussed above, the [redacted] products include [redacted] that meets the "window controller" limitation and a [redacted] that meets the "display engine" limitation. Dr. Rodriguez further identifies [redacted] that are [redacted] for use by the [redacted]. CX-0008C at Q/A 62-63, 146-47, 183-85. Citing a Renesas manual, he identifies [redacted]. *Id.* at Q/A 63, 147, 185 (citing JX-0090C). He further confirmed that these parameters are set in the source code for the DENSO TEN and Panasonic head units. *Id.* at Q/A 64, 148. With respect to Pioneer head units, Dr. Rodriguez offered his opinion that the [redacted] that is implemented is similar to the DENSO TEN and Pansonic head units. *Id.* at Q/A 186-89.

Respondents argue that this limitation is not infringed because the [redacted] are not "header packets," relying on Dr. Bovik's testimony that a header packet must [redacted] with the corresponding graphics data. RX-0007C at Q/A 52-53. This opinion relies on Respondents' proposed construction for "header packet," however, which has been rejected. The only requirement in the claim language is that graphics images are transferred "responsive to said header packets," which is addressed in the next claim limitation.

Respondents further argue that this limitation is not infringed because the alleged [redacted] correspond to [redacted]. RIB at 130-31. Dr. Bovik testifies that "a [redacted] *Id.* at Q/A 60. Dr. Bovik correctly recognizes that the Renesas manual cited by Dr. Rodriguez refers to [redacted]. JX-0090.00026833-36 (Renesas [redacted] User's Manual section 32.1.8). But this does not appear to be a relevant distinction, because in another part of the same document, the [redacted] JX-0090.1400, Figure 24.2. A preponderance of the evidence thus supports Dr. Rodriguez's interpretation of the source code and manual.

Accordingly, Broadcom has carried its burden to show infringement of the "header packet" limitation by the [redacted] products.

**g. "the graphics images are transferred from the memory to the display engine responsive to said header packets"**

Dr. Rodriguez identifies evidence that the [redacted] discussed above and [redacted]. CX-0008C at Q/A 71 (citing JX-0090C). The Renesas [redacted] User's Manual provides that [redacted] and "the [redacted] JX-0090C.02090-91. Dr. Rodriguez further cites evidence that [redacted]. CX-0008C at Q/A 71 (citing JX-0090C). He also reviewed source code confirming that [redacted] in the DENSO TEN, Panasonic, and Pioneer head units. *Id.* at Q/A 72, 155, 196.

Respondents argue that the graphics images are not transferred "responsive to" the header packets. RIB at 132-33. Dr. Hu analyzed the source code for the [redacted] products,

concluding that the [redacted]. RX-0010C at Q/A 64 (citing RPX-0161C, RPX-0252C, RPX-0209C, RPX-0198C). She further determined that the [redacted], rather than the claimed header packets. *Id.* at Q/A 67 (citing RPX-0248C, RPX-0235C, RPX-0236C). In reply to this evidence, Dr. Rodriguez testifies that [redacted] CX-0008C at Q/A 76. Broadcom further argues that a causal response is not required to meet the claim limitation requiring the transfer of images "responsive to" the header packets, only that the transfer is based on information contained in the header packet. CRB at 60-61.

I agree with Broadcom's reading of the claim language, and there is no dispute that certain of the [redacted] identified by Dr. Rodriguez, such as the [redacted], would be necessary to [redacted]. This is sufficient to show infringement of this limitation.

As discussed above, however, the [redacted] products do not infringe claim 1 because they do not infringe the "sorting" limitation.

**h. Claim 20**

With respect to claim 20, Dr. Rodriguez identifies disclosures in the Renesas [redacted] User's Manual describing [redacted]. CX-0008C at Q/A 83, 163, 201 (citing JX-0090C). There is no dispute that the accused products infringe this limitation, but they cannot infringe claim 20 because they do not infringe claim 11.

### 2. Infringement by [redacted] Products

Dr. Rodriguez separately analyzed the DENSO TEN products incorporating Socionext [redacted] SoCs (the "[redacted] products"). CX-0008C at Q/A 84-128.

#### a. Claim 11 preamble

There is no dispute that the [redacted] products comprise a system for processing graphics images, in accordance with the preamble of claim 11. CX-0008C (Rodriguez DWS) at Q/A 88.

#### b. "a window controller for obtaining data that describes windows in which the graphics images are displayed"

Dr. Rodriguez [redacted] in the [redacted] SoCs that run software for [redacted]. CX-0008C at Q/A 92. He cites specifications and user manuals, deposition testimony, and source code describing the operation of the [redacted] products with respect to [redacted]. *Id.*, at Q/A 93-94 (citing CX-0975C, CX-1025C, JX-0059C (Nakahara Dep. Tr.) at 120-24, JX-0060C (Nakahara Dep. Tr.) at 160-64, CPX-0634, CPX-0635). Respondents only dispute infringement of this limitation under their proposed construction for "window controller," which was rejected above. *See* RRB at 63.

#### c. "sorting the data in accordance with respective depths of the windows"

With respect to the "sorting" limitation, Dr. Rodriguez identifies the function [redacted] in the [redacted] source code. CX-0008C at Q/A 95 (citing CPX-0636). According to Dr. Rodriguez, this function receives an input [redacted] that specifies the [redacted] and the [redacted]. *Id.*

Respondents argue that the [redacted] products do not infringe this limitation because the function identified by Dr. Rodriguez merely [redacted]. RIB 134-35. Based on Dr. Hu's analysis of the source code, the [redacted] function is only [redacted]. RX-0010C at

Q/A 77-85. Dr. Hu further testifies that the function does not perform [redacted], merely [redacted]. *Id.* at Q/A 86.

In reply, Broadcom argues that the claimed sorting is completed [redacted]. CRB at 62. As discussed above in the context of the R-Car Gen 2 products, however, this limitation requires [redacted]. Accordingly, Broadcom has not shown that the [redacted] products infringe the "sorting" limitation of claim 11.

**d. "a display engine for blending the graphics images using alpha values associated with the graphics images"**

Dr. Rodriguez identifies a [redacted] in the [redacted] products that [redacted]. CX-0008C at Q/A 100. His opinion is supported by a Socionext product specification and the testimony of a Socionext witness. *Id.* at Q/A 101-02 (citing CX-0975, JX-0057C). There is no dispute with respect to infringement of the "display engine" limitation.

**e. "a memory for storing the graphics images"**

Dr. Rodriguez identifies [redacted] in the [redacted] products that is used to store image data. CX-0008C at Q/A 104-06 (citing CX-1025C, CX-0975C, JX-0057C, CX-0981C). There is no dispute with respect to infringement of the "memory" limitation.

**f. "the window controller transmits header packets to the display engine, each header packet containing at least a portion of the data, said portion describing at least one of the windows"**

Dr. Rodriguez identifies software that sets registers in the [redacted] of the [redacted] products. CX-0008C at Q/A 110. He identifies certain registers that [redacted] *Id.* at Q/A 93. In his opinion, these registers are the claimed "header packets," and he further identifies "a function [redacted]." *Id.* at Q/A 110 (citing CPX-0637).

Respondents argue that these registers cannot comprise a "header packet," RIB at 137-39, but these arguments rely on Respondents' rejected claim construction. Accordingly, the [redacted] products infringe the "header packet" limitation of claim 11.

**g. "the graphics images are transferred from the memory to the display engine responsive to said header packets"**

Dr. Rodriguez submits that the CPU in the [redacted] products sets registers and that "graphics images are transferred from memory to the [redacted] CX-0008C at Q/A 117. This opinion is based on the testimony of a Socionext witness, identifying [redacted] *Id.* at Q/A 118 (quoting JX-0057C (Nagashima Dep. Tr.) at 124). He further identifies [redacted] *Id.* (quoting JX-0057C (Nagashima Dep. Tr.) at 119-125).

Respondents argue that the [redacted] the register settings identified by Dr. Rodriguez. RIB at 140-41. As discussed above, however, the claim language does not require that the header packet information be [redacted] the [redacted]. Dr. Rodriguez has identified registers settings that [redacted], and accordingly, Broadcom has shown that the [redacted] products infringe this limitation of claim 11.

As discussed above, however, the [redacted] products do not infringe claim 1 because they do not infringe the "sorting" limitation.

**h. Claim 20**

With respect to claim 20, Dr. Rodriguez identifies a [redacted] in the [redacted] products. CX-0008C at Q/A 128. Respondents argue that this module is [redacted] of the [redacted] and thus does not meet the limitations of claim 20 requiring that "the display engine comprises a graphics converter." RIB at 141; RX-0007C (Bovik RWS) at Q//A 96; JX-0089C.202. Broadcom argues, however, that the [redacted] comprise the claimed "display engine." CIB at 148; CX-0008C (Rodriguez DWS) at Q/A 128. I agree with Broadcom that the [redacted] can collectively comprise the claimed "display engine," thus infringing this limitation. As discussed above, however, the [redacted] products cannot infringe claim 20 because they do not infringe claim 11.

**F. Domestic Industry**

Broadcom relies on the same domestic industry products for the '027 patent that it identified for the '752 patent. CIB at 148-49, Appendix 3. Dr. Rodriguez identifies the [redacted] as representative of these products for the purposes of the '027 patent. CX-0008C at Q/A 207; *see also* CX-0003C (Hellman WS) at Q/A 53. He offers a limitation-by-

limitation analysis setting forth his opinion that the [redacted] practices claims 11 and 20 of the '027 patent, [redacted]. *Id.* at Q/A 211-43.

**a. Claim 11 preamble**

There is no dispute that the domestic industry products [redacted], in accordance with the preamble of claim 11. CX-0008C (Rodriguez DWS) at Q/A 211.

**b. "a window controller for obtaining data that describes windows in which the graphics images are displayed"**

Dr. Rodriguez identifies [redacted]. RX-0014C (Przybylski RWS) at Q/A 39-41. The Commission has recently held, however, that a domestic industry "article" does not need to be sold. "The term 'article' on its own is sufficiently capacious to embrace pre-commercial or non-commercial items." *Certain Non-Volatile Memory Devices and Products Containing the Same*, Inv. No. 337-TA-1046, Comm'n Op. at 41 (Oct. 26, 2018). Accordingly, Broadcom is not required to prove that its [redacted], which are the "articles" that Broadcom relies on for its domestic industry. Respondents do not appear to dispute that [redacted]

[redacted].[20] Accordingly, consistent with Commission precedent, the fact that the [redacted] does not necessarily defeat Broadcom's domestic industry claims.

Dr. Rodriguez cites a specification and source code supporting his opinion that the domestic industry products meet this limitation, and this evidence is undisputed. CX-0008C at Q/A 214-15 (citing JX-0116C, CPX-0081C). Accordingly, Broadcom has met its burden to show that the "window controller" limitation is practiced by the asserted domestic industry products.

**c. "sorting the data in accordance with respective depths of the windows"**

With respect to the "sorting" limitation, Dr. Rodriguez identifies [redacted]. CX-0008C at Q/A 214-218 (citing CPX-0060C, CPX-0081C). Respondents do not raise any disputes with respect to this limitation separate from the arguments discussed above for the "window controller".

**d. "a display engine for blending the graphics images using alpha values associated with the graphics images"**

Dr. Rodriguez identifies the [redacted] CX-0008C at Q/A 220. His opinion is supported by an architecture specification and certain source code. *Id.* at Q/A 220-21 (citing JX-0116C, CPX-0064C). There is no dispute with respect to the "display engine" limitation.

[20] With respect to the '027 patent, Respondents do not argue in their post-hearing briefs that the [redacted], as discussed *supra* in the context of the domestic industry for the '583 patent.

**e. "a memory for storing the graphics images"**

Dr. Rodriguez identifies a [redacted] CX-0003C at Q/A 61. There is no dispute, however, that the claimed [redacted] that have been identified as the domestic industry articles in this investigation.

Broadcom argues that it should be allowed to claim a domestic industry based on its SoCs regardless of [redacted], citing *Certain Mobile Devices, Associated Software, and Components Thereof* ("*Mobile Devices*"), where an administrative law judge found that complainant Microsoft could rely on a domestic industry based on third-party mobile phones running Microsoft operating systems. Inv. No. 337-TA-744, Initial Determination at 196-206 (Dec. 20, 2011), *not reviewed in relevant part by* Comm'n Op. (May 18, 2012). The determination in *Mobile Devices* held that Microsoft's development of operating systems was "significant" to the mobile phones, noting that "the operating systems are specifically tailored to meet the specifications and demands of each mobile device that utilizes it." *Id.* at 197-98. The respondent in *Mobile Devices* argued that it was inappropriate for Microsoft to rely on investments in developing operating systems for the economic prong of domestic industry while using third-party mobile phones to satisfy the technical prong, but the

administrative law judge rejected this argument, holding that "Microsoft may rely on mobile devices running Windows Mobile 6.5 or Windows Phone 7 operating systems to satisfy the domestic industry requirement." *Id.* at 199.

Following the precedent in *Mobile Devices* would have allowed Broadcom to rely on its investments in developing SoCs to satisfy the economic prong while using its customers' products [redacted] to satisfy the technical prong. But Broadcom has not offered any analysis of its customers' products to satisfy the technical prong in the present investigation—it relies only on its own products, [redacted] Establishing a domestic industry requires the identification of "actual 'articles protected by the patent.'" *Microsoft Corp. v. Int'l Trade Comm'n*, 731 F.3d at 1361-62 (quoting 19 U.S.C. § 1337(a)(2), (3)). By failing to identify any particular [redacted], Broadcom has failed to identify any actual articles practicing the "memory" limitation. On this record, Broadcom cannot satisfy the technical prong with respect to this claim.

**f. "the window controller transmits header packets to the display engine, each header packet containing at least a portion of the data, said portion describing at least one of the windows"**

Dr. Rodriguez identifies [redacted] CX-0008C at Q/A 228 (citing CPX-0074C). Respondents dispute whether the identified [redacted],

but their arguments rely on their proposed construction for "header packet," which has been rejected. CIB at 144-45.

**g. "the graphics images are transferred from the memory to the display engine responsive to said header packets"**

Dr. Rodriguez identifies functions in [redacted] CX-0008C at Q/A 234 (citing CPX-0068C). There is no separate dispute with respect to this limitation.

As discussed above, however, Broadcom has failed to satisfy the technical prong of the domestic industry requirement with respect to claim 11 because the identified domestic industry products do not include the claimed "memory."

**h. Claim 20**

With respect to claim 20, Dr. Rodriguez identifies a [redacted]. CX-0008C at Q/A 243. There is no separate dispute with respect to this limitation. Nevertheless, the technical prong of the domestic industry requirement is not satisfied with respect to claim 20 because it is not satisfied with respect to claim 11, as discussed above.

## G. Invalidity

Respondents contend that claims 11 and 20 of the '027 patent are invalid for indefiniteness and obviousness-type double patenting. CIB at 146-65.

### 1. Indefiniteness

Respondents argue that claim 11 is indefinite because the limitation requiring "the graphics images are transferred from the memory" improperly injects a method step into an apparatus claim. RIB at 146-47; RRB at 69-70. In *IPXL Holdings, LLC v. Amazon.com, Inc.*,

the Federal Circuit held that "a single claim covering both an apparatus and a method of use of that apparatus is invalid" as indefinite under section 112, second paragraph. 430 F.3d 1377, 1384 (Fed. Cir. 2005) (citing 35 U.S.C. § 112, ¶ 2). Nonetheless, "apparatus claims are not necessarily indefinite for using functional language." *Microprocessor Enhancement Corp. v. Texas Instruments Inc.*, 520 F.3d 1367, 1375 (Fed. Cir. 2008).

The disputed language of the '027 patent is similar to the claim limitation addressed by the Federal Circuit in *MasterMine Software, Inc. v. Microsoft Corp.*, 874 F.3d 1307 (Fed. Cir. 2017). In *MasterMine Software*, the claim at issue recited "a reporting module . . . wherein the reporting module . . . presents a set of user-selectable database fields as a function of the selected report template, receives from the user a selection of one or more of the user-selectable database fields, and generates a database query as a function of the user selected database fields." 874 F.3d at 1315 (citing U.S. Patent No. 7,945,850 at 9:39-67). The Federal Circuit held that this claim was not indefinite because the limitations "merely claim that the system possesses the recited structure which is capable of performing the recited functions." *Id.* at 1315-16 (quotations and citations removed). The court further explained that "[w]hile these claims make reference to user selection, they do not explicitly claim the user's act of selection, but rather, claim the system's capability to receive and respond to user selection." *Id.* at 1316. The disputed language of the '027 patent is similarly limited to a capability of the claimed system and memory—the "graphics images are transferred" limitation does not claim the act of transferring images but the capability of the system and memory to transfer images from memory responsive to header packets. Accordingly, claim 11 is not invalid for indefiniteness.

### 2. Obviousness-Type Double Patenting

Respondents further contend that claims 11 and 20 are invalid for obviousness-type double patenting in view of U.S. Patent No. 6,630,945 (RX-0029, "MacInnis"). RIB at 148-64. MacInnis issued on October 7, 2003, from U.S. Patent Application No. 09/437,581. RX-0029, cover. A continuation of this same application led to the issuance of the '027 patent. '027 patent, cover. The patents share a specification, name the same inventors, and are both assigned to Broadcom. Although MacInnis expired on November 9, 2019, the term of the '027 patent extends to July 28, 2022, pursuant to a term adjustment under 35 U.S.C. § 154(b). *Id.*

Non-statutory "obviousness-type" double patenting "is a judicially created doctrine adopted to prevent claims in separate applications or patents that do not recite the 'same' invention, but nonetheless claim inventions so alike that granting both exclusive rights would effectively extend the life of patent protection." *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1373 (Fed. Cir. 2005) (citations omitted). There are two steps in a double patenting analysis: "First, the court construes the claims in the earlier patent and the claims in the later patent and determines the differences. Second, the court determines whether those differences render the claims patentably distinct." *Abbvie Inc. v. Mathilda & Terence Kennedy Inst. of Rheumatology Trust*, 764 F.3d 1366, 1374 (Fed. Cir. 2014) (internal quotations removed).

Respondents rely on the testimony of Dr. Bovik comparing claims 11 and 20 of the '027 patent to claims 16-23 and claims 24-26 of MacInnis. RX-0001 at Q/A 29-60.

#### a. Claim 11 preamble

Dr. Bovik submits that claims 16 and 24 of MacInnis disclose the limitations of the preamble of claim 11. RX-0001 at Q/A 32, 53. MacInnis claim 16 describes "[a] graphics window control data passing mechanism," and claim 24 describes "[a] method of processing

graphics images for display." RX-0029 at 61:16-17, 62:20-21. There is no dispute with respect to the preamble of claim 11 in view of MacInnis.

**b. "a window controller for obtaining data that describes windows in which the graphics images are displayed"**

Claim 16 of MacInnis recites "a window controller for sorting data comprising a plurality of data portions, each data portion being used to describe a corresponding one of a plurality of windows." RX-0029 at 61:18-20. Dr. Bovik identifies this claim language to render obvious the "window controller" limitation of the '027 patent. RX-0001 at Q/A 33-37. Broadcom argues that MacInnis claim 16 fails to disclose that the window controller obtains data, as claimed in the '027 patent. CIB at 156-57; CX-0013C (Rodriguez RWS) at Q/A 30-31. Dr. Bovik explains that because MacInnis sorts the data, the data "must have already been obtained." RX-0001 at Q/A 37. I agree that the absence of an explicit obtaining step in claim 16 of MacInnis does not render the claims patentably distinct—one of ordinary skill in the art would have recognized that the data necessarily must be obtained before it is sorted.

Claim 24 of MacInnis recites "obtaining in a window controller data that describes the windows on a current display line, the data comprising a plurality of data portions, each data portion describing a corresponding window." RX-0029 at 62:24-26. Here the "obtaining" step is explicitly claimed, and there is no dispute that claim 24 discloses the "window controller" limitation of the '027 patent.

**c. "sorting the data in accordance with respective depths of the windows"**

Claim 16 of MacInnis recites "a window controller for sorting data comprising a plurality of data portions, each data portion being used to describe a corresponding one of a plurality of windows, according to the depth of the corresponding windows on a display." RX-0029 at

61:18-22. Claim 24 of MacInnis recites "sorting in the window controller the data portions according to the depth of the corresponding windows on the display." *Id.* at 62:32-34. Broadcom does not identify any distinction between these claim limitations in MacInnis and the "sorting" limitation of claim 11.

**d. "a display engine for blending the graphics images using alpha values associated with the graphics images"**

Claim 16 of MacInnis recites "a display engine for receiving the window parameters extracted from the sorted data from the window controller and graphics images organized into the windows from memory, and for blending the graphics images using alpha values associated with the graphics images." RX-0029 at 61:25-30. Claim 24 of MacInnis recites "blending in the display engine the graphics images using alpha values associated with the graphics images." *Id.* at 62:37-38. Broadcom does not identify any distinction between these claim limitations in MacInnis and the "display engine" limitation of claim 11.

**e. "a memory for storing the graphics images"**

Claim 16 of MacInnis describes that the "display engine" receives "graphics images organized into the windows from memory." RX-0029 at 61:25-28. Claim 24 of MacInnis recites "transferring the graphics images from memory to a display engine." *Id.* at 62:35-36. Broadcom does not identify any distinction between these claim limitations in MacInnis and the "memory" limitation of claim 11.

**f. "the window controller transmits header packets to the display engine, each header packet containing at least a portion of the data, said portion describing at least one of the windows"**

With respect to claim 16, Respondents rely on MacInnis's claim language reciting "window parameters" to meet the "header packets" limitation of claim 11 of the '027 patent. CIB at 156-59. In particular, claim 16 describes "a display engine for receiving the window

parameters extracted from the sorted data from the window controller." RX-0029 at 61:25-27. Broadcom disputes Respondents' contentions regarding these "window parameters," criticizing Respondents for failing to offer a claim construction for "window parameters," as required in an obviousness-type double patenting analysis. CIB at 158-59. But any relevant claim construction disputes have been resolved in the context of the construction for "header packet," which was addressed in the context of the *Markman* proceedings. The '027 patent and MacInnis share a common specification, and the adopted construction for "header packet" broadly covers "identification or control information for a window." Broadcom argues that MacInnis's "window parameters" are not "packetized," *see* CX-0013C (Rodriguez RWS) at Q/A 42, but the "header packets" of the '027 patent are not required to be "packetized"—no such limitation was proposed by Broadcom or any other party in this investigation. Under the construction for "header packets" adopted herein, there is no patentable distinction between the "window parameters" of claim 16 of MacInnis and the "header packets" of claim 11 of the '027 patent.

Broadcom further argues that claim 16 of MacInnis fails to disclose that the header packets are transmitted by the window controller to the display engine. CIB at 158-59. But claim 16 states this explicitly: "a display engine for receiving the windows parameters extracted from the sorted data from the window controller." RX-0029 at 61:25-27. There is no patentable distinction between the '027 patent's claimed transmission from the window controller to the display engine and MacInnis's claimed extraction from the window controller that is received by the display engine.

Respondents further contend that this limitation is disclosed in claims 24 and 26 of MacInnis, which recite a limitation "wherein transferring the graphics images comprises transferring window parameters from the window controller to a direct memory access module,"

and "wherein transferring the graphics images further comprises packetizing the window parameters in the direct memory access module, and transmits the packets as control information to the display engine." RX-0029 at 62:39-41, 52-56. Broadcom argues that the "direct memory access module" recited in claims 24 and 26 of MacInnis renders these claims patentably distinct from claim 11 of the '027 patent. CIB at 162-63. As explained by Respondents, however, the direct memory access module can be considered part of the "window controller" claimed in the '027 patent. RIB at 160-62. Under the construction proposed by Broadcom and adopted herein, there is no requirement that the "window controller" be a distinct hardware component. Accordingly, there is no patentable distinction between the "packetized" window parameters of claim 26 of MacInnis and the "header packets" of claim 11 of the '027 patent.

**g. "the graphics images are transferred from the memory to the display engine responsive to said header packets"**

Claim 16 of MacInnis recites: "a direct memory access module capable of transferring the graphics images from the memory to the display engine." RX-0029 at 61:32-24. Claim 16 further discloses that "the window parameters from the data portion that corresponds to a back most window on a current display line is provided to the direct memory access module to initiate transfer of a portion on the current display line of the graphics image." *Id.* at 61:35-39. Broadcom argues that this claim language does not disclose that the graphics images are transferred "responsive to" said header packets. CIB at 160-61. As discussed above in the context of infringement, however, claim 11 of the '027 patent does not require a direct causal relationship—only that information in the header packets is used to subsequently transfer the graphic images. Under this construction for the "responsive to" limitation, there is no patentable distinction between "transferring the graphics images from the memory" recited in claim 16 of

MacInnis and "graphics images are transferred from the memory" recited in claim 11 of the '027 patent.

Claim 24 of MacInnis recites: "transferring the graphics images from memory to a display engine;" and "wherein transferring the graphics images comprises transferring window parameters from the window controller to a direct memory access module . . . said window parameters comprising a window size, a window location and a location in memory where the graphics images for the corresponding window is stored." RX-0029 at 62:35-36, 39-47. Broadcom again argues that MacInnis fails to disclose transferring the graphics images "responsive to" said header packets, but the language of claim 24 clearly discloses that the window parameters are used in the transferring step. Critically, the "location in the memory where the graphics image for the corresponding window is stored" described as a "window parameter" in claim 24 is very similar to the register information discussed above in the context of infringement for this "header packet" limitation. Accordingly, under the claim constructions adopted for these limitations, there is no patentable distinction between "transferring the graphics images from memory" in claim 24 of MacInnis and "graphics images are transferred from the memory" in claim 11 of the '027 patent.

Claim 11 of the '027 patent is thus invalid for obviousness-type double patenting in view of both claim 16 of MacInnis and claim 26 of MacInnis.

**h. Claim 20**

Claim 23 of MacInnis depends from claim 16 and adds a limitation "wherein the display engine comprises a graphics converter, and wherein the graphics converter receives the graphics images directly from the memory." RX-0029 at 62:16-19. Broadcom argues that MacInnis's "graphics converter" fails to disclose the limitation of claim 20 of the '027 patent requiring that

"the graphics converter is capable of placing the graphics images into a common format." '027 patent at 60:48-51. Respondents offer Dr. Bovik's opinion that this limitation would be obvious, although his testimony is conclusory. RX-0001 at Q/A 51. The parties' arguments do not fully address the limitation the issue.

Based on a review of the intrinsic evidence, however, it is clear that any reasonable construction of "graphics converter" would encompass the conversion of graphics data into a common format. The specification of MacInnis repeatedly describes embodiments of a "graphics converter" that places graphics images into a common format. *See* RX-0029 at 7:17-29 ("In the preferred embodiment, the graphics converter block 90 takes raw graphics data from the FIFO block and converts it to YUValpha (YUVa) format . . . In an alternate embodiment, the graphics converter may convert the raw graphics data into a different format, such as RGBalpha.") at 9:12-16 ("The graphics FIFO 132 receives raw graphics data from memory through a graphics DMA 124 and passes it to the graphics converter 134, which preferably converts the raw graphics data into YUV 4:4:4 format or other suitable format.") at 22:6-8 ("In the preferred embodiment, the graphics converter in the display engine converts raw graphics data having various different formats into a common format for subsequent compositing with video and for display."). Based on this evidence, one of ordinary skill in the art would recognize that the "graphics converter" in claim 23 of MacInnis places graphics images into a common format. Accordingly, claim 20 of the '027 patent is invalid for obviousness-type double patenting in view of claim 23 of MacInnis.

**i. Secondary Considerations of Non-Obviousness**

Broadcom asserts that the commercial success of its domestic industry products is due in part to the invention of the '027 patent. CIB at 166-67. Broadcom cites no evidence of any

nexus between the commercial success of these products and the alleged invention of the '027 patent, however.[21] In addition, [redacted]. Accordingly, Broadcom's evidence of secondary considerations does not meaningfully impact the obviousness analysis discussed above.

## VIII. THE '844 PATENT

### A. Background and Specification

The '844 patent is entitled "Video Decoding System Supporting Multiple Standards" and issued October 9, 2012. '844 patent (JX-0001), cover. The '844 patent describes a system and method for decoding digital video data. *Id.* at Abstract. "Digital video decoders decode compressed digital data that represent video images in order to reconstruct the video images." *Id.* at 1:43-45. At the time of the invention, a "wide variety of encoding/decoding algorithms and encoding/decoding standards" existed. *Id.* at 1:45-46. The '844 patent describes "a multi-format decoding system that can accommodate a variety of encoded bitstream formats . . . in a cost-effective manner." *Id.* at 1:54-58. The claimed invention describes a system having a

[21] The testimony of Tim Hellman cited by Broadcom references the '752 and '844 patents, not the '027 patent. *See* CX-0003C at Q/A 28.

[redacted]

processor adapted to control the decoding process and one or more configurable hardware accelerators coupled to the processor. *Id.* at 2:40-45. The accelerator(s) perform the decoding function on a digital media stream according to a plurality of decoding methods. *Id.* at 2:45-46. Figure 4*a* is a functional block diagram of a digital decoding system according to an illustrative embodiment of the invention. *Id.* at 7:43-45.

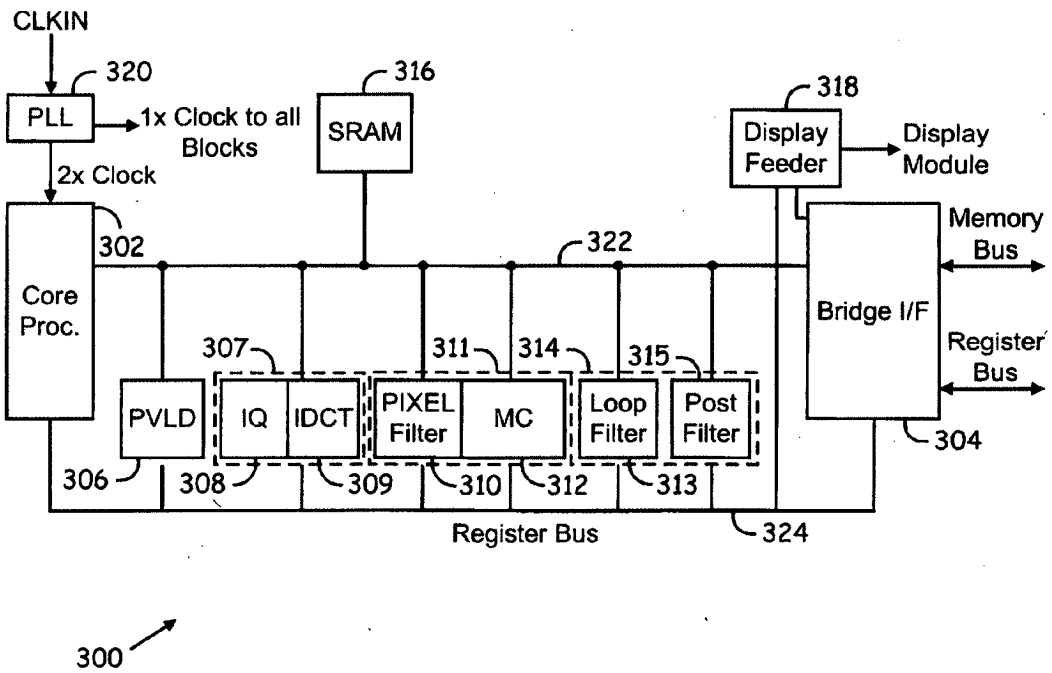


FIG. 4a

'844 patent, Fig. 4a.

### B. Level of Ordinary Skill in the Art

Broadcom submits that at the time of the invention of the '844 patent, a person of ordinary skill in the art would have "a Bachelor's Degree in Electrical Engineering, Computer Science, or a similar discipline, with one to two years of experience" in those or related fields, and that the person would also be "familiar with software or hardware related to digital signal, image, and video processing." CMIB at 5; *see* CX-0004C (Acton DWS) at Q/A 45. Respondents propose that a person of ordinary skill in the art "would have had a Bachelor's Degree in Electrical Engineering or similar discipline, with at least four years of experience in implementing hardware and software-based video decoders." RX-0006C (Bovik RWS) at Q/A 23. Broadcom does not appear to dispute Respondents' proposal, and Broadcom's expert, Dr. Scott Acton, submits that the differences in the two proposals would not affect his opinions. CX-0004C at Q/A 46. Accordingly, I adopt Respondents' proposal for the level of ordinary skill in the art.

### C. Asserted Claims

Broadcom asserts claims 11 and 13 of the '844 patent. CIB at 12 and App. 1, at 4. While claims 1-10 of the '844 Patent have been terminated from the Investigation, asserted claims 11 and 13 depend from claim 10, which depends from claim 9, which depends from claim 1. The pertinent claims are set forth below:

> 1. A digital media decoding system comprising:
> a processor adapted to control a decoding process; and
> a hardware accelerator coupled to the processor and adapted to perform a decoding function on a digital media data stream, wherein the accelerator is configurable to perform the decoding function according to a plurality of decoding methods.
>
> 9. The digital media decoding system of claim 1 wherein the digital media decoding system is a video decoding system and wherein the hardware accelerator is adapted to perform the decoding function on a video data stream.

10. The video decoding system of claim 9 comprising a plurality of hardware accelerators coupled to the processor, each accelerator adapted to perform a decoding function on the video data stream, wherein each of the accelerators are configurable to perform their associated decoding functions according to a plurality of decoding methods.

11. The video decoding system of claim 10 wherein the plurality of hardware accelerators comprise:
a programmable entropy decoder adapted to perform entropy decoding on the data stream;
an inverse quantizer adapted to perform inverse quantization on the data stream;
an inverse transform accelerator adapted to perform inverse transform operations on the data stream;
a pixel filter adapted to perform pixel filtering on the data stream; and
a motion compensator adapted to perform motion compensation on the data stream.

13. The digital media decoding system of claim 11 wherein the processor is adapted to configure each of the accelerators to perform the decoding function according to a format of the media data to be decoded.

'844 patent at 20:17-22:4.

### D. Claim Construction

The parties raise two claim construction disputes in their pre-hearing and post-hearing briefs.

#### 1. "Programmable entropy decoder" (Claim 11)

##### a. Proposed Constructions

| Claim Phrase | Broadcom's Construction | Respondents' Construction |
|---|---|---|
| "programmable entropy decoder" | "configurable hardware or a processor that performs entropy decoding" | "processor that performs entropy decoding"[23] |

[23] The term "entropy decoding" is defined in the specification and is not disputed. RMIB at 26; *see* '844 patent at 4:61-64. As discussed above, the existing dispute is whether the term

Broadcom construes the term "programmable entropy decoder" to describe hardware or a processor, whereas Respondents say the term describes a processor. Broadcom says Respondents' construction improperly excludes embodiments that describe "configurable" hardware and also violates the principle of claim differentiation, while Respondents say Broadcom's construction improperly reads out the word "programmable." Both sides point to the embodiments described in the specification to support their competing constructions.

Broadcom contends that Respondents' proposed restriction of the disputed term to a processor runs counter to the disclosures in the '844 patent specification. Broadcom argues that the "programmable entropy decoder" set forth in claim 11 is a Programmable Variable Length Decoder ("PVLD") described as having both configurable hardware and processor embodiments.[24] With respect to configurable hardware, Broadcom points to the description of the PVLD as a configurable hardware module that "'is internally configurable or programmable to allow changes according to various processing algorithms.'" CMIB at 29 (quoting '844 patent at 5:56-64 and citing 8:41-43, 8:45-48). Broadcom also points to the disclosure of a programmable variable-length decoder that "can be hardwired." *Id.* (quoting '844 patent at 6:31-41).

Broadcom agrees that the PVLD may also be a processor-based component functioning as a coprocessor, but it asserts that when the PVLD is functioning as a coprocessor it is not a hardware accelerator. *Id.* at 29-30 (citing 6:28-31). Broadcom states that the specification

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"programmable entropy decoder" describes only a processor or permits configurable hardware as well.

[24] There is no dispute that the specification describes the programmable entropy decoder in claim 11 as a PVLD (module 306). RMIB at 27; CMIB at 29. *See* '844 patent, Fig. 4a.

makes clear that when the PVLD functions as a processor the other modules "are designed as hardware accelerators." *Id.*[25]

Respondents contend that the PVLD in claim 11 must be a processor because the entropy decoder "is uniquely and expressly 'programmable'" while, in contrast, the hardware accelerators described in claims 1 and 10 are only configurable. RMIB at 26. Respondents assert that "the patent makes clear that the 'programmable' distinction drawn in claim 11 refers to the entropy decoder being implemented as a processor that executes instructions, *i.e.*, a program or software." *Id.* at 28. In support of this assertion, they cite to portions of the specification that illustrate embodiments in which the PLVD clearly operates as a processor. *See id.* at 28 (citing '844 patent at 6:28-31; 6:33-38; 8:41-43; 8:52-61; 9:7-23). Respondents argue that the word programmable as used in "the relevant embodiment claimed by dependent claim 11" only describes a processor. RMIB at 28 (citing '844 patent at 6:28-31) ("In an illustrative embodiment of the present invention, the PVLD module 306 is designed as a coprocessor to the core processor 302, while the rest of modules 308, 309, 310, 312 and 314 are designed as hardware accelerators"). *See also, id.* (citing '844 patent at 9:7-9) (the PVLD 306 "is architected as a coprocessor of the core processor); 19:64-20:2 ("some or all of the hardware accelerators comprise programmable processors."); 8:52-61 (noting "full programmability" of PVLD 306). They assert further that because the PLVD in claim 11 includes a code table random access

[25] Claim 11 states explicitly that all the elements comprising the video decoding system are hardware accelerators, including the programmable entropy decoder. '844 patent at 21:1-2. Broadcom points to nothing in the patent to indicate that a processor is not hardware; on the contrary, Broadcom agrees that the patent describes several processors that function as hardware accelerators.

memory ("RAM") and can execute instructions, it is a processor. RMIB at 29.[26]

**b. Discussion**

"[T]he present invention can be employed in systems of widely varying architectures and widely varying design," the patent states. '844 patent at 3:61-63. As described in the specification, "the term 'entropy decoding' may be used generically to refer to variable length decoding, arithmetic decoding, or variations on either of these." *Id.* at 4:61-64. "These functions are accelerated by hardware accelerators." *Id.* at 4:64-65. The hardware accelerators "are provided with sufficient flexibility or programmability enabling a decoding system that decodes a variety of standards efficiently and flexibly," the patent states. *Id.* at 5:3-6, 19:33-35 ("The decoding system 300 of the present invention provides flexible configurability and programmability to handle different video stream formats."). The specification makes clear (and there is no dispute) that a hardware accelerator can be a processor. *See, e.g., id.* at 19:64-20:2 ("In another illustrative embodiment, some or all of the hardware accelerators comprise programmable processors which are configured to operate according to different encoding/decoding formats by changing the software executed by those processors, in addition to programming registers as appropriate to the design."). *See also id.* at 6:24-31; 9:7-9.

Broadcom's construction is incorrect because claim 11 specifically requires a "programmable" entropy decoder not, as Broadcom proposes, a "configurable" entropy decoder. The terms are not used interchangeably in the specification.[27] The patent states: "Each hardware

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[26] Broadcom responds that the '844 patent's hardware modules, including the PVLD, also can access RAM, citing the '844 patent at 7:26-42.

[27] *Compare Enercon GmbH v. Int'l Trade Comm'n,* 151 F.3d 1376, 1385 (Fed. Cir. 1998) (refusing to limit a term used "interchangeably" in the written description to only one of the uses of the term).

module 306, 308, 309, 310, 312 and 314 is internally configurable *or* programmable to allow changes according to various processing algorithms." *Id.* at 5:62-64 (emphasis added). To give meaning to both the word "programmable" and the word "configurable," it is necessary to construe the term "programmable entropy decoder" to mean a programmable processor, not configurable hardware. *See Merck & Co., Inc. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.")

As noted above, the programmable entropy decoder is one of the hardware accelerators that comprise the video decoding system in claim 11, per the explicit language of the patent. '844 patent at 21:1-2. This does not mean that the processor should be construed as configurable hardware, when claim 11 states expressly that it is programmable. Broadcom cites this sentence: "In an illustrative embodiment of the present invention, the PVLD module 306 is designed as a coprocessor to the core processor 302, while the rest of the modules 308, 309, 310, 312 and 314 are designed as hardware accelerators." CMIB at 29-30 (citing '844 patent at 6:28-31). Broadcom argues that this sentence means that "the term 'programmable entropy decoder' encompasses both 'configurable hardware' and 'processor' implementations." *Id.* at 30. On the contrary, I cannot derive any meaning from this sentence other than that the PVLD module in this illustration is a programmable processor, while the other modules are configurable hardware.

I also agree with Respondents that the doctrine of claim differentiation does not support Broadcom's proposed construction. *See* RRMB at 16. Broadcom points to claim 8, which requires that the claimed hardware accelerator "includes one of a set of registers or memory coupled to an internal processor." '844 patent at 20:53-54. As Respondents point out, Claims 8 and 11 are not dependent on one another. Claim 8 depends from claim 1 through claim 7, while

claim 11 depends from claim 1 through claims 9 and 10. Neither claim 8 nor the claims from which it depends require a "programmable entropy decoder." Moreover, claims 8 and 11 contain several different limitations. Accordingly, this is not an instance in which construing the entropy decoder as a processor renders claim 11 "completely superfluous and redundant" in light of claim 8 or *vice versa*. *See Comark Commc'ns Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (referring to the presumption that "each claim in a patent has a different scope").

### 2. "Plurality of hardware accelerators" (Claim 11)

#### a. Proposed Constructions[28]

As set forth above, claim 11 requires a plurality of hardware accelerators "wherein the plurality of hardware accelerators comprise:" a programmable entropy decoder, an inverse quantizer, an inverse transform accelerator, a pixel filter, and a motion compensator. '844 patent at 21:1-12. Broadcom maintains that claim 11 requires only "a plurality of hardware accelerators (more than one but not necessarily five) that perform the five recited decoding functions." CIB at 169. Broadcom contends that the plurality of hardware accelerators can perform overlapping decoding functions, resulting in less than five devices but still meeting the requirements of claim 11. "Neither the claims nor the specification require that the five recited decoding functions must be performed by five separate hardware accelerators," Broadcom argues. *Id.* Broadcom cites *Northern Telecom Ltd. v. Samsung Elecs. Co.*, 215 F.3d 1281, 1297 (Fed. Cir. 2000) ("'[W]hat matters is not that the patent describes A and B as different, but whether, according to the patent, A and B must be mutually exclusive.'")

[28] The parties' dispute concerning this limitation developed in the course of the litigation, after *Markman* briefing was completed.

Respondents maintain that claim 11 requires five accelerators adapted to perform the five claim decoding functions. Respondents rely on the plain meaning doctrine. *See Thorner v. Sony Comp. Ent. Am. LLC,* 669 F.3d 1362, 1365 (Fed. Cir. 2012). They state that claim 11 depends on claim 10, which recites: "The video decoding system of claim 9 comprising a plurality of hardware accelerators coupled to the processor, each accelerator adapted to perform a decoding function on the video data stream, wherein each of the accelerators are configurable to perform their associated decoding functions according to a plurality of decoding methods." Respondents state that although each accelerator may perform more than the functions described in claim 11, they must "each perform their respective, expressly claimed decoding function." RRB at 77 (citing and quoting *Spectrum Int'l, Inc. v. Sterilite Corp.,* 164 F.3d 1372, 1380 (Fed. Cir. 1998) ("'Comprising' is not a weasel word with which to abrogate claim limitations.")).

Respondents also point to the file history. They say that during an *inter partes* review ("IPR") proceeding before the Patent Trial and Appeal Board ("PTAB") in 2017, Broadcom sought to distinguish prior art by asserting that claim 11 required "'five particular hardware accelerators.'" RIB at 167 (quoting IPR2017-01111). *See* RX-0263.45; Tr. (Acton) 213:16-20. Respondents say Broadcom's statements during the IPR inform the meaning of the disputed claim term. RIB at 168 (citing *Aylus Networks, Inc. v. Apple Inc.,* 856 F.3d 11353, 1359 (Fed. Cir. 2017)). Respondents also maintain that Broadcom cannot make arguments now that are inconsistent with its contentions during the IPR. Respondents assert further that Broadcom's statement during the IPR "'can support a finding of prosecution disclaimer.'" *Id.* (quoting *TC Tech. LLC v. Sprint Corp.*, No. 16-cv-153-RGA, 2019 WL 1596998, at *14 (D. Del. Apr. 15, 2019)).

In addition, Respondents cite the testimony of Broadcom's expert witness, Dr. Acton, who testifies at hearing that five configurable hardware accelerators are required by claim 11. *See* Tr. 212:25-213:2. Respondents note that Broadcom's counsel does not question Dr. Acton regarding this testimony on redirect examination.[29]

**b. Discussion**

Broadcom argues that claim 11 requires only a plurality, *i.e.,* more than one, accelerator. Broadcom's argument is based on the legal principle that a court should not "read unstated limitations into claim language." *See Northern Telecom,* 215 F.3d at 1290 (citations omitted)). Broadcom argues that claim 11 may be satisfied by three accelerators performing the five operations listed in claim 11, unless the language in claim 11 specifically precludes the use of fewer than five accelerators.

In *Northern Telecom*, the claim at issue specified the use of "plasma etching." 215 F.3d at 1292. The question was whether the use of an additional element in the accused process would prevent a finding of infringement. *Id.* In the absence of any indication in the patent that the additional element was to be excluded from the patented process, the court refused to limit the scope of the claim to plasma etching only. *Id.* at 1294 (citing *Cybor Corp. v. FAS Techs., Inc.,* 138 F.3d 1448, 1458 (Fed. Cir. 1998) (refusing to limit scope of claim language where prosecution history did not clearly call for a narrower definition)). Broadcom argues that, under

[29] Dr. Acton testifies in his rebuttal witness statement that: "What is required is a plurality of configurable hardware accelerators that perform the recited decoding functions." CX-0010C (Acton RWS) at Q/A 68. To the extent that Broadcom relies on this testimony to support its contention that claim 11 does not require five separate accelerators performing five separate tasks, I note that Dr. Acton's hearing testimony seems to contradict his own witness statement. *See* discussion *infra.*

the reasoning of *Northern Telecom*, claim 11 should not be limited to devices containing five separate hardware accelerators.

Broadcom's reliance on *Northern Telecom* is misplaced for several reasons. First, the requirement of five accelerators is expressly stated (not unstated, as Broadcom maintains), as a limitation under claim 11. Although the use of "'a' or 'an' in patent parlance carries the meaning of 'one or more' in open-ended claims containing the transitional phrase 'comprising,'" that convention is overcome "when the patentee evinces a clear intent to ... limit the article.'" *Free Motion Fitness, Inc. v. Cybex Int'l, Inc.*, 423 F.3d 1343, 1350 (Fed. Cir. 2005) (quoting *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000)). Here, the convention is overcome. '844 patent at 20:62-67. Claim 10 requires a plurality of hardware accelerators "each accelerator adapted to perform a decoding function . . . wherein each of the accelerators are configurable to perform their associated decoding functions . . . ." Emphasis added. Claim 11 (through claim 10) articulates five different devices, *each* of which must be "adapted to perform" a discrete task "*associated with*" that accelerator. Applying the plain meaning of the language "each" and "associated with," requires five separate accelerator devices.

The file history, moreover, confirms that the patentee intended to specify five separate accelerators. In the course of an IPR proceeding, Broadcom told the PTAB that claim 11 requires "five particular hardware accelerators." RX-0263.45. As Respondents point out, statements made during an IPR proceeding can support a finding of prosecution disclaimer. RIB at 168 (citations omitted). Even without an express finding of disclaimer, "the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention." *Phillips*, 415 F.3d at 1317. That is my finding here: in light of the

clear evidence of Broadcom's intent in the file history, claim 11 must be construed to require five separate devices.[30]

In addition, I give significant weight to the hearing testimony of Dr. Acton, Broadcom's expert, who testifies that claim 11 requires five hardware accelerators. I note the following colloquy between Respondents' counsel and Dr. Acton on cross-examination: "Q. How many hardware components are required to practice claim 11? A. Well, hardware components is in the construction of hardware accelerator I believe. So five." Tr. at 213:3-6. A few moments later, Dr. Acton is asked again: "Q. Dr. Acton, you agree that claim 11 requires five particular hardware accelerators, correct?" He replies: "A. Yes, I think I agreed to that a few minutes ago, yes." Dr. Acton's statements on behalf of Broadcom constitute admissions – whether evidentiary or judicial makes no difference – and I find them to be probative on the issue of the number of accelerators required by the plain language of claim 11.[31]

Accordingly, I agree with Respondents that claim 11 requires five hardware accelerators each adapted to perform one of the five articulated decoding functions with which that accelerator is associated. '844 patent at 21:3-12 ("a programmable entropy decoder adapted to perform entropy decoding," "an inverse quantizer adapted to perform inverse quantization," an inverse transform accelerator adapted to perform inverse transform operations," "a pixel filter

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[30] As noted above, the court in *Northern Telecom* found no express disclaimer of scope.

[31] Such expert testimony, adverse to the patentee's proposed construction, was missing from the facts in *Northern Telecom.* Indeed, the court relied on the patentee's expert testimony that a person of skill in the art would agree with the patentee's construction. *Northern Telecom,* 215 F.3d at 1296.

adapted to perform pixel filtering," and "a motion compensator adapted to perform motion compensation," all on the data stream.

### E. Infringement

Broadcom accuses all Toyota vehicles and infotainment products developed by Respondents that incorporate the Renesas [redacted] SoCs of infringing claims 11-13. *See* CIB at 170-171, CIB App. 2.[32] Products made by Pioneer, Panasonic and DENSO TEN incorporating these Renesas units are installed in a variety of Toyota vehicles. *See* CIB, App. 2 at 12; CX-0004C (Acton DWS) at Q/A 178-179. Broadcom's infringement allegations are supported by the testimony of Dr. Acton. CX-0004C (Acton DWS).

#### 1. Claim 11

Dr. Acton analyzes the operation of the Renesas accused products to offer his opinion that these products infringe claims 11-14 of the ''844 patent.[33] Although claims 1, 9 and 10 are not asserted in this investigation, Dr. Acton includes them in his infringement analysis because claim 11 depends from those claims. CX-0004C (Acton DWS) at Q/A 47.[34]

At a very high level, there is little dispute as to how the accused products function. They include [redacted]

[32] Broadcom represents that there is no dispute that [redacted] accused products are representative of each other. CIB at 170; CX-0004C (Acton DWS) at Q/A 32-38.

[33] Broadcom asserts only claims 11 and 13. CIB at 171.

[34] A dependent claim cannot be infringed unless the independent claim from which it depends is also infringed. *E.g., Ferring B.V. v. Watson Labs., Inc.–Fla.,* 764 F.3d 1401, 1411 (Fed. Cir. 2014).

[redacted] CIB at 171.

Respondents maintain, however, that none of the Renesas accused products infringes claim 11 for three reasons: (1) the accused Renesas products do not have five hardware accelerators; (2) there is no evidence that using the hardware accelerators in the Renesas accused products results in faster decoding than using the [redacted]; and (3) the hardware accelerators in the accused products are not internally programmable by the processor. *See* CRB at 75.[35]

**a. Requirement of five separate hardware accelerators**

There is no dispute that the accused products include [redacted] that perform decoding functions—the [redacted]. CIB at 176-78; RIB at 170-72. In essence, Broadcom asserts that as long as the five *functions* enumerated in claim 11 are executed by a plurality (more than one) of the hardware accelerators, it does not matter if there are five separate hardware accelerators in the product or [redacted]. Broadcom argues that [redacted] hardware accelerators in the Renesas accused products satisfy the limitations of claim 11, because they perform overlapping functions.

Broadcom points [redacted] as an example. *See* '844 patent at 21:9-12. Broadcom asserts that a [redacted] that meet the limitations of claim 11. CRB at 76. "Similarly," Broadcom maintains, [redacted] *Id.* In other words, [redacted] of the hardware accelerators in the Renesas

[35] Respondents assert that the accused products do not infringe for "at least" six independent reasons. RRB at 77. There appears to be no actual dispute, however, about the number of infringement issues; Broadcom simply has grouped several of them together. *See* discussion, *infra.*

accused products use [redacted] contained within the products to perform [redacted] identified in claim 11.

The construction adopted above, which requires five separate hardware accelerators, each adapted to perform one of the enumerated functions in claim 11, precludes a finding of infringement. In the accused products, the [redacted] enumerated in claim 11 are not separate. Devices in which less than five separate hardware accelerators perform the functions enumerated in claim 11 do not satisfy the requirement of five different hardware accelerators, each of which performs a task specifically associated in claim 11 with that accelerator.

Broadcom asserts that "there is no dispute" that [redacted] CIB at 179. The testimony offered in support does not substantiate Broadcom's assertion, however. Dr. Acton is asked whether the Renesas accused products satisfy the inverse quantizer limitation of claim 11. CX-0004C (Acton DWS) at Q/A 124. He replies in the affirmative, stating that the Renesas products [redacted] *Id.* He is then asked whether the Renesas products satisfy the inverse transform accelerator limitation. He replies that the products [redacted] *Id.* at Q/A 125. This testimony does not support the requirement that inverse quantization be performed by a separate hardware accelerator; it confirms only that the functionality is contained [redacted]. Similarly, Dr. Acton is asked whether the Renesas products satisfy the pixel filter limitation. Again, he answers in the affirmative, stating that the Renesas products [redacted],

[redacted] *Id.* at Q/A 126. He then is asked whether the Renesas products satisfy the motion compensator limitation. *Id.* at Q/A 127. As before, he answers that the [redacted] accused products [redacted] *Id.* These answers beg the question, which is whether the [redacted]. Such evasions do not satisfy Broadcom's burden of proof with respect to infringement.

Broadcom also cites the testimony of Dr. Bovik, Respondents' expert witness, on cross-examination. CIB at 179. In the cited portion of the transcript, Dr. Bovik is asked the following questions and gives the following answers:

[redacted]

[36] The reference is to RDX-0006C.4. Tr. (Bovik) at 666:19-667:2.

[redacted]

Tr. (Bovik) at 667:9-25. Dr. Bovik's evidence establishes that in the accused products [redacted] required by claim 11 may be executed within a [redacted]; it does not establish that those functions are carried out by [redacted], as required by claim 11 (as construed herein).

Accordingly, I find that Broadcom has failed to demonstrate that any of the accused Renesas products infringe claim 11 of the '844 patent.[37]

**b. Faster decoding**

Respondents' remaining arguments on infringement relate to claim 1 of the '844 patent, from which claim 11 depends. Claim 1 recites "a hardware accelerator coupled to the processor." '844 patent at 20:19. The parties agree that this limitation means "'a hardware component that performs one or more operations separately from the processor to perform decoding faster than the processor alone.'" RIB at 172. Respondents maintain that Broadcom has failed to carry its burden to show that using the accelerators [redacted] in the Renesas accused products "is done to 'perform decoding faster than the processor alone' as required by the agreed construction." *Id.*

Broadcom cites to Dr. Acton's testimony as satisfying Broadcom's burden. CRB at 77 (citing CX-0004C (Acton DWS) at Q/A 87-88, 95-97, 99). Dr. Acton testifies that he reviewed source code for the Renesas accused products and that his review confirmed that [redacted] CX-0004C (Acton DWS) at Q/A 94. He proceeds to identify the source code that shows each of the [redacted] and their

[37] Broadcom has not alleged infringement under the doctrine of equivalents.

corresponding functions, and concludes that each [redacted] is a component that performs its function separately from the [redacted], "which results in a faster decoding process." *Id.* at Q/A 95-98. This makes each of those components a "hardware accelerator," in Dr. Acton's opinion. *Id.* at Q/A 98. He opines, in particular, that using "these hardware modules as part of the decoding process results in decoding being performed faster than if the decoding was done only the [redacted]." *Id.* at Q/A 88.[38]

Respondents argue that Dr. Acton's testimony is "wholly conclusory and entitled to no weight." RIB at 172. Respondents state that "Dr. Acton cites no evidence" in support of his opinion and "admitted at the hearing that he did not perform any testing to support his opinion." *Id.* Respondents state further that Dr. Acton's testimony is irrelevant to the accused products because they can have [redacted] and Dr. Acton's opinion pertains only to products containing a [redacted]. *Id.* at 172-173. They cite testimony by Dr. Acton that his opinion would not change if there were [redacted], but they assert that this answer "highlights the lack of any substantive basis for Dr. Acton's original conclusory testimony." *Id.* at 173.

Dr. Acton reviewed source code to determine that the hardware components were present and performed certain decoding functions in the accused products. He concluded that these components would increase the speed of decoding as compared to what the [redacted] could do without them.

[38] Broadcom also cites the testimony of Dr. Bovik, Respondents' expert, on the "power, speed and efficiency" of the '844 decoding process. CRB at 78.

Although Dr. Acton concedes that he did not test the accused products to determine if the hardware component actually speeds up the decoding process, he explains that performing the functions of [redacted] CX-0004C (Acton DWS) at Q/A 99. "Pipelining," he explains further, "means that multiple different decoding functions can occur at the same time in either two separate hardware blocks or in a hardware block that is separate from the [redacted]" *Id.* As a result, de-coding is accelerated.

Dr. Acton has drawn a reasonable conclusion from his investigation of the accused products. His testimony is not simply conclusory, as Respondents maintain. The requirement in claim 1 for faster decoding using hardware components therefore is satisfied. *See also* Tr. (Bovik) at 780:21-781:8 (Respondents' invalidity expert agreeing that "operating the processing in parallel on other hardware resources increases the processing power, speed, and efficiency of the decoding process and is inherently faster than performing those functions on only one of the processors.") (quoting RX-0002C (Bovik DWS) at Q/A 39).

**c. Internally programmable by the processor**

Claim 1 discloses a hardware accelerator "configurable to perform the decoding function according to a plurality of decoding methods." '844 patent at 20:19-23. The agreed-upon construction for this term is an accelerator "internally programmable by the processor to perform its decoding function according to a plurality of decoding methods." CIB at 173. Respondents argue that the accused hardware accelerators are not internally programmable by the processor. Respondents raise two issues: (1) they contend that the accused hardware accelerators [redacted]

and (2) they contend that "the accused accelerators are not internally programmable 'by the processor' because [redacted]" RIB at 173.

Respondents say Broadcom merely asserts that [redacted] neither of which is an accused accelerator. RRB at 79. Respondents assert further that "neither Broadcom nor Dr. Acton show that any of the [redacted] *Id.* They assert that their own experts provide extensive analysis showing that the "internally programmable" feature is not present in the accused devices, and that the alleged absence of identified parameters constitutes a failure of proof.

**i.** [redacted]

"The parties agree that [redacted] does not practice the claim." RIB at 175. As Dr. Acton explains, "prior art systems used hardware to assist the processor with decoding . . . [b]ut that hardware was dedicated to a specific standard." CX-0004C (Acton DWS) at Q/A 24. [redacted] for a particular standard, for instance, MPEG-2, while a [redacted] performs the function for MPEG-4. *Id.* Thus, two hardware accelerators would perform the same function "but each only for one standard." *Id.*

The accelerators in the '844 patent, Dr. Acton states, are "configurable to operate according to multiple standards," resulting in "more efficient multi-standard decoding" *Id.* at Q/A 25. For example, the same hardware accelerator could be configured to perform a particular decoding function "according to either MPEG-2 or MPEG-4 standards, as well as other

standards." *Id.* According to Dr. Acton, "[t]his saves space[] on the chip and saves the costs associated with additional hardware." *Id.*

Respondents claim that the hardware accelerators in the accused products are not internally programmable [redacted] RIB at 173. The Respondents allege that, "[redacted] identified standard." CX-0004C (Acton DWS) at Q/A 116 (describing Respondents' arguments). In other words, the hardware accelerators in the accused products are [redacted] RX-0009C (Hu RWS) at Q/A 44.

Respondents' experts testify that the hardware accelerators in the accused products are [redacted] RX-0006C (Bovik RWS) at Q/A 44. As an example, Dr. Bovik testifies that "the source code module . . . which is shown in RPX-0267C, illustrates that [redacted] *Id.* at Q/A 39. In other words, the [redacted]. *Id.* at Q/A 39-41. This conclusion is based on the expert's analysis of the software, which is set forth in specific detail, with explanation. *Id.*

In response, Dr. Acton explains that the source code for the accused products shows that the [redacted] CX-0004C

(Acton DWS) at Q/A 110. He describes this process for each of the accused products. *Id.* at Q/A 111-115. "For example, for the [redacted] Accused Products [redacted] *Id.* at Q/A 113.

Dr. Acton explains that [redacted] *Id.* at Q/A 116. He says the Renesas accused products, in contrast, contain [redacted] *Id.* He states that he relied on specific Verilog code "to assess [redacted]." *Id.* at Q/A 119. "Based on my analysis," he opines, "it is apparent that the [hardware accelerators] . . . can be internally programmed to perform decoding according to different decoding methods and are [redacted] as Respondents' experts contend." *Id.*

Dr. Acton's testimony with respect to how the circuits are physically implemented is conclusory ("it is apparent'), as Respondents maintain, and I find it unpersuasive for that reason.[39]

**ii. Programming of accelerators by the [redacted]**

Respondents' experts maintain that Dr. Acton's testimony fails to establish that in the accused products [redacted]." RX-0006C (Bovik

[39] Respondents allege that Dr. Acton does not contest Dr. Bovik's testimony. On the contrary, as discussed above, he does. CX-0004C at Q/A 116.

RWS) at Q/A 45. Their opinion is consistent across the range of accused products. *See id.* at Q/A 35-58.

Dr. Acton's witness statement explains his conclusion that the [redacted] CX-0004C (Acton DWS) at Q/A 101. As an example, he says [redacted] *Id.* Dr. Acton testifies in detail about the documents he relied upon to determine the way in which [redacted] are used to configure the accelerators to perform their functions according to different encoding standards. *Id.* at Q/A 104-115. He states that he reviewed source code to determine the [redacted] interactions with the accelerators, including Verilog code. *Id.* at Q/A 103, 117-118.

Broadcom finds confirmation for Dr. Acton's opinion in the testimony of Renesas's corporate representative, Mr. Matsubara. "Mr. Matsubara explained that [redacted] CRB at 82 (citing JX-0055C at 46:18-82:7. Broadcom asserts that "Mr. Matsubara also explained that the operation [redacted] *Id.* (citing 49:10-53:7; CX-0004C (Acton DWS) at Q/A 89-91).[40]

Broadcom argues, in addition, that claim 1 does not require the [redacted] to program the hardware accelerators directly. They must simply be internally programmable, meaning "that

[40] Broadcom has not explained how Dr. Matsubara's testimony adds any meaningful information.

the processor sends information to the hardware accelerator, the result of which is the internal configuration of the hardware accelerators." CRB at 82-83. Again, Broadcom relies on testimony from Dr. Acton and Mr. Matsubara. *Id.* at 83 (citing CX-0004C (Acton DWS) at Q/A 84, 87-121; JX-0055C at 46:20-56:22, 57:10-61:6).

Dr. Acton identifies [redacted] that he maintains are received by the accelerators and how they are [redacted] *E.g.*, CX-0004C (Acton DWS) at Q/A 107 . He testifies repeatedly that [redacted]. "For example," he states, "for the [redacted] Accused Products, [redacted] Hardware Manual, JX-0095C.348-49, explains that the [redacted] *Id.* at Q/A 102. He specifies the source code he reviewed to reach a determination that the [redacted] *Id.* at Q/A 104; *see also* Q/A 105-115.

I agree with Respondents, however, that Dr. Acton fails to identify the specific parameters on which he relies or to explain how the accelerators actually are programmed by the [redacted].[41] Accordingly, Broadcom has filed to carry its burden of proof on this issue.

[41] Broadcom cites Judge Shaw's opinion in *Certain Semiconductor Devices and Consumer Audiovisual Prods. Containing the Same,* Inv. No. 337-TA-1047, 2018 WL 3062372 (May 11, 2018). This passage involved Judge's Shaw's resolution of a disputed construction of the term: "wherein the accelerator is configurable to perform the decoding function according to a plurality of decoding methods." *Id.* at *127. Broadcom was advocating plain and ordinary meaning (without any requirement that the accelerator be "internally programmable"). *Id.* at *127-128. In rejecting Broadcom's proposed construction, Judge Shaw was merely citing the

For the reasons stated above, there is no infringement of claim 11 of the '844 patent by any of the Renesas accused products or the products in which they are contained.

### 2. Claim 13

For the reasons discussed above, the Renesas accused products do not infringe claim 13 because they do not infringe claims 1, 9, 10, or 11, from which claim 13 depends.[42]

### 3. Indirect Infringement

Given the absence of direct infringement, there can be no indirect or contributory infringement, as a matter of law. *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518, 526 (1972), *superceded by Life Tech. Corp. v. Promega Corp.*, 137 S.Ct. 734 (2017); *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 341 (1961).

## F. Domestic Industry

Broadcom identifies the [redacted] as representative of the '844 DI products. CIB at 183 (citing CX-0004C (Acton DWS) at Q/A 182-185; CX-0003C (Hellman WS) at Q/A 63-70). Broadcom maintains that the DI products satisfy the limitations of claims 11 and 13, as well as claims 1, 9, and 10, from which they depend. Broadcom asserts that the manner in which the products operate is basically undisputed. Broadcom points [redacted] Broadcom asserts that at least [redacted]

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specification. *Id.* at *129. Broadcom's citation to Judge Shaw's opinion does not illuminate the issue of internal programmability.

[42] Respondents assert that none of their products infringe claim 11 and 13 for the reasons discussed above. With respect to the Pioneer products, they assert in addition that the alleged video decoding functionality is not included in any of the Pioneer [redacted] accused products. RIB at 187-189; RX-0009C (Hu RWS) at Q/A 82, 83. Dr. Hu's testimony is not specifically addressed by Broadcom, *see* CIB at 182-183; CRB at 85, and Dr. Acton agrees that there is no evidence that [redacted] for the accused Pioneer [redacted] products. Tr. (Acton) at 218:8-12. Accordingly, I agree with Respondents that the Pioneer [redacted] products do not infringe for this additional reason.

[redacted] *Id.* at 184 (citing CX-0004C (Acton DWS) at Q/A 186-187, 195, 196).

Broadcom also maintains that the '844 DI products are [redacted] *Id.* at 184-185; CX-0004C (Acton DWS) at Q/A 187, 216-228.

Respondents dispute Broadcom's domestic industry contentions, raising arguments similar to those addressed above in the context of infringement. First, they contend that the '844 [redacted] as required by claim 11. They point to Dr. Acton's testimony, in which he identifies [redacted] RIB at 190 (citing CX-0004C (Acton DWS) at Q/A 234-238). Respondents say [redacted]

Claim 11 requires five separate accelerators that perform five separate functions: entropy decoding, inverse quantization, inverse transform, pixel filtering and motion compensation. In his witness statement, Dr. Acton appears to identify [redacted]. CRB at 87; CX-0004C (Acton DWS) at Q/A 234-237. Broadcom claims that [redacted] CIB at 186. In support of this contention, Broadcom points to Dr. Acton's testimony, but the cited answer, Q/A 235, does not state that [redacted]; this is attorney argument to which I give no particular weight. The testimony Broadcom cites [redacted]. CIB at 187; CX-0004C (Acton DWS) at Q/A 227, 237.

Broadcom points out that Respondents' expert, on the other hand, does not contend that the DI products include [redacted]. Broadcom is correct that Dr. Przybylski's witness statement does not include this contention. RX-0014C (Przybylski RWS) at Q/A 21-22. Accordingly, Respondents' argument also is unsupported by expert testimony and consists of attorney argument. I conclude that it is unnecessary to resolve this dispute because the DI products do not practice the patent for another reason.

Respondents's raise a second contention that the '844 DI products lack [redacted]. RIB at 191-192. Dr. Przybylski testifies that the

[redacted]

RX-0014C (Przybylski RWS) at Q/A 21. As noted by Dr. Przybylski, Broadcom essentially concedes that the [redacted] of claim 11 unless Broadcom's claim construction arguments are accepted. *See id.*; CRB at 87 [redacted] As set forth above, Broadcom's claim construction arguments do not prevail; as a result, Broadcom has failed to demonstrate that its DI products practice this limitation. Broadcom has not demonstrated that the [redacted].[43]

Because the alleged Broadcom DI products do not practice all the limitations of claim 11, they do not practice all the limitations of claim 13, on which claim 11 depends. As a result, Broadcom fails to satisfy the technical prong of the domestic industry requirement.

### G. Invalidity

Respondents contend that claims 11 and 13 of the '844 patent are invalid in view of Fandrianto '459 (RX-0070) and Reader (RX-0073). These prior art references were considered in an earlier section 337 investigation where the '844 patent was asserted.

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43 [redacted]

### 1. "Collateral Estoppel" (Claims 1, 9, and 10)

Respondents assert that Broadcom is collaterally estopped from contesting the facts underlying the Commission's holding in *Certain Semiconductor Devices and Consumer Audiovisual Products Containing Same*, Investigation No. 337-TA-1047 ("*Semiconductor Devices*" or the "1047 investigation"), "that claims 1-10 of the '844 patent are invalid." RIB at 192.

#### a. Background

In the 1047 investigation, the administrative law judge construed the claims and found that Fandrianto '459 anticipated claims 1-10 of the '844 patent and Reader '073 and its appendices anticipated claims 1, 2, and 5-9. *Semiconductor Devices*, Final ID (May 11, 2018) (the "'1047 ID") at 220-268. On review, the Commission modified one construction and affirmed the findings regarding anticipation. *Semiconductor Devices*, Comm'n Op. at 7-13, 17-24 (Sept. 19, 2018). After the deadline for filing an appeal from the Commission's decision had passed, Broadcom withdrew claims 1-10 of the '844 patent from the present investigation. Order No. 20 (Jan. 31, 2019), *not reviewed by* Comm'n Notice (Feb. 21, 2019).

Respondents assert that Broadcom is "bound by the final, unappealable decision and findings in the 1047 investigation," RIB at 193, and argue that Broadcom is estopped from challenging the Commission's construction of the term "a processor adapted to control a decoding process" in claim 1 of the '844 patent. '844 patent at 20:18. Respondents state further that the parties in this investigation "agreed to adopt the Commission's actual claim construction." RIB at 194 (citing Complainant's pre-hearing brief at 407).

Broadcom maintains that "claims 1, 9, and 10 are valid over Fandrianto '459, alone or in combination with secondary references." CIB at 188. Broadcom says collateral estoppel does

not apply on the grounds that (1) it did not have a full and fair opportunity in the 1047 investigation to litigate the validity of the claims because the Commission adopted "a new, and never-before briefed construction for claim limitation 1[a] during Commission review; (2) the Commission's findings were not essential to the Commission's final determination; and (3) equitable considerations weigh in favor of not applying collateral estoppel." *Id.* at 189.

**b. Discussion**

It may be helpful to review what is and is not in dispute. Broadcom no longer asserts any of claims 1-10 of the '844 patent in this investigation. Broadcom does, however, assert claims 11-13, which depend from claims 1, 9 and 10. '844 patent at 20:58-22:4. Respondents challenge the validity of claims 11-13. To carry their burden to demonstrate invalidity, Respondents must show by clear and convincing evidence that each and every limitation of claims 11-13 is invalid. Since claims 11-13 depend from claims 1, 9 and 10, the validity of those claims is at issue notwithstanding that they are not asserted. Respondents maintain, however, that Broadcom is estopped by the Commission's decision in the 1047 investigation from contesting that Fandrianto '459 and Reader '073 anticipate claims 1, 9, and 10.

I find that it is neither necessary nor proper to adjudicate the question of collateral estoppel in this setting. As an administrative law judge, I lack the power to deviate from the Commission's decision, which is binding precedent. My job is to apply the Commission's decision regarding the invalidity of claims 1-10 of the '844 patent and the Commission's construction of the pertinent claim terms. Broadcom has preserved its arguments regarding the 1047 decision. If Broadcom finds itself before the Commission on appeal, it can present those arguments to the Commission, which has the authority to alter the 1047 decision. I am powerless to do so.

This conclusion is compelled by operation of law, not by the doctrine of issue preclusion. "It is commonly recognized that ALJs "are entirely subject to the agency on matters of law." *Iran Air v. Kugelman*, 996 F.2d 1253, 1260 (D.C. Cir. 1993) (citing Antonin Scalia, *The ALJ Fiasco—A Reprise,* 47 U.Chi.L.Rev. 57, 62 (1979)). An ALJ "is governed, as in the case of any trial court, by the applicable and controlling precedents." *Id.* (quoting Joseph Zwerdling, *Reflections of the Role of an Administrative Law Judge*, 25 Admin. L. Rev. 9, 12-13 (1973)). Thus, "'once the agency has ruled on a given matter . . . it is not open to reargument by the administrative law judge.'" *Id.* Just as a district court is bound to follow the law of its circuit, *Panduit Corp. v. All States Plastic Mfg. Co.,* 744 F.2d 1564, 1573 (Fed. Cir. 1984), *disapproved on other grounds,* 472 U.S. 424 (1985); *Hasbrouck v. Texaco, Inc.,* 663 F.2d 930, 933 (9th Cir.), *cert. denied,* 459 U.S. 828 (1982) (citing *Bolf v. Berklich,* 401 F. Supp. 74, 76 (D. Minn. 1975)), an administrative law judge is bound to follow the Commission's precedent.

The doctrine of collateral estoppel may apply when a sister court reviews the findings of another trial court, or when an appellate court considers trial court rulings, but not when a lower court considers precedent from a higher authority. Whether the controlling case law is correct or incorrect, fair or unfair, lies beyond the authority of an inferior tribunal to decide. *See Ithaca Coll. v. NLRB*, 623 F.2d 224, 228–29 (2nd Cir. 1980) (holding that a decision by an inferior court or an administrative agency that conflicts with applicable circuit precedent is *ultra vires* and "simply an academic exercise that possesses no authoritative effect"). An administrative law judge may entertain the doctrine of collateral estoppel when considering a decision by another judge, but cannot do so when the Commission has itself has rendered a binding determination on the issue. Accordingly, I find that the limitations of claims 1, 9 and 10 of the '844 patent are

disclosed and anticipated by Fandrianto '459 and Reader '073. *Semiconductor Devices,* Comm. Op. at 24.

The parties dispute the content as well as the correctness of the Commission's claim construction. Broadcom maintains that the construction requires simultaneous decoding. CRB at 88 ("Broadcom is simply stating, as the Commission did, that the agreed-upon construction requires simultaneous decoding.") I agree with Broadcom's argument, notwithstanding that the statement at page 8 of the opinion does not expressly require simultaneity. *See Semiconductor Devices,* Comm'n Op. at 8 ("[T]he Commission has determined to modify the construction of 'a processor adapted to control a decoding process' to mean 'a core processor adapted to control a decoding process according to a processing pipeline.'"). The Commission's reasoning, which follows the statement above, elaborates on the requirements of a pipeline. *Id.* at 8-10. The Commission concludes: "*[U]nder the Commission's construction* of 'a processor adapted to control a decoding process,' the core processor controls a decoding process according to a pipeline in which a series of decoding functions are [sic] performed on each data block, arranged so that multiple decoding functions are performed on each data block, arranged so that multiple decoding functions decode different data blocks simultaneously." *Id.* at 10-11 (emphasis added). The requirement of simultaneity thus is set forth clearly in the Commission's opinion.

**2. Obviousness (Claims 11 and 13)**

Respondents rely on the testimony of Dr. Bovik to support their contentions that claims 11 and 13 are obvious over Fandrianto '459 (RX-0070) in combination with Reader (RX-0073) and its appendices (RX-0180). RX-0002C (Bovik DWS). Fandrianto '459, issued in 1999, is a patent for "a multimedia processor contain[ing] a general purpose RISC and video processors which operate in parallel to execute software for combined video and audio bit stream coding

and decoding." RX-0070 at Abstract. Reader, issued in 2001, is a patent for a computer system including "three processors capable to operate concurrently – a scalar processor, a vector processor, and a bitstream processor." RX-0073 at Abstract.

**a. Claim 11 preamble**

Broadcom does not dispute that Fandrianto '459 discloses the preamble. CIB at 196-199; RRB at 95.

**b. "a programmable entropy decoder adapted to perform entropy decoding on the data stream"**

Dr. Bovik states that under Respondents' construction of "programmable entropy decoder" (which I adopted above), this limitation would have been obvious over Fandrianto '459 in combination with Reader and its appendices, "[b]ecause it would have been obvious to a POSITA to implement the Huffman decoder [in Fandrianto '459] with a processor as disclosed in [Reader] and its appendices." RX-0002C (Bovik DWS) at Q/A 62, 66.[44] Dr. Bovik identifies Reader's bitstream processor as "'a processor that performs variable length decoding, arithmetic decoding, or variations on either of those'" as required under the adopted construction. *Id.* at Q/A 63. He opines that the bitstream processor is configurable because Reader discloses "that the scalar processor configures the Bitstream Processor by initializing its internal registers." *Id.* He identifies the relevant internal registers of the bitstream processor and describes its function. *Id.* at Q/A 64, 65. Dr. Bovik adds that a POSITA would understand that Fandrianto '459 would

[44] Dr. Bovik describes the Huffman decoder as the subsystem of the Huffman codec disclosed in Fandrianto '459. The "Huffman codec 260 is a high-speed engine which performs variable length encoding or decoding using Huffman tables that are stored in Huffman codec 260." RX-0002C at Q/A 43 (quoting Fandrianto '459 at 11:40-11:-63.)

be improved by replacing the Huffman decoder tables in Reader with a programmable processor. *Id.* at Q/A 66-69.

Dr. Acton, for Broadcom, opines that a person of ordinary skill "would not have been motivated to implement Huffman decoding in Fandrianto '459's system using a processor, as disclosed in Reader '073 instead of the existing Huffman codec." CX-0010C (Acton RWS) at Q/A 50. He explains that Fandrianto '459's system "was already a functional multi-standard video decoder, capable of performing decoding according to a plurality of standards," and a person of ordinary skill would have "avoided" adding an additional processor because doing so "would have increased the cost and complexity" of Fandrianto's system. *Id.* at Q/A 51.

Dr. Bovik provides several compelling reasons to support his opinion that a person of ordinary skill would be motivated to combine Fandrianto '459 and Reader '073 in the way he suggests. He states that it would have been obvious and desirable to increase configurability by implementing the Huffman decoder as a processor. RX-0002C (Bovik DWS) at Q/A 66. He explains that at the time the '844 patent was issued, it was known that certain standards used types of entropy decoding that required a processor, and that the use of a processor would provide the flexibility to support the new algorithms. *Id.* at Q/A 66-67. Dr. Bovik says that, at the relevant time, a person of ordinary skill "would have had a reasonable expectation of success in implementing" Fandrianto's Huffman decoder as a processor. *Id.* at Q/A 68. He describes in detail how the inventions described in Fandrianto and Reader already disclosed a multi-standard video decoder with analogous architectures. *Id.* He asserts further that, as discussed in the Fandrianto '459 patent, earlier systems lacked a programmable processor to execute "'user programmable software to implement the desired standards.'" *Id.* at Q/A 69 (citing RX-0070 at 1:30-62). Dr. Bovik's conclusion appears well supported: at the time of the '844 patent

invention, he states, it would have been obvious to implement the Huffman decoder as a processor, "as taught by" Reader, "in order to support the growing number of public and propriety/custom standards, and thereby achieve [Fandrianto's] stated objective or a 'universal' decoder.'" *Id.* at 69.

Dr. Acton's conclusory statement that a person of ordinary skill would have been de-incentivized to implement the Huffman decoder as a processor by the additional expense is unpersuasive in light of the known benefits of doing do. Accordingly, Respondents have demonstrated by clear and convincing evidence that this limitation of claim 11 is obvious over Fandrianto '459 and Reader.

**c. "an inverse quantizer adapted to perform inverse quantization on the data stream"**

In Fandrianto, the video processor is adapted to perform inverse quantization on the data stream as may be required by public or proprietary standards. RX-0070 at 12:48-57; RX-0002C at Q/A 70. Broadcom does not dispute that Fandrianto '459 discloses or renders obvious this limitation of claim 11.

**d. "an inverse transform accelerator adapted to perform inverse transform operations on the data stream"**

As above, the video processor is adapted to perform inverse transform operations on the data stream as may be required by public or proprietary standards. RX-0070 at 12:48-57; RX-0002C (Bovik DWS) at Q/A 71. Broadcom does not dispute that Fandrianto '459 discloses or renders obvious this limitation of claim 11.

**e. "a pixel filter adapted to perform pixel filtering on the data stream"**

Respondents assert that Fandrianto '459 discloses this limitation or at least renders it obvious. RX-0002C (Bovik DWS) at Q/A 72-83.[45] The parties agreed to construe "pixel filtering" as "'the interpolation necessary when a reference block is translated (motion compensated) by a vector that cannot be represented by an integer number of whole-pixel locations.'" RX-0002C (Bovik DWS) at Q/A 72. Respondents' expert, Dr. Bovik, opines that Fandrianto '459 alone discloses this limitation. *Id.* at Q/A 74. He states further that Fandrianto '351, RX-0182, incorporated by reference in Fandrianto '459, discuses pixel filtering. *Id.* at Q/A 80. Dr. Bovik opines that in light of the incorporation of Fandrianto '351 in Fandrianto '459, Fandrianto itself discloses the pixel filter recited in claim 11. *Id.* Respondents state in addition

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[45] Broadcom points out that, in the 1047 investigation, Judge Shaw "found that Fandrianto '459 did not disclose a configurable pixel filter." CRB at 95. This aspect of the 1047 decision was not reviewed by the Commission. *Certain Semiconductor Devices and Consumer Audiovisual Products Containing the Same*, Inv. No. 337-TA-1047, 2018 WL 3491402 (July 17, 2018). The Commission's determination in the 1047 investigation means only that, with respect to claims 11-14, respondents failed to carry their burden on invalidity. That result has no binding effect on my consideration of the facts and arguments raised by Respondents here. In *Ethicon, Inc. v. Quigg*, the Federal Circuit explained:

> Courts do not find patents "valid," *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 699 n. 9 (Fed.Cir.1983), only that the patent challenger did not carry the "burden of establishing invalidity in the particular case before the court" under 35 U.S.C. § 282. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1569 (Fed.Cir.1987) (emphasis added); *accord Shelcore, Inc. v. Durham Industries, Inc.*, 745 F.2d 621, 627 (Fed.Cir.1984) ("A patent is not held valid for all purposes but, rather, not invalid on the record before the court"). "Thereupon, the patent simply remains valid until another challenger carries the § 282 burden." *Panduit Corp.*, 810 F.2d at 1570. Accordingly, a court's decision upholding a patent's validity is not ordinarily binding on another challenge to the patent's validity, *Stevenson v. Sears, Roebuck & Co.*, 713 F.2d 705, 710, 711 (Fed. Cir. 1983), in either the courts or the PTO.

849 F.2d 1422, 1428-29 n. 3 (Fed. Cir. 1988)

that it would have been obvious to a person of ordinary skill at the time of the invention to implement the pixel filtering disclosed in Fandrianto '351 in the video processor of Fandrianto '459, "in order to comply with the necessary standards and achieve" Fandrianto 459's stated goal of a "universal" video decoder. *Id.* at Q/A 81. Respondents also claim that "by 2002 it would have been obvious to perform configurable pixel filtering as claimed to support newer standards." RRB at 97.

Broadcom responds that "Dr. Bovik does not cite a single passage from Fandrianto '459 that mentions pixel filtering." CIB at 198 (citing CX-0010C (Acton RWS) at Q/A 53). Broadcom asserts further that, even if pixel filtering were mentioned, the pixel filter would not be a configurable hardware accelerator because none of the encoding standing standards mentioned in Fandrianto '459 require pixel filtering. *Id.* (citing CX-0010C (Acton RWS) at Q/A 60). Dr. Acton says Fandrianto '351 "describes pixel interpolation but does not describe a configurable hardware accelerator that performs pixel filtering, as is required by claim 11." *Id.* (citing CX-0010C (Acton RWS) at Q/A 53-58).[46] Dr. Acton states that a person of ordinary skill would not "be motivated to modify Fandrianto '459's video processor, when pixel filtering was not a requirement." CX-0010C at Q/A 60.

Fandrianto alone does not disclose pixel filtering. I find, however, that Fandrianto '351 is specifically incorporated into Fandrianto '459. The reference in Fandrianto '459 to Fandrianto'351 affirmatively incorporates "architectures and embodiments of video processor 280." RX-0070 at 13:29-30.

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[46] Respondents counter that Dr. Acton "fails to explain" how the pixel filtering operations described in Fandrianto '351 could be incorporated by reference into Fandrianto '459's video processor 280 in a 'non-configurable' manner." RIB at 211.

Nevertheless, Fandrianto '351 "does not describe a configurable hardware accelerator that performs pixel filtering, as is required by claim 11." CX-0010C (Acton RWS) at Q/A 60. Fandrianto '351 does not claim a "pixel filter that would perform its operations differently" for different standards. *Id.* at Q/A 58. As Dr. Acton points out, "none of the encoding standards that Fandrianto mentions when discussing video processor [sic] require pixel filtering." *Id.* at Q/A 54.

Respondents' contention that "it is undisputed that by 2002 it would have been obvious to perform configurable pixel filtering as claimed to support newer standards," RRB at 97, is not entirely accurate. Dr. Acton explains why it would not have been obvious to modify Fandrianto '459 to include a pixel filter based on then-known standards. CX-0010C (Acton RWS) at Q/A 52-62; Tr. (Acton) 1011:10-13 ("[A]ny video decoder, encoder is going to be physically limited as to the number of standards it can or cannot encode or decode."). Respondents have not demonstrated clearly and convincingly that it would have been obvious to a person of ordinary skill to modify the video processor of Fandrianto '459 based on the incorporation of Fandrianto '351 or the state of the art in 2002.

**f. "a motion compensator adapted to perform motion compensation on the data stream"**

Respondents maintain that Fandrianto '459 "discloses or at least renders obvious this limitation," based on the incorporation by reference of motion compensation from Fandrianto '351. RRB at 97.

Broadcom responds that "even if" Fandrianto '351 describes motion compensation, it "does not mention configuring the vision processor so that the motion compensation can be done according to different decoding standards." CX-0010C (Acton RWS) at Q/A 65.

Respondents have not demonstrated by clear and convincing evidence that Fandrianto '459, alone or in combination with Fandrianto '351, discloses the pertinent limitation. Respondents rely on the notion that because motion compensation was recognized as a "'fundamental function' common to 'most or all' formats . . . ," the specific requirements of claim 11 would have been obvious. RIB at 214 (citing JX-0001 at 4:55-61). The '844 patent's specification contains a significant *caveat*, however, noting that existing technology ("fixed hardware implementations") could not address "all requirements [of the noted algorithms] without duplication of resources." JX-0001 at 4:66-5:2. The invention of the '844 patent discloses hardware modules "with sufficient flexibility or programmability enabling a decoding system that decodes a variety of standards efficiently and flexibly." *Id.* at 5:4-6. Respondents do not clearly explain why it would have been obvious to create a programmable motion compensator. Dr. Bovik's cited testimony simply does not address this issue squarely. RX-0002C (Bovik DWS) at Q/A 84-87.

Respondents assert that "Dr. Acton's only dispute is that individual references each only discuss a single standard." RIB at 214 (citing CX-0010C (Acton RWS) at Q/A 64-67). This is not the case. The cited testimony from Dr. Acton focuses on the absence of a configurable motion compensator in the prior art references. CX-0010C (Acton RWS) at Q/A 64-67.

**g. Five hardware accelerators**

Respondents assert that Fandrianto '459 in light of Takahashi (RX-0228) renders claim 11 obvious under Respondents' proposed construction requiring five separate accelerators. RIB at 214-215; RX-0228. Respondents assert that a person of ordinary skill would have known several ways to implement the functionality of Takahashi and the benefits of using dedicated hardware. *See* RX-0002C (Bovik DWS) at Q/A 92-95. Dr. Bovik testifies that a person of

ordinary skill who chose to use separate and dedicated hardware components "would have had a reasonable expectation of success in achieving the predictable result of decoding the video." *Id.* at Q/A 95.

Broadcom does not dispute that Takahashi's article, "A 60-Mhz 240-mW MPEG-4 Videophone LSI with 16-MB embedded DRAM," published in 2000, is prior art. RX-0228 Broadcom does not dispute Dr. Bovik's testimony that Takahashi teaches that "a benefit of using different and dedicated hardware components is to allow for parallel operation of each function, which allows each core to run at a lower clock speed and use less power." RX-0002C (Bovik DWS) at Q/A 92 (citing RX-0228 at 1715). In opposing Respondents' arguments, Broadcom and its expert do not appear to refer specifically to the Takahashi reference at all.

With regard to this element of claim 11, Broadcom cites Dr. Acton's testimony at Q/A 68, which merely disputes the claim construction requiring separate accelerators. Dr. Acton's testimony at Q/A 51, also cited by Broadcom, states that a person of ordinary skill would have no reason to modify a multi-standard video decoder, but this testimony is contradicted persuasively by Dr. Bovik, as discussed above. Accordingly, Respondents have established by clear and convincing evidence that the element of claim 11 requiring five separate accelerators was rendered obvious by Fandrianto '459 in light of Takahashi.

**h. Claim 13**

Respondents contend that claim 13 is rendered obvious by Fandrianto '459 alone or in combination with other references, for the same reasons discussed with regard to claim 11. *See* RX-0002C (Bovik RWS) at Q/A 97. Dr. Bovik asserts that the RISC processor 220 in Fandrianto '459 is adapted to configure "each of the accelerators to perform the decoding function according to a format of the media data to be decoded," or that it would have been

obvious to do so. *Id.* He says that a person of ordinary skill would have known that each of the standards disclosed by Fandrianto '459 would have constituted a different format as claimed in claim 13. *Id.*

In response, Broadcom states only that Respondents have not shown claim 13 to be invalid, for the same reasons provided for claims 1, 9, 10, and 11. CIB at 199 (citing CX-0010C (Acton RWS) at Q21-70).

For the reasons stated above with respect to claim 11, Respondents have not demonstrated clearly and convincingly that Fandrianto '459 renders claim 13 obvious.

**i. Secondary considerations of non-obviousness**

Broadcom argues that the commercial success of the alleged DI products "is due in part to the '844 Patent's claim invention." CIB at 200. Broadcom points to the testimony of its economic expert, Mr. Green. *Id.* (citing CX-0007C (Green WS) at Q/A 97). The cited testimony, however, relates to domestic industry and does not support a nexus between any commercial success and the technology disclosed in claims 11 and 13 of the '844 patent.

Broadcom also cites Dr. Acton's testimony. *Id.* (citing CX-0010C (Acton RWS) at Q/A 99, but the cited testimony similarly lacks probative value. Dr. Acton refers to Broadcom's own documentation and the testimony of its corporate representative, Tim Hellman. CX-0010C at Q/A 100. But this evidence provides no support for the required nexus between commercial success and the features disclosed in claims 11 and 13 of the '844 patent. In addition, Dr. Acton appears to have no personal knowledge [redacted] to which he refers, even if they were probative of non-obviousness which, without demonstration of the required nexus, they are not.

I have determined above that the alleged DI products do not practice claims 11 and 13 of the '844 patent. It follows that Broadcom cannot demonstrate the appropriate nexus between the success of its products and the patented technology, since it has not established that the products actually practice that technology. Accordingly, the alleged secondary considerations do not affect the obviousness analysis above with respect to the '844 patent.

## IX. THE '187 PATENT

### A. Background and Specification

The '187 patent, entitled "Method and Apparatus for Forming a Dynamic Model to Locate Position of Satellite Receiver," issued on August 30, 2005 from an application filed on June 13, 2006. JX-0003 at *Inter Partes* Reexamination Correction Certificate. The '187 patent is a continuation-in-part of U.S. Patent No. 6,734,821 ("the '821 patent"), which in turn is a continuation-in-part of U.S. Patent No. 6,417,801 ("the '801 patent"). *Id.* The named inventors of the '187 patent are Frank van Diggelen and Charles Abraham. *Id.*

As a continuation-in-part, the specification of the '187 patent includes material not previously disclosed in the priority patents. This new material relates to two embodiments for locating the position of a GPS receiver. *Id.* at *Inter Partes* Reexamination Correction Certificate (Abstract), 4:16-20. In the first embodiment, pseudoranges obtained from a plurality of satellites are used to calculate absolute time, *i.e.*, the time generated by the clocks of the GPS satellites. *Id.* at *Inter Partes* Reexamination Correction Certificate (Abstract), 3:30-38, 4:16-20. The calculated absolute time is used to compute GPS position at a subsequent period of time. *Id.* In the second embodiment, "a plurality of states associated with a satellite signal receiver are estimated, where the plurality of states includes a time tag error state." *Id.* at *Inter Partes* Reexamination Correction Certificate (Abstract), 4:21-26. A dynamic model is then formed

"relating the plurality of states, the dynamic model operative to compute [the] position of the satellite signal receiver." *Id.*

GPS receivers "determine their position by computing time delays between transmission and reception of signals transmitted from satellites and received by the receiver." *Id.* at 1:24-27. The time delay between transmission and reception allows the GPS receiver to calculate the approximate distance between the receiver and the satellite by multiplying the time delay by the speed of light. *Id.* at 1:27-30. This calculated distance is called a "pseudorange." The satellite signal contains satellite-positioning data (called ephemeris data) and the "Time of Week (TOW) data." *Id.* at 2:30-35, 2:56-59. The TOW data provides the GPS receiver with the absolute time associated with the signal, which allows "the receiver to unambiguously determine a time tag for when each received signal was transmitted by each satellite." *Id.* at 1:35-38. The ephemeris data allows the receiver to calculate the position of the satellite at the time it transmitted the signal. *Id.* at 1:38-40. By determining the pseudoranges and calculated positions of multiple satellites, the GPS transceiver is able to estimate its position through triangulation. *Id.* at 1:40-42, 2:43-46.

In order to determine its position with an acceptable degree of accuracy, the receiver must take into account the common mode error and the time tag error. The common mode error "is an error in the reference point for measuring sub-millisecond pseudoranges at the GPS receiver and has a total range of one millisecond." *Id.* at 15:9-12; *see also id.* at 3:39-42. This error is called the common mode error because it "affects all measurements equally" *Id.* at 3:42-43. The time tag error is "a value that represents the difference between absolute time and local time and may range to one minute or more." *Id.* at 15:12-15.

In order to calculate its position without knowing absolute time, the receiver needs to calculate the pseudoranges of five GPS satellites. *Id.* at 13:53-55. Five pseudoranges are

needed because there are five variables that need to be solved: three position variables (x, y, and z), the common mode error variable, and the time tag error variable. *Id.* at 13:50-55. The '187 patent discloses that the receiver's position can be determined using a dynamic model to model various states associated with the receiver, including the x, y, and z states, common-error mode state, and the time tag error state. *Id.* at 16:54-59. According to the patent, while "[t]he first four states are well known in the art," the time-tag error state is novel. *Id.* at 16:56-62. All of the asserted claims require a time-tag error state.

**B. Asserted Claims**

Broadcom asserts that JRC, u-blox, Pioneer, Panasonic, DENSO, and Toyota infringe claims 1-3, 5, and 9 of the '187 patent. Broadcom further asserts that its domestic industry products practice the asserted claims. Claims 1 and 9 are independent, and the remaining asserted claims depend directly from claim 1.

Claim 1 recites:

> A method, comprising:
>
> estimating a plurality of states associated with a satellite signal receiver, the plurality of states including a time tag error state, the time tag error state relating a local time associated with said satellite signal receiver and an absolute time associated with signals from a plurality of satellites; and
>
> forming a dynamic model relating the plurality of states, the dynamic model operative to compute position of the satellite signal receiver.

*Id.* at 20:45-54. Claim 2 further requires that the plurality of states include "a state related to a common mode error and at least one state related to the position of the satellite signal receiver." *Id.* at 20:55-58. Claim 3 requires the following three additional steps:

> obtaining pseudoranges that estimate the range of the satellite signal receiver to the plurality of satellites;

> updating the plurality of states within the dynamic model using the pseudoranges; and
>
> computing a position of the satellite signal receiver using the dynamic model.

*Id.* at 20:59-65. Claim 5 requires the following two additional steps:

> obtaining time-of-week information; [and]
>
> estimating a known value for the time tag error state within the dynamic model using the time-of-week information.

*Id.* at 21:1-5.

Unlike claims 1-3 and 5, independent claim 9 is an apparatus claim. Claim 9 recites:

> A mobile device, comprising:
>
> a satellite signal receiver for providing pseudoranges that estimate the range of the mobile device to a plurality of satellites; and
>
> a sequential estimator having a plurality of states associated with the satellite signal receiver, the plurality of states including a time tag error state, the time tag error state relating a local time associated with said satellite signal receiver and an absolute time associate with signals from the plurality of satellites.

*Id.* at 22:1-12.

### C. Level of Ordinary Skill in the Art

The parties have put forth similar definitions for the level of skill. Broadcom contends that a person of ordinary skill in the art "would have a Bachelor's Degree, or equivalent industry experience, and an additional two to three years of experience in the design of GPS receivers. The POSA would also have been familiar with the overall design of GNSS systems." CMIB at 5-6. Respondents contend that a person of ordinary skill in the art "would have a Bachelor's Degree in an Engineering discipline such as Electrical, Aeronautical or Mechanical Engineering, or a Bachelor's Degree in Computer Science or Equivalent degree, plus at least two years of relevant experience with GNSS or similar systems." RRMB at 16 n. 7. Although the definitions

are similar in scope, Respondents' proposed definition better defines the required undergraduate degree. Accordingly, I adopt Respondents' proposed definition of ordinary skill.

### D. Claim Construction

As set forth in the Complainant and Respondents' Agreed Compromise Claim Constructions, the parties have reached agreed-upon constructions for the following terms:

| Claim Term | Agreed-upon Construction |
|---|---|
| "estimating a plurality of states associated with a satellite signal receiver, the plurality of states including a time tag error state" (claim 1) | "estimating, without having absolute time information, a plurality of states associated with a satellite signal receiver, where the plurality of states includes a time tag error state" |
| "common mode error" (claim 2) | "an error in the reference point for measuring sub-millisecond pseudoranges at the GPS receiver and has a total range of one millisecond" |
| "time tag error" (claims 1, 9) | "a value, separate from the common mode error, that represents the difference in time between an absolute time and the local receiver time" |

Complainant and Respondents' Agreed Compromise Claim Constructions at 5.

The parties dispute the constructions of the following terms: "time tag error state" (claims 1, 9), "dynamic model" (claim 1), "forming a dynamic model relating the plurality of states" (claim 1), "estimating a known value for the time tag error state within the dynamic model using the time-of-week information" (claim 5), and "sequential estimator" (claim 9). The parties' disputes are addressed below.

**1. "time tag error state"**

| Claim Term | Respondents' Proposed Construction | Broadcom's Proposed Construction |
|---|---|---|
| "time tag error state" | "the state in the dynamic model used to represent and estimate the time tag error" | Complainant and Respondents' Agreed Compromise Claim Constructions at 6: No construction necessary OR "the state in the dynamic model used to represent and estimate the time tag error"<br><br>Broadcom's Initial Post-Hearing Brief at 203: "the state in the dynamic model that represents the time tag error" |

During the *Markman* proceedings, Broadcom argued that the term "time tag error state" did not need to be construed, but if it were, that it should be construed to mean "the state in the dynamic model used to represent and estimate the time tag error" (claims 1, 9). RMIB at 35 During the *Markman* proceedings, Respondents argued that the term should be construed to mean "a dynamically-modeled variable that represents the time tag error." *Id.* at 35. After the *Markman* hearing, the Respondents adopted Broadcom's alternative proposed construction. Complainant and Respondents' Agreed Upon Claim Constructions (February 19, 2019) at 6. In its pre-hearing and post-hearing briefs, Broadcom amended its alternative construction by removing the words "and estimate." CIB at 203.

The only support provided by Broadcom for its revised construction are citations to its *Markman* briefs and the rebuttal witness statement of its expert Dr. Goldberg. *Id.* Because Respondents adopted Broadcom's original proposed construction, the portions of the *Markman* briefs cited by Broadcom support Respondents' current proposed construction, not Broadcom's. *See, e.g.,* CRMB at 18 ("The 'time tag error state' is 'the state in the dynamic model used to represent and estimate the time tag error.'"). While Dr. Goldberg states that Respondents'

current proposed construction and Broadcom's former proposed construction "is confusing because a 'dynamic model' does not 'estimate' the time tag error," CX-0011C (Goldberg RWS) at Q/A 71, he does not provide any further elaboration.

There are no infringement, technical domestic industry, or invalidity issues addressed in this initial determination that turn on whether an "alleged time tag error state" estimates, as well as represents, the time tag error. For the purposes of this initial determination, it is sufficient that the parties agree that the "time tag error state" is a state in a dynamic model that at least represents the time tag error.

**2. "dynamic model"/ "forming a dynamic model relating the plurality of states"**

| Claim Term | Respondents' Proposed Construction | Broadcom's Proposed Construction |
|---|---|---|
| "dynamic model" | "a model that predicts the values of the states of a system as the system changes in one point in time to the next, wherein the 'next' point in time is a past or a present point in time" | "a set of mathematical equations that characterize the relationships between the values of the states of a dynamic system as the system changes from one point in time to the next" |
| "forming a dynamic model relating the plurality of states" (claim 1) | No construction necessary | No construction if Broadcom's proposed construction of "dynamic model" is adopted |

Complainant and Respondents' Agreed Compromise Claim Constructions at 6-7.

Claim 1 requires a step of "forming a dynamic model relating" a plurality of states associated with a satellite signal receiver, wherein the dynamic model is "operative to compute position of the satellite signal receiver." JX-0003 at 20:51-54. The parties' dispute the meaning of "dynamic model." Each party has amended its proposed construction since the *Markman* hearing.

During the *Markman* proceedings, Respondents argued that "dynamic model" should be construed as "a model that predicts the values of the states of a system as the system changes from one point in time to the next." CIB at 203. At the *Markman* hearing, the only objection to Respondents' proposed construction made by Broadcom was that the word "predicts" connoted that the model had to predict values for future states, rather than for current states. *Markman* Hearing Tr. at 191:8-12 (counsel for Broadcom) ("[Broadcom] just disputes the word 'predict' because that—the definition of predict is that it's doing something in the future."). After the *Markman* hearing, Respondents amended their proposed construction to its current form by adding the language "wherein the 'next' point in time is a past or a present point in time." CIB at 203. As amended, Respondents proposed construction requires any prediction be for a past or present point in time, not a future point in time.

During the *Markman* hearing, Broadcom argued that the "dynamic model" did not need to be construed, but if it were it should be construed to mean "a model that accounts for time-dependent changes in the state of a system." CIB at 203. After the hearing, Broadcom amended its construction significantly: "a set of mathematical equations that characterize the relationships between the values of the states of a dynamic system as the system changes from one point in time to the next." *Id.* Broadcom has not offered an explanation as to why it changed its proposed construction after the *Markman* hearing, and a rationale for the changes is not apparent from the record.[47]

[47] The construction of the term "forming a dynamic model relating the plurality of states" was addressed in a prior Commission investigation, *Certain GPS Devices and Products Containing Same,* Inv. No. 337-TA-602 ("602 investigation"). In the 602 investigation, the respondent argued that the term means "building a mathematical model whose states are updated by a sequential estimator." 602 ID at 195-96. The ALJ rejected the respondent's proposed construction and construed the term as "forming a model of a dynamic system represented by a

For the reasons set forth below, I find that the term "dynamic model" is "a model that predicts the values of the states of a system as the system changes from one point in time to the next, wherein the 'next' point in time is a past or a present point in time."

**a) Respondents' proposed construction is consistent with the specification and the customary meaning of "dynamic model."**

The specification describes dynamic models by contrasting dynamic models to previously described embodiments. In these previously described embodiments, "each position is computed independently, with the exception of using a previously computed absolute time." JX-0003 at 16:9-12. In contrast, dynamic models "do not produce independent position computations each time the position is requested," but rather use "a history of information . . . to continuously produce a filtered position result." *Id.* at 16:9-16; *see also Markman* Hearing Tr. at 148:21-23 ("As the specification makes clear, the dynamic model takes historical information and uses that to produce—continuously produce a filtered position.") (counsel for Broadcom). Incorporating the historical GPS information in order to produce a filtered result requires a "formal model or informal set of assumptions regarding the tendency of the GPS receiver to move from position to position." JX-0003 at 16:16-19.

According to the patent, using a dynamic model provides two advantages. First, it allows a designer to "choose filtering time constants that adequately track receiver dynamics, yet allow

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plurality of states, with the model describing the relationship between the states as they change." 602 ID at 195-97. Thus, the ALJ appears to have construed "dynamic model" to mean "a model of a dynamic system." Although Broadcom in its initial *Markman* brief argued that the construction adopted in the 602 investigation is binding under the doctrine of *stare decisis*, CMIB at 32-33, both Broadcom and Respondents advance constructions in their post-hearing briefs that are different from the construction adopted in the 602 investigation. Accordingly, the argument that the construction adopted in the 602 investigation is binding in this investigation appears to have been abandoned.

improved accuracy through the averaging process." *Id.* at 16:19-23. Second, the use of filtering techniques allows the receiver to "continue to operate when insufficient satellite measurements exist to create independent solutions." *Id.* at 16:23-25. This is particularly useful "in urban driving situations, where the vehicle dynamics can be modeled, and where frequency blockages hamper the ability to produce independent solutions." *Id.* at 16:26-29.

As an example of a dynamic model, the specification discloses a sequential filter implemented as "a Kalman filter that employs a linear dynamic model of a discrete GPS system." *Id.* at 16:54-56. The linear dynamic model used by the Kalman filter has several states, one of which is the "time tag error state." *Id.* at 16:56-65. Incorporating a time-tag error state into the model allows the model to "determin[e] the position of the GPS receiver even if insufficient pseudorange measurements exist to solve for absolute time in the classical 'least-squares' approach of solving for m unknown variables with n independent measurements, where $n \geq m$." *Id.* at 17:64-18:2. As described by the patent, "[e]ach iteration of the sequential estimator 802 begins by predicting the state values at the next time interval. . . ." *Id.* at 17:31-46. The estimates are weighted according to past observed and predicted measurements for the states. *Id.* at 17:47-51. After the state values have been updated with the predicted values for the next time interval, the updated state values are "used to generate a prediction of the measurements." *Id.* at 17:31-37.

In his rebuttal statement, Respondents' expert Dr. Pullen explains his understanding of how one of ordinary skill in the art would define "dynamic model." According to Dr. Pullen, a model is dynamic if it shows the temporal relationship of the states representing the system being modeled at different points in time, so that the states at a current point in time can be predicted by extrapolating the states at a prior point in time. RX-0017C (Pullen RWS) at Q/A 11-13. As

explained by Dr. Pullen, a person of ordinary skill in the art would understand the term "predict" to "mean mathematically applying the dynamic model on the state of the system from an earlier point in time . . . in order to extrapolate (*i.e.,* propagate forward) the state of the system at a later point in time." *Id.* at Q/A 12-13. By way of example, Dr. Pullen testifies that a dynamic model could be used "to predict the flight of a golf ball (and its position at any time after being struck) based on the speed and angle of impact of the club that struck it." *Id.* at Q/A 11 (underlining in original omitted).

Dr. Pullen's definition of "dynamic model" requiring the model to predict the receiver's position is consistent with the specification and how the term is interpreted in the field. In describing the dynamic model, the specification uses variations of the term "predict" seven times. JX-0003 at 17:21-50. The textbook "Understanding GPS: Principles and Applications" by Kaplan ("Kaplan;" RX-0197), describes a dynamic model in the context of a GPS system as "a set of differential equations describing the dynamic behavior of the satellite" that can "predict[] forward in time" satellite position and clock correction. RX-0197.82.

Broadcom argues that Respondents' proposed construction improperly excludes two embodiments. This argument, however, is not persuasive. The first embodiment allegedly excluded is an alternative embodiment in which, "rather than continually computing independent absolute times until a sufficiently accurate absolute time is obtained, the invention . . . average[s] a plurality of computed time tag errors and record[s] the average as the known time tag error." JX-0003 at 15:54-58 In this embodiment, "if a computed absolute time is not sufficiently accurate . . . , rather than discarding the computed absolute time, the computed time tag error may be stored so that it may be averaged with a subsequently computed time tag error.

*Id.* at 15:54-65; Hearing Tr. at 858:18-15. The second embodiment allegedly excluded is "sequential estimator 802" as described at lines 30-53 of column 60.

Broadcom's argument that these embodiments are excluded under Respondents' proposed construction appears to be based on Broadcom's interpretation of the Respondents' original proposed construction of "dynamic model" as requiring a model to predict future values of the plurality states. CIB at 205 ("Nowhere does the '187 Patent require a dynamic model to predict future values."). As discussed above, Respondents amended their initial proposed construction to require that the model had to predict values for future states, rather than for current states. Broadcom does not make any argument that Respondents' proposed construction as currently formulated would exclude the two embodiments in question. *Id.*

**b) Broadcom's proposed construction is overbroad.**

In contrast to Respondents' proposed construction, which comports with the specification's description of dynamic models and how one of ordinary skill in the art would understand the term, Broadcom's proposed construction is unsupported and overbroad. As discussed above, during the *Markman* proceedings, Broadcom advanced a construction of "dynamic model" that is significantly different from its current construction. Despite this, Broadcom does not offer any argument in support of its post-*Markman* construction, other than citing to its arguments in the *Markman* briefing concerning its earlier proposed construction. *See, e.g.,* CIB at 203-05. In support of that proposed construction, Broadcom argued that the term "dynamic model" should not be limited to models that "predict future values," but should be construed so as to encompass models that "calculate the current values." CMIB at 38. As an example of a dynamic model that "calculate[s] future values," Broadcom pointed to the Figure 2 embodiment described in column 7 of the '187 patent. *Id.* ("For example, the embodiment

described with reference to FIG. 2 uses a one [*sic*] mathematical model that calculates position and time updates. '187 patent at 7:40-8:10; 14:19-28; 15:33-36.") (footnote and emphasis omitted). In Broadcom's own words, the Figure 2 embodiment is a "mathematical model [that] provides 'position updates, x, y, z' and 'time updates $t_C$, $t_S$' over time that are added to prior estimates for position and prior estimates of time of reception, respectively." CMIB. at n. 14 (citing '187 patent, at 7:37-39, 8:11-14).

Although Broadcom changed its proposed construction after the *Markman* hearing, Broadcom's current construction would still ensnare the Figure 2 embodiment. In its prehearing brief, Broadcom cites to the Figure 2 embodiment as an example of a model that is encompassed by the revised Broadcom model.

> The '187 Patent discusses both dynamic models that are used to estimate current or present values and also dynamic models that are used by a Kalman filter to predict values. The embodiment set forth in FIG. 2 uses a mathematical model that calculates position and time updates." '187 Pat. (JX-0003) at 7:40-8:10; 14:19–28; 15:33–36. Specifically, this mathematical model provides "position updates x, y, z" and "time updates tc, ts" over time that are added to prior estimates for position and prior estimates of time of reception, respectively. *Id.* at 7:37–39; 8:11–14. . . . Nowhere does the '187 Patent disclose that these embodiments predict future values. Thus, limiting the construction of "dynamic model" to only models that predict values (rather than models that can predict, calculate, and/or measure values) improperly narrows the claim scope of the claims to exclude several of the disclosed embodiments.

CPHB at 485-486.

Construing "dynamic model" to encompass the Figure 2 embodiment, however, would improperly broaden the term. The Figure 2 embodiment is described in columns 7 and 8 of the '187 patent. As acknowledged by Broadcom's own expert, Dr. Goldberg, the Figure 2 embodiment uses a static model, not a dynamic model, to calculate the absolute time and the

GPS receiver's position. Hearing Tr. at 434:7-16 ("And what's—what's being—in the embodiment here, there is no—there is no—this is basically the same claim language that was used in the 801 patent, which was describing, again —the answer to your question is no, it's not—in this particular case, it's not part of a dynamic system."); 435:9-10 ("The model here, I believe, is used in the context of a static model."); 435:16-23; 439:19-20 ("The model here, I believe, is used in the context of a static model.").

Accordingly, Broadcom's proposed construction is overbroad.

### 3. "sequential estimator"

| Claim Term | Respondents' Proposed Construction | Broadcom's Proposed Construction |
|---|---|---|
| "sequential estimator" | "a process that produces, at least once without having absolute time information, a time sequence of estimates of a plurality of states of a dynamic model that are associated with the satellite signal receiver" | "a process that sequentially produces, at least once without having absolute time information, estimates of a plurality of states associated with the satellite signal receiver" |

Complainant and Respondents' Agreed Compromise Claim Constructions at 7.

Claim 9 requires "a sequential estimator having a plurality of states associated with [a] satellite signal receiver." JX-0003 at 22:6-7. Both parties agree that the sequential estimator is a process that produces, without having absolute time information, estimates of a plurality of states associated with the satellite signal receiver. The parties' proposed constructions differ from each other in two ways. First, Respondents' proposed construction explicitly requires that the plurality states associated with the satellite signal receiver be states in a dynamic model. Second, Broadcom's proposed construction requires that the estimator "sequentially produce[]" estimates of the states, while Respondents' proposed construction requires that the estimator "produce[] . . . a time sequence of estimates of a plurality of states." With regard to the first difference, there is

no dispute that the "plurality of states associated with the satellite signal receiver" are states of a dynamic model. The claim requires that one of the plurality of states associated with the satellite signal receiver be a "time tag error state." *Id.* at 22:6-8. Both Respondents and Broadcom agree that the "time tag error state" is a state in a dynamic model. Complainant and Respondents' Agreed Compromise Claim Constructions at 6.

The second difference—whether the sequential estimator must sequentially produce estimates or produce a time sequence of estimates—is irrelevant to any infringement, technical domestic industry, or invalidity argument. *See, e.g., U.S. Surgical Corp. v. Ethicon, Inc.,* 103 F.3d 1554, 1568 (Fed. Cir. 1997) ("Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement. It is not an obligatory exercise in redundancy."). Accordingly, this claim construction dispute does not need to be resolved.

## E. Infringement

### 1. The Accused Products

Broadcom accuses u-blox and JRC products and downstream products containing the accused u-blox and JRC products of infringing the asserted claims of the '187 patent. In support of its infringement case, Broadcom provides infringement analyses of the u-blox [redacted] and the JRC [redacted] products. In addition, Broadcom argues that the u-blox [redacted] and JRC [redacted] products are representative of other unanalyzed products. According to Broadcom, the [redacted] product is representative of the [redacted]

[redacted]. CX-0005C (Goldberg WS) at Q/A 99, 101. With respect to the [redacted], Broadcom alleges that the product is representative of JRC's [redacted] product family [redacted]. *Id.* at Q/A 27. Respondents do not contest Broadcom's contentions regarding representativeness. Accordingly, I find that the u-blox [redacted] product is representative of the accused u-blox products, and the JRC [redacted] device is representative of the accused JRC products.

With regard to downstream products, it is undisputed that the accused u-blox products are incorporated into Panasonic and Pioneer products, which in turn are incorporated into Toyota vehicles. *See, e.g.*, CIB at 231-232. It is also undisputed that the accused JRC products are incorporated into Panasonic, DENSO CORP., and DENSO TEN products, which are in turn incorporated into Toyota vehicles. *See id.*

Respondents argue that the accused products do not infringe the asserted claims because the accused products do not employ a "dynamic model" having a "time tag error state." For the reasons set forth below, I find that Broadcom has not shown that the accused products satisfy the "dynamic model" (claims 1-3 and 5) and "time tag error state" (claims 1-3, 5, and 9) limitations of the asserted claims.

**2. The Accused Functionalities**

Arguing that the accused u-blox products satisfy the 'dynamic model" limitation, Broadcom points to what it describes as two processing loops in the [redacted]'s GPS position source code: [redacted]

[redacted] CX-0005C (Goldberg WS) at Q/A 116. Broadcom alleges that the [redacted] —constitute the claimed "dynamic model. *Id.* As understood by Broadcom's expert Dr. Goldberg, [redacted] *Id.* [redacted] *Id.* at Q/A 115-116 [redacted] *Id.* [redacted] *Id.* Relying on his understanding of the operation of [redacted], Dr. Goldberg concludes [redacted] constitute a single dynamic model because of their [redacted] *Id.* at Q/A 116.

According to Broadcom, the accused JRC products operate in a similar fashion as the accused u-blox products. CIB at 217. As explained by Dr. Goldberg, the [redacted] in the [redacted]'s source code determines whether absolute time is available. CX-0005C (Goldberg WS) at Q/A 55. If absolute time is not available, the function [redacted] is called, which in turn calls the function [redacted]. *Id.* [redacted] computes the states representing the location of the GPS receiver (x,y,z) and the common mode error using values calculated from the prior iteration of [redacted]. *Id.* The common mode error is used to [redacted]. *Id.*; CPX-2041C. The [redacted] updates the

time tag error state by calling [redacted], which retrieves an update of the time tag error state. *Id.* at Q/A 56.

While Respondents' and their experts dispute Dr. Goldberg's analysis of the accused products' source code, even assuming *arguendo* that Dr. Goldberg's analysis is correct, Broadcom has failed to show that the accused products satisfy either the "dynamic model" limitation of claims 1-3 and 5 or the "time tag error state" limitation of claims 1-3, 5, and 9. At bottom, Broadcom's infringement contentions are based on the contention that the models employed in the accused products are dynamic because the models have [redacted] CRB at 98. The flaw in Broadcom's infringement case is that the evidentiary record does not provide a basis for distinguishing between the models employed by the accused products and [redacted].

Figure 2 is a flow chart showing the process flow used by a GPS receiver to calculate its position when absolute time is unavailable:

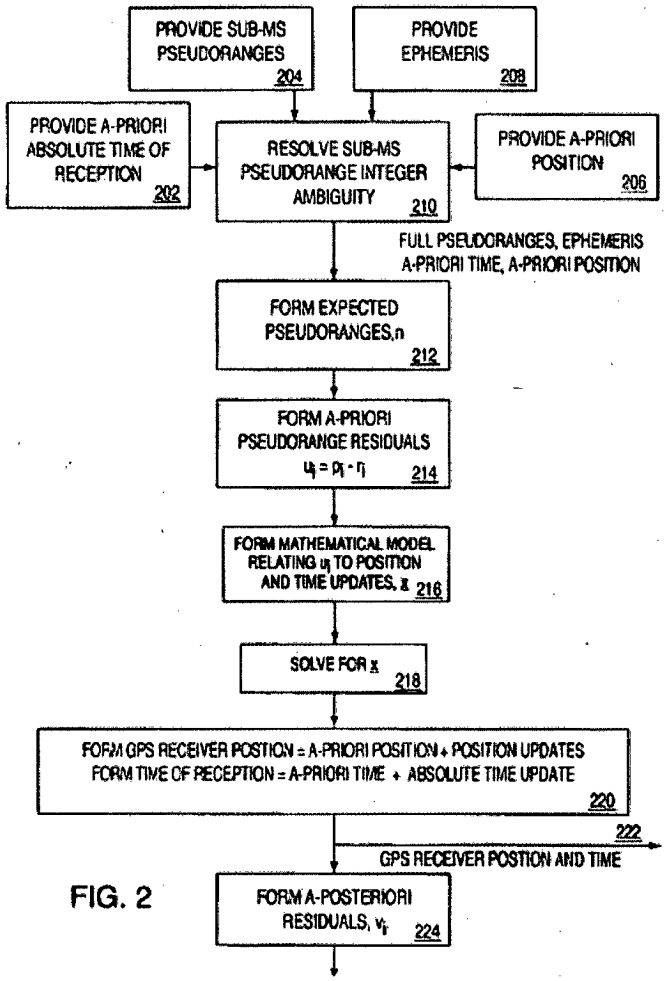


FIG. 2

In step 206, the GPS receiver's a-priori position is provided at the start of the process. In particular, "a previously calculated position for the same GPS receiver 108 could be used as an a-priori position." JX-0003 at 6:45-52. In step 212, the previously calculated position (a priori position) is used with other information to calculate expected pseudoranges, which "are the pseudoranges that would be measured if all the a-priori parameters (a-priori position, a-priori absolute time of measurement, and a-priori common mode error) were in fact the actual values of these parameters." *Id.* at 7:3-9. In step 214, the receiver calculates the a-priori pseudorange residuals, which are the differences between the measured pseudoranges and the expected pseudoranges. *Id.* at 7:10-14. In step 216, a mathematical model is formed, relating a vector of

the a-priori pseudorange residuals (u) to a vector of the updates to the a-priori values of position, common-mode error, and absolute time of reception (x). *Id.* at 7:3-14. In step 220, the model computes the GPS receiver's current position "by adding the updates x,y,z, to the a-priori position, and the absolute time of reception is formed by adding the update ts to the a-priori time of reception." *Id.* at 8:11-14. The '187 patent teaches that the model employed by the Figure 2 embodiment may not be able to determine the current position and absolute time with sufficient accuracy in a single pass. *Id.* at 8:14-28. If the result from the first pass is not sufficiently accurate, "the result 222 is used to form a new a-priori time of reception estimate for step 202 and a new a-priori position estimate for step 206, and the process 200 is repeated until the result converges on the correct result." *Id.*

Thus, [redacted], the Figure 2 embodiment has a "least squares estimator ('mathematical equations') that uses previous state information to estimate the current state ('characterize the relationships between the values of the states'), where the previous state is from a previous time's position fix (*i.e.*, 'as the system changes from one point in time to the next')." CRB at 98. Broadcom's own expert Dr. Goldberg admitted at the hearing, however, that the model employed in the Figure 2 embodiment was a static model, not a dynamic model. Hearing Tr. at 434:7-16 ("And what's—what's being—in the embodiment here, there is no—there is no—this is basically the same claim language that was used in the 801 patent, which was describing, again—the answer to your question is no, it's not—in this particular case, it's not part of a dynamic system."); 435:9-10 ("The model here, I believe, is used in the context of a static model."); 435:16-23; 439:19-20 ("The model here, I believe, is used in the context of a static model."). Specifically, according to Dr. Goldberg, the model is not dynamic because it does not predict the values of the states "as the system changes from one point in time to the

next." *Id.* at 439:21-25.[48]

For the foregoing reasons, I find that Broadcom has not shown that the accused products have a "dynamic model" as required by claims, 1-3 and 5. Furthermore, the parties agree that the "time tag error state" is a state in a dynamic model. *See, e.g.,* CRMB at 18 ("As Respondents recognize, Broadcom has consistently explained that 'the time tag error state is ***one of the plurality of states that are used to dynamically model the GPS system in the '187 patent.***' Broadcom's argument here is no different. The 'time tag error state' is 'the state in the dynamic model used to represent and estimate the time tag error.'") (internal citations omitted).[49] Accordingly, because it has not established that the accused products have a dynamic model, Broadcom cannot establish that that the accused products have the time tag error state as required by all of the asserted claims.

### F. Indirect Infringement

Claims 1-3 and 5 of the '187 patent are method claims. Broadcom argues that Respondents indirectly infringe these claims by inducing infringement or through contributory infringement. CIB at 232-33. In order to prove to indirect infringement, Broadcom must show that there has been an act of direct infringement. *See, e.g., Dynacore Holdings Corp. v. U.S.*

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[48] The same limitation—"as the system changes from one point in time to the next"—is contained in Broadcom's proposed construction of "dynamic model." Accordingly, Broadcom failed to show that the accused products have a "dynamic model" even under its own proposed construction. Hearing Tr. (Goldberg) at 439:21-25.

[49] In addition, although claim 9, unlike the other asserted claims, does not explicitly recite the term "dynamic model," during the reexamination the patentees argued that claim 9's "time tag error state" was a state in a dynamic model in order to distinguish prior art. *See, e.g.,* RX-218.191 (Patent Owner's Response (Nov. 30, 2010) ("Independent claims 1 and 9 of the '187 patent incorporate a term called the '***time tag error state***,' and involves the use of the time tag error state in a ***dynamic model***.").

*Philips Corp.*, 363 F.3d 1263, 1272 (Fed. Cir. 2004) ("Indirect infringement, whether inducement to infringe or contributory infringement, can only arise in the presence of direct infringement . . . ."). For the reasons discussed above, the accused products do not infringe the asserted claims and therefore Broadcom has failed to show an act of direct infringement.

**G. Domestic Industry**

Broadcom asserts that its [redacted] system on a chip ("SoC") practices the asserted claims of the '187 patent. CX-0005C (Goldberg WS) at Q/A 211. Broadcom further argues that [redacted]. *Id.* at Q/A 212. Respondents do not contest Broadcom's contentions regarding representativeness. Accordingly, I find that the [redacted] is representative of the domestic industry products with respect to the '187 patent.

According to Broadcom's expert Dr. Goldberg, the [redacted] *Id.*

As with the accused products, Respondents dispute many aspects of Dr. Goldberg's analysis of the domestic industry products. Again, assuming *arguendo* that Dr. Goldberg's

analysis is correct, Broadcom has failed to show that its products employ a dynamic model. In particular, Broadcom has not offered any explanation, much less pointed to any supporting evidence, [redacted].

Accordingly, for the same reasons that I found that Broadcom failed to show that that accused products satisfied the "dynamic model" limitation of claims 1-3, and 5 and the "time tag error state" limitation of claims 1-3, 5, and 9, I find that Broadcom failed to establish that these limitations are practiced by the domestic industry products.

**H. Invalidity**

Respondents assert that claims 1, 3, 5, and 9 are anticipated by U.S. Patent 6,473,694 to Akopian *et al.* ("Akopian;" RX-0176) and that Akopian in view of the prior art and the knowledge of one skilled in the art renders claim 2 obvious. Respondents further argue that claims 1-3 and 9 are rendered obvious by the article "GPS Receiver Structures for the Urban Canyon" by Peterson *et al.* ("Peterson;" RX-0201) in view of "Understanding GPS: Principles

and Applications" by Kaplan ("Kaplan;" RX-0197). In addition to their anticipation and obviousness invalidity arguments, Respondents assert that claim 5 is indefinite under § 112(2).

For the reasons set forth below, I find that claim 5 is indefinite and claims 1, 3, and 9 are anticipated by Akopian.[50]

**1. Claim 5 is indefinite.**

Claim 5 depends from claim 1 and requires the receiver to perform two additional steps. The first additional step is "obtaining time-of-week information." JX-0003 at 21:2. The time-of-week information provides the receiver with the absolute time. *Id.* at 2:56-59. The second additional step requires that the receiver "estimat[e] a known value for the time tag error state within the dynamic model using the time-of-week information." *Id.* at 21:3-5. Respondents argue that this limitation is indefinite. Specifically, Respondents argue that the "words 'estimating' and 'known' are directly contradictory; there is no need to estimate a value if it is known." RMIB at 42. Broadcom counters that the limitation is not indefinite and means that "after the absolute time is decoded, using the time-of-week information to calculate a known time tag error and replacing the time-free time tag error with the known time tag error in the mathematical model." CRMB at Exhibit S at 3.

As Respondents argue, the limitation is internally contradictory. Claim 5 requires that the receiver "estimat[e] a known value for the time tag error state" using time-of-week information. Time-of-week information provides the receiver with the absolute time, while the time tag error state represents the time tag error. Because the time tag error is "a value that represents the difference between absolute time and local time," it is determined by subtracting

[50] Because claim 5 is indefinite it cannot be compared to the cited prior art in order to perform the analyses required for anticipation and obviousness.

the absolute time from "the time produced by the local clock ('local time')." JX-0003. at 2:56-59, 15:12-14; *see also id.* at 15:5-8, 15:14-19 ("Mathematically, time tag error is related to local time and absolute time as follows: tabsolute = tlocal – ts, where tabsolute is the absolute time, tlocal is the local time, and tS is the time tag error."). The receiver will always know the local time, therefore if the receiver knows the absolute time—which claim 5 requires it to know—the receiver will determine the actual time tag error by subtracting the known absolute time from the local time. The result of this calculation will not be an estimate of the time tag error, it is by definition the actual time tag error.

Broadcom argues that the requirement of "estimating a known value for the time tag error state" is not internally inconsistent because the local time is provided by a non-atomic clock, which is less precise and accurate than the atomic clocks used by the satellites. CMRB at 21 & n. 23. Therefore, according to Broadcom, "any calculation using local time would also be imprecise, or viewed as an estimate. A POSA would understand that one can calculate, or know the time tag error state, but because the variable used in calculating the time tag error state is imprecise, the ultimate calculation of the time tag error state is also an estimate." *Id.* Broadcom's argument is a *non-sequitur*. The time tag error state represents the time tag error, which by definition is "a value that represents the difference between absolute time and local time." JX-0003 at 15:12-14. While a local clock with a high degree of imprecision would result a large time tag error, the time tag error itself would not be imprecise as it is calculated by subtracting the local time (whatever that local time is) from the time provided by the atomic clocks of the satellites.

Based on the foregoing, I find that the limitation "estimating a known value for the time tag error state" is internally contradictory and that this internal contradiction renders claim 5

indefinite. *See Competitive Techs., Inc. v. Fujitsu Ltd.*, 185 Fed. Appx. 958, 965-66 (Fed. Cir. 2006) ("Because the 'address means' limitation of claim 5 requires ISA structures, and the 'sustain means' limitation of that same claim excludes ISA structures, a person of ordinary skill in the art would be unable to determine the scope of the claims. They are internally inconsistent.").

**2. Akopian anticipates claims 1, 3, and 9 of the '187 patent.**

Akopian discloses a method for determining the position of a GPS signal receiver when weak signal conditions prevent the receiver from determining the signal's absolute time at arrival ($\tau$), *i.e.*, the time at which the user receives the signal. RX-0176 at 3:1-4, 6:28-29.[51] Akopian teaches that it would be advantageous to implement the method using a dynamic model in the form of a Kalman filter. *Id.* at 6:47-50 ("In the method using a filter such as a Kalman filter, the time error can be determined more precisely and the extra computation load is minimized when the time error solution is integrated into the Kalman filter."). It is undisputed that Akopian discloses all but one of the limitations of claims 1, 3, and 9.

**a) Undisputed Limitations**

As required by claim 1, the receiver disclosed in Akopian determines its position without absolute time by using the dynamic model ΦL to estimate a plurality of states associated with the receiver. RX-0176 at 1:37-38, 6:27-29, 10:39-61, 11:4-19, 11:36-60; RX-0004C (Pullen DWS) at Q/A116, Q117; RDX-0004C.40. The states include position states (x, y, z), velocity states ($\dot{x}, \dot{y}, \dot{z}$), the offset between the receiver clock and GPS system time (tu), and the absolute time of arrival ($\tau$). RX-0176 at 10:39-61. The dynamic model is implemented using a Kalman filter. *Id.*

[51] Akopian issued on October 29, 2002 from an application filed on April 6, 2001. RX-0176.1. It is undisputed that Akopian qualifies as prior art under 35 U.S.C. § 102(a) and (e).

At each epoch, the Kalman filter algorithm estimates the state values. RX-0176 at 12:55-13:37, 11:4-19, 11:36-60; RX-0004C (Pullen DWS) at QA 116; RDX-0004C.39. The "low dynamics model" $\Phi_L$ predicts the values of the states in the state vector of a system as the system changes from one point in time ($x_L(k-1)$) to the next ($x_L(k)$), and computes the position of the satellite signal receiver. RX-0176 at 10:43-45, 11:4-19, 11:36-60; RX-0004C (Pullen DWS) at Q/A 127.

With regard to claim 3, the receiver disclosed in Akopian obtains expected and measured pseudoranges to a plurality of satellites. RX-0176 at 11:25-35, 12:59-67; RX-0004C (Pullen DWS) at Q/A 133; RDX-0004C.49. The pseudoranges are used to update the plurality of states. RX-0176 at 7:21-9:44, 9:64-10:10, 13:14-37; RX-0004C (Pullen DWS) at Q/A 134. The receiver uses the dynamic model to compute its position. RX-0176 at 10:39-58, 13:29-37; RX-0004C (Pullen DWS) at Q/A 135.

With regard to claim 9, to the extent that the preamble is limiting, Akopian discloses a mobile receiver. RX-0201 at 11:4-8; RX-0004C (Pullen DWS) at Q/A 140. The mobile receiver has a satellite signal receiver that obtains expected and measured pseudoranges to a plurality of satellites. RX-0176 at 11:25-35, 12:55-13:37; RX-0004C (Pullen DWS) at Q/A 141. The mobile receiver's Kalman filter is a sequential estimator with a plurality of states associated with the mobile receiver. RX-0176 at 10:43-45, 11:4-19, 11:36-60; RX-0004C (Pullen DWS) at Q/A 143-44.

The only dispute is whether one of the plurality of states disclosed in Akopian is a "time tag error state" that "relat[es] a local time associated with [the] satellite signal receiver and an absolute time associated with signals from the plurality of satellites," as required by the asserted claims. '187 patent at 20:50-52 (claim 1), 22:9-12 (claim 9). For the reasons set forth below, I find that Akopian discloses such a state.

**b) Akopian discloses a "time tag error state."**

The parties agree that the claimed time error state must represent the time tag error.[52] Complainant and Respondents' Agreed Compromise Claim Constructions at 5-6. The parties agree that the "time tag error" is "a value, separate from the common mode error, that represents the difference in time between an absolute time and the local receiver time." *Id.* at 5. Thus, under the parties' agreed upon construction, "time tag error" (1) represents the difference between the absolute time and local time and (2) is separate from the common error mode error. For the "time tag error" Respondents point to the variable $t_u$, which is the "offset . . . of the receiver clock from GPS System time." RX-0176 at 1:37-43. Akopian further describes the offset as "the primary error" in the receiver's determination of a satellite's pseudorange. *Id.* at 1:16-26.

Broadcom argues that the variable $t_u$ represents the common mode error, not the time tag error. Broadcom's position diverges from the testimony of its own expert, however. Specifically, Dr. Goldberg testified that the variable $t_u$ does not represent "time tag error" because "the value of $t_u$ is not separate from the common mode error." CX-0011C (Goldberg RWS) at Q/A 73. As understood by Dr. Goldberg, "the variable $t_u$ includes the 'common mode error' because it is a combination of receiver clock offsets and hardware-based errors that includes the common mode error." *Id.* Thus, according to Dr. Goldberg, variable $t_u$ encompasses, but is not coextensive with, the common mode error. In the end, however, both

[52] In addition, as discussed above, Respondents' current proposed construction and Broadcom's proposed construction during the *Markman* hearing required the time tag error state to estimate as well as represent the time tag error. There are no arguments relating to this additional requirement with respect either Akopian or Peterson in combination with Kaplan. Rather the parties' dispute centers on whether the variables identified by Respondents in Akopian and Peterson represent time tag error or common mode error.

Broadcom's position that $t_u$ is the common mode error and Dr. Goldberg's opinion that $t_u$ includes the common mode error runs afoul of the express disclosures of the '187 patent and Akopian.

The '187 patent expressly defines the "time tag error" as "a value that represents the difference between absolute time and local time and may range to one minute or more." JX-0003 at 15:12-14. The '187 patent is also clear that the difference between the local time and the absolute time is distinct and separate from the common mode error. *Id.* at 15:9-11 ("The time tag error should not be confused with the common mode error."). Thus, according to the patentees' clear lexicography, the difference between the receiver's local clock and the absolute time, by definition, does not include the common mode error. *See Phillips v. AWH Corp.,* 415 F.3d 1303, 1316 (Fed. Cir. 2005) (*en banc*) ("[O]ur cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs."). Akopian explicitly defines $t_u$ to be the difference between the receiver's local clock and the GPS system's time (*i.e.,* absolute time), which is consistent with the '187 patent's definition of time tag error. RX-0176 at 1:16-43.

Broadcom also argues that, while Akopian itself was not considered by the PTO during the '187 patent's initial prosecution or reexamination, the patent owner disclosed the European counterpart to Akopian (EP 1248117A2) in the reexamination. RX-0219.49-.73. While the European counterpart was not the basis for any rejections and was not discussed during the reexamination, the examiner is presumed to have considered it. *Shire LLC v. Anneal Pharm., LLC,* 802 F.3d 1301, 1307 (Fed. Cir. 2015). In view of this presumption, Respondents have "the added burden of overcoming the deference that is due to a qualified government agency

presumed to have properly done its job, which includes one or more examiners who are assumed to have some expertise in interpreting the references and to be familiar from their work with the level of skill in the art and whose duty it is to issue only valid patents." *Id.* (quoting *PowerOasis, Inc. v. T–Mobile USA, Inc.*, 522 F.3d 1299, 1304 (Fed. Cir. 2008)) (internal quotation marks omitted). Respondents, however, have satisfied this added burden.[53]

Based on the foregoing, I find that Respondents have shown by clear and convincing evidence that Akopian discloses a time tag error state in the form of the variable $t_u$. Because Akopian discloses each limitation of claims 1, 3, and 9, I find that these claims are anticipated by Akopian.

**3. Akopian does not render claim 2 obvious.**

Respondents argue the claim 2 is rendered obvious by Akopian in view of the admitted prior art and the knowledge of a person of ordinary skill in the art. RIB at 260-262. Claim 2 depends from claim 1 and requires that the plurality of states associated with the satellite signal receiver have two additional states: (1) one related to a common mode error and (2) one related to the position of the satellite signal receiver. JX-0003 at 20:55-58. There is no dispute that Akopian discloses states representing the receiver's Cartesian coordinates (x,y,z). RX-0176 at 10:39-58; RX-0004C (Pullen DWS) at Q/A 116.

[53] Broadcom also argues that the burden on Respondents is heightened by the outcome of the 602 investigation, in which the Commission determined that the '187 patent was not invalid. CIB at 209. The Commission's rejection of the respondents' invalidity arguments was not a determination of validity, but a determination that the patent was "not invalid on the record before the" Commission. *Shelcore, Inc. v. Durham Indus., Inc.*, 745 F.2d 621, 627 (Fed. Cir. 1984). As such, the outcome of the 602 investigation does not in any way augment the statutory presumption of patent validity. *Id.*

With regard to a state relating to a common error mode, Respondents' expert Dr. Pullen acknowledges that "Akopian does not expressly disclose a common mode error as construed," RX-0004C (Pullen DWS) at Q/A 149, but opines that it would have been obvious to modify Akopian to "include an additional state to model the 'common mode error' . . . to compensate for this source of pseudorange error." *Id.* at Q/A 151. Dr. Pullen further opines that "it was standard practice in the art by the time the '801 patent was filed to model [common error mode] as an unknown even in 'traditional receivers.'" *Id.* Ultimately, Dr. Pullen's argument that one of ordinary skill in the art would have been motivated to modify Akopian to include a state relating to common error mode is undermined by the very evidence he cites in support of his argument.

According to Dr. Pullen, Akopian's discussion of the clock offset ($t_u$) and the GPS time at arrival ($\tau$) indicates that Akopian was aware that the common mode error could affect the GPS receiver's position calculation. *Id.* at Q/A 153. This discussion occurs at lines 53-61 in column 7. *Id.* (quoting RX-0176 at 7:43-61). In the portion relied on by Dr. Pullen, Akopian states that although theoretically "a precise determination of the receiver clock offset $t_u$ should include the same information as a precise determination of what is here called the GPS time at arrival $\tau$ (in the sense that if you know $t_u$ precisely, you should know $\tau$)," in practice "the GPS time at arrival as used in the invention likely does not convey the same information as the receiver clock offset." RX-0176 at 7:43-48. According to Akopian, clock offset $t_u$ and GPS time at arrival $\tau$ diverge because of "uncertainties (errors) in the times of flight estimates." *Id.* at 7:50-61. Dr. Pullen concludes that the reference to "uncertainties (errors) in the times of flight estimates" is a reference to the common mode error, and that one of ordinary skill in the art would have been motivated to modify Akopian in order to account for this error. In the same sentence, however, Akopian states that any such discrepancies are "approximately account[ed]" for by the disclosed

invention: "By introducing the GPS time at arrival $\tau$ as one additional degree of freedom for the solution of the system of pseudorange equations (16), the invention approximately accounts for the uncertainties (errors) in the times of flight estimates. . . ." *Id.* Neither Dr. Pullen nor Respondents address why one of ordinary skill in the art would have found Akopian's method for accounting "for the uncertainties (errors) in the times of flight estimates" to be deficient. The only motivation identified by Dr. Pullen is his conclusory assertion that one of ordinary skill in the art would have been motivated to "further refine the receiver design by incorporating a common mode error state." RX-0004C (Pullen DWS) at Q/A 153.

Based on the foregoing, I find that Respondents have failed to show that one of ordinary skill in the art would have been motivated to modify Akopian to include a common mode error state.

#### 4. Peterson in Combination with Kaplan

Peterson discloses a method of determining a GPS fix when absolute time is unavailable. RX-0201.19. Although the method disclosed in Peterson uses a static model, Respondents argue that it would have been obvious to modify Peterson to use a dynamic model. For a disclosure of a suitable dynamic model, Respondents point to Kaplan, which was drafted by a "multidisciplinary team" with the intent that it "serve as a student text as well as a reference source" concerning GPS technology. RX-0197.13-.14.[54] As detailed below, Peterson figured prominently in the reexamination of the '187 patent and the reexamination of its grandparent, the '801 patent.

[54] Peterson was published in 1995 and is prior art under § 102 (b). RX-0201.19. Kaplan was published in 1996 and is prior art under § 102 (b). RX-0197.5.

### c) The '187 Patent Reexamination

The PTO initiated reexamination of the '187 patent on July 27, 2010 and the claims were confirmed on March 21, 2012. RX-0219.50-.60, .1129-.1135. In the request for reexamination, the requestor asserted that claims 1-10 of the '187 patent were both anticipated and rendered obvious by Peterson. RX-0218.34-50. With respect to obviousness, the requestor argued that if it was found that Peterson did not disclose a dynamic model, it would have been obvious to modify Peterson by converting Peterson's static model to a dynamic model with the Kalman filter disclosed in U.S. Patent No. 6,285,316 to Nir *et al.* ("Nir"). *Id.* at .44-.45. Granting the request for a reexamination, the examiner found that Peterson taken alone raised substantial new questions of patentability with respect to claims 1-10. RX-0219.53-.55.[55] In the first office action, the examiner rejected claims 1-4, 9, and 10 as anticipated by Peterson, but found claims 5-8 to patentable over Peterson. *Id.* at .65-67, .69-.70. Because he found the claims to be anticipated by Peterson, the examiner did not adopt the requestor's argument that Peterson in view of Nir rendered claims 1-4, 9, and 10 obvious. *Id.* at .69 ("Claims 1-4, 9 and 10 are anticipated by Peterson *et al.* for the reasons given above. Therefore, an obviousness rejection under 35 USC 103(a) is unnecessary and inappropriate, *i.e.*, there are no differences between the claimed invention and Peterson *et al.* for which it is necessary to make an obviousness determination.").

[55] The examiner also made rejections on other grounds, including a rejection of claim 2 as obvious in view of Nir in combination with Peterson. For this rejection, the examiner found that Nir disclosed all of the limitations of independent claim 1, but did not satisfy claim 2's additional requirement of a "variable/state" corresponding to the common mode error. RX-0219.608. For this element, the examiner pointed to Peterson's disclosure of "fine time," which the examiner found corresponded to the common mode error. *Id.* The Board reversed the examiner's rejection, finding that Nir did not disclose a "time tag error state" as required by claim 1.

After considering the patent owner's response to the initial office action, the examiner found that Peterson did not disclose or enable a sequential estimator (claims 4 and 9) or a Kalman filter having a time tag error state (claim 10) and withdrew his rejections of claims 4, 9, and 10. RX-0219.555-.556. The examiner maintained his rejections of claims 1-3 as anticipated by Peterson. *Id.* at .545-.560. The examiner's rejections turned on his interpretation of Peterson's disclosure of "coarse time." According to the examiner, "coarse time" corresponded to "time tag error" because "[c]onsistent with the disclosure of Patent No. 6,937,187, Peterson *et al.*'s 'coarse time' corresponds to a relatively large time error of 'a minute or two.'" *Id.* at .1025.

Ultimately, the Board of Patent Appeals and Interferences reversed the examiner. The Board found that even if Peterson's "coarse time" corresponded to the "time tag error," such a correspondence did not satisfy the claims, which required a "time tag error state," not a time tag error. *Id.* at .1077. As explained by the Board, "the 'time tag error' is a particular ascertained 'value' of the difference between the 'absolute time' of the transmission of a satellite signal from a satellite to a receiver and the 'local time' as determined by a clock local to the receiver." *Id.* at .1077. (citing '187 patent at 15:1-14). In contrast, the "time tag error state," is not a particular "value," but a "state" that forms part of a "sequential estimator." *Id.* (citing '187 patent at 16:9-59). The Board also found that Peterson's disclosure did not support the examiner's conclusion that "Peterson's 'coarse time' was something 'which relates a local time associated with the satellite signal receiver and an absolute time associated with signals from a plurality of satellites,' (Ans. 9:23-26), it is simply not apparent how the Examiner arrived at that conclusion from the content of Peterson." *Id.* at .1077.

**d) The '801 Patent Reexamination**

The PTO initiated reexamination proceedings against the '801 patent on July 1, 2010 and issued a reexamination certificate on January 1, 2015. RX-0220.225-.240, .1207-.1208. The

reexamination certificate cancelled claims 1-27, 33, and 35 and confirmed claims 28-32 and 34. *Id.* at .1207-.1208. As noted above, the '187 patent is a continuation in part to the '821 patent, which is a continuation in part to the '801 patent. Because of this relationship, portions of the specifications of the '187 and '801 patents are identical. In the reexamination, the Board affirmed the examiner's determinations that claims 1, 3-14, 17, 19-26, and 33 were anticipated by Peterson and claims 5, 15, 16, 27, 33, and 35 were obvious in view of Peterson either by itself or in combination with another reference. *Id.* at .1153-.1154. In reaching his determination that Peterson rendered the claims unpatentable, the examiner compared an equation disclosed in Peterson to one disclosed in the '801 patent. *Id.* at .834-836. The equation from the '801 patent that the examiner compared also appears in the '187 patent:

$$\underline{u} = \begin{bmatrix} u_1 \\ \\ u_n \end{bmatrix} = \begin{bmatrix} \partial\rho_1/\partial x & \partial\rho_1/\partial y & \partial\rho_1/\partial z & \partial\rho_1/\partial t_C & \partial\rho_1/\partial t_S \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \partial\rho_n/\partial x & \partial\rho_n/\partial y & \partial\rho_n/\partial z & \partial\rho_n/\partial t_C & \partial\rho_1/\partial t_S \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ t_C \\ t_S \end{bmatrix}$$

$$= \begin{bmatrix} \partial\rho_1/\partial x & \partial\rho_1/\partial y & \partial\rho_1/\partial z & c & -\dot{\rho}_1 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \partial\rho_n/\partial x & \partial\rho_n/\partial y & \partial\rho_n/\partial z & c & -\dot{\rho}_n \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ t_C \\ t_S \end{bmatrix}$$

$$= H\underline{x}$$

RX-0195 ('801 patent) at 7:20-31; '187 patent at 7:47-55.

The equation from Peterson that the examiner compared is

$$\begin{bmatrix} c_x(1) & c_y(1) & c_z(1) & v(1)/c & 1 \\ c_x(2) & c_y(2) & c_z(2) & v(2)/c & 1 \\ c_x(3) & c_y(3) & c_z(3) & v(3)/c & 1 \\ c_x(4) & c_y(4) & c_z(4) & v(4)/c & 1 \\ & & \cdots\cdots & & \\ c_x(n) & c_y(n) & c_z(n) & v(n)/c & 1 \end{bmatrix} \begin{bmatrix} \Delta x \\ \Delta y \\ \Delta z \\ c\Delta t_g \\ c\Delta t_f \end{bmatrix} = \begin{bmatrix} c\Delta TOA(1) \\ c\Delta TOA(2) \\ c\Delta TOA(3) \\ c\Delta TOA(4) \\ \cdots \\ c\Delta TOA(n) \end{bmatrix}$$

RX-0201.26.

Although the equations use different symbols, different names for terms, and a different ordering of columns, the examiner determined that the two equations were equivalent. RX-0220.835, .962. In reaching this determination, the examiner found that ". . . Peterson *et al.'s* $\Delta t_g$ and $\Delta t_f$ are equivalent to the '801 patent's $t_S$ and $t_C$, respectively." *Id.* Peterson's variable $t_g$ is called alternately the "gross estimate of time" or "coarse time," while the '801 and '187 patents' variable $t_S$ represents the "time tag error state." RX-0201.25; '187 patent at 15:14-123; RX-0201; RX-0004C (Pullen DWS) at Q/A 168-169, 191. Peterson's variable $t_f$ is referred to as "fine time," while the'801 and '187 patents' variable $t_C$ represents the common mode error. RX-0201.25; '187 patent at 9:28-31, 19:63-66.

**a) Respondents have not shown a motivation to combine Peterson and Kaplan.**

Broadcom does not dispute that the static equation disclosed in Peterson has variables representing (1) the time tag error ($\Delta t_g$), (2) the common mode error ($t_f$), and (3) the receiver's x, y, and z coordinates. CIB at 243-246. Broadcom argues, however, that Peterson does not disclose calculating the "time tag error" using a dynamic model, as required by the asserted claims. *See* CIB at 244 ("Peterson was found by the Patent Office to invalidate an older

Broadcom patent that claimed time tag error without a dynamic model. However, it is undisputed that Peterson does ***not*** disclose the invention of the '187 Patent, and in particular does not disclose a dynamic model or correspondingly determining a time tag error with a dynamic model.") (internal citations omitted).[56]

Respondents argue that one of ordinary skill in the art would have been motivated to implement the equation disclosed in Peterson in a dynamic model using a Kalman filter in view of the teachings of both Peterson and Kaplan. Respondents cite Peterson's "[f]uture goal[]" of expanding "the code to include a Kalman filter [to] enable the receiver to use signals acquired at various times to perform an electronic 'running fix.'" RX-0201.28. Respondents also point to Kaplan's touting the benefits of using a dynamic model implemented with a Kalman filter in the context of GPS navigation. RX-0197.66-.67 (teaching that Kalman filtering can provide "smoothed navigation solution[s]" and "optimum estimates of use PVT [(position, velocity, and time)]" by accounting for noise and other error sources, while static methods can be "corrupted by noise and other error sources" resulting in "noisy navigation solutions.").

Broadcom counters that one of ordinary skill in the art would not have been motivated to convert the static equation disclosed in Peterson into a dynamic model having a time tag error state. In support of this position, Broadcom argues that Peterson's reference to expanding the code to include a Kalman filter is a reference to using a Kalmam filter to improve the accuracy of the local oscillator clock, not a reference to converting the static model into a dynamic model. CIB at 246. Broadcom's argument is persuasive.

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[56] Although Broadcom's expert Dr. Goldberg opines that the variable $\Delta t_g$ disclosed in Peterson "is a gross estimate of time, not the 'time tag error' or 'time tag error state' taught in the '187 Patent," Broadcom does not make this argument in its post-hearing briefs. *Compare* CX-0011C (Goldberg RWS) at Q/A 120 *with* CIB at 244.

As a preliminary matter, it should be noted that Respondents' burden is particularly steep with regard to Peterson. Peterson was not only disclosed during the reexamination, it was relied on by the examiner to reject several claims. *See Shire,* 802 F.3d at 1307. As a result, Peterson was the subject of extensive analysis by the examiner and the Board of Patent Appeals and Interferences. Despite this level of scrutiny, the examiner did not find that it would have been obvious to modify Peterson by using a Kalman filter to implement Peterson's static model as a dynamic model. The examiner's failure to do so was not an oversight, as the requestor had specifically proposed such a modification. *Id.* at .44-.45.

**b) Peterson does not provide a motivation for converting the static equation into a dynamic model using a Kalman filter.**

When examined in context, Peterson's statement that it is a "[f]uture goal[]" to expand "the code to include a Kalman filter" so as to "enable the receiver to use signals acquired at various time to perform an electronic 'running fix,'" is a suggestion to use a Kalman filter to improve the accuracy and precision of the local clock, not a suggestion to use a Kalman filter to implement the equation disclosed in Peterson. RX-0201.28. Peterson discusses three ways to improve GPS performance in an urban environment where the GPS signal can be blocked by buildings: (1) using a more accurate and precise local clock, (2) block processing 1 ms worth of data to directly calculate the cross correlation, rather than using a sliding replica code search, and (3) using the equation disclosed in Peterson to determine position when absolute time is unavailable. RX-0201; CX-0011C (Goldberg RWS) at Q/A 131. With regard to the first improvement, Peterson teaches that using a more precise and accurate local clock, such as a Cesium oscillator, allows for improved navigation in an urban environment where satellite signals can be blocked by buildings.

For instance, in such an environment, satellite signals may only be available at street intersections. RX-0201.19. With a more accurate and precise clock, a receiver is better able to "coast" through signal outages. *Id.* at .21. In order to coast through a signal outage, the receiver must "propagate the satellite's tracking state forward" during the signal outage, so that it can "lock onto the satellite's signal immediately when it returns to view." *Id.* Furthermore, a more accurate and precise clock reduces the number of satellites needed for two-dimensional fixes. *Id.* at .21-.22. According to Peterson, conventional GPS systems require three satellites to compute a two-dimensional fix because they need to solve for three variables: the x and y coordinates and a time correction component to account for the local clock's drift. *Id.* With a sufficiently accurate local clock, however, the number of satellites needed for a two-dimensional fix can be reduced by one because local clock drift can be assumed to be zero, thereby reducing the number of variables that need to be solved to two: the x and y coordinates. *Id.*

Peterson provides the results of a number tests demonstrating that a local clock with improved accuracy and precision improves a receiver's ability to coast through signal outages and allows the receiver to obtain two-dimensional fixes from two satellites. *Id.* at .20-.22. Although a Cesium oscillator was used in the tests to provide the improved local clock, Peterson discusses various ways of improving a local clock's accuracy and precision, including using a Kalman filter. *Id.* at .20 ("Researchers in [E. M. Copps, "An Aspect of the Role of the Clock in a GPS Receiver," GLOBAL POSITIONING SYSTEM, Vol. III, pp. 44-53, Institute of Navigation, 1986] develop[ed] analytic solutions for the steady state optimal estimate (Kalman filter) covariance, and in particular look at the improved performance in situations with bad geometry. It is well known that because the satellites used (by receivers on the earth's surface) all must lie within a cone starting at some (elevation mask) angle above the horizon, there is high

correlation between altitude and clock errors."). Thus, the reference to expanding the code in the future to include a Kalman filter, appears to be a reference to using a Kalman filter to improve the accuracy of the local clock.

Interpreting the reference in Peterson to a Kalman filter as relating to a way of improving the performance of the local clock and not as a way implementing Peterson's static equation is consistent with the examiner's interpretation of Peterson during reexamination proceedings. In its Request for *Inter Partes* Reexamination, the requestor argued that Peterson anticipated claims 1-10 of the '187 patent or, in the alternative, rendered those claims obvious. RX-0218.34-.50. In his initial office action, the examiner found that claims 1-4, 9, and 10 were anticipated by Peterson. RX-0219.65-.67. Claim 4 requires the dynamic model of claim 1 to be formed within a sequential estimator. '187 patent at 20:66-67. Claim 9 requires "a sequential estimator having a plurality of states associated with [a] satellite signal receiver," wherein one of the states is a "time tag error state," and claim 10 requires the sequential estimator of claim 9 to be a Kalman filter. *Id.* at 22:6-14. For claim 4 and claim 9's "sequential estimator" and claim 10's Kalman filter, the examiner pointed to Peterson's discussion of expanding the code to include a Kalman filter as a future goal. RX-0219.66 ("Peterson *et al.* further discloses that a sequential estimator in the form of a Kalman filter can be used to process signals acquired at various times to sequentially solve for updates of the position and time, thereby obtaining a 'running fix.'"). The patent owner challenged the examiner's interpretation of Peterson's suggestion to expand the code to include a Kalman filter, arguing, *inter alia*, that the suggestion would have been understood by one of ordinary skill in the art as "a research goal of modeling the drift of the receiver's local oscillator in a Kalman filter to improve the ability of the receiver to calculate

position in a coasting situation." The examiner found this argument to be persuasive and withdrew the rejections of claims 4, 9, and 10. RX-0219.555-.556.

**c) Kaplan does not provide a motivation to implement the Peterson static equation as a dynamic model.**

Respondents also point to Kaplan as providing a motivation to implement Peterson's static equation as a dynamic model. To be sure, Kaplan touts the advantages of using Kalman filtering. In particular, in Chapter 2, Kaplan notes that static "techniques for obtaining user PVT [(position, velocity, and time)] are derived from measurements that may be corrupted by noise and other error sources" and, as a result, "may yield noisy navigation solutions." RX-0197.066-.067. In contrast, dynamic modeling using Kalman filtering can "comput[e] a smoothed navigation solution" and an "optimum estimate[] of user PVT based on noise statistics and current measurements." *Id.* at .0067. Chapter 2 is directed to "a reader with a general science background," while later chapters are directed to readers "with a stronger engineering/scientific background." *Id.* at .13. Consistent with this structuring, Chapter 2 provides only an "overview of the Kalman filtering process," and directs readers to Chapter 9 for "further elaboration." *Id.* at .67. Chapter 9 addresses integration of GPS receivers with other sensors "to provide continuous navigation between the update periods of the GPS receiver, during periods of shading of the GPS receiver's antenna, and through periods of interference." *Id.* at .398. Although Chapter 9 focuses on inertial sensors, it notes that other sensors can be integrated with the GPS receiver, including altimeters, speedometers, odometers, magnetic compasses, low-cost gyroscopes, and wheel sensors. *Id.* at .229, .398, .423. When signal interruption "caused by shading of the GPS antenna by terrain or manmade structures (*e.g.*, buildings, vehicle structure, and tunnels) or by interference from an external source" reduces the number of usable satellites to less than three, sensor measurements can be used to provide navigation during shading outages and the sensor

measurements can be used to help the receiver to reacquire the satellite signal. *Id.* at .399. According to Kaplan, a Kalman filter is typically used to integrate a GPS receiver with other sensors. *Id.*

Thus, Kaplan discloses a GPS receiver that is capable of providing "continuous navigation," even during intervals in which the satellite signal is blocked. Respondents do not address why one of the ordinary skill in the art would have been motivated to modify the solution disclosed in Kaplan by adding a time tag error state to the Kalman filter disclosed in Kaplan or converting the static solution disclosed in Peterson to a dynamic model. In particular, Respondents do not provide any evidence that the solution disclosed in Kaplan suffered from any deficiencies that could be overcome by such modifications.

**5. The secondary considerations of non-obviousness do not weigh in favor of non-obviousness.**

Broadcom identifies three secondary considerations of non-obviousness: (1) industry skepticism, (2) long-felt need, and (3) commercial success. With regard to industry skepticism, Broadcom argues that [redacted] CIB at 247. Broadcom's argument, however, is not persuasive as both Akopian and Peterson teach methods of obtaining a fix without using absolute time information; Peterson in particular was published several years before priority date of the '187 patent. With regard to both long-felt need and commercial success, Broadcom relies on sales of its domestic industry products. CIB at 247-248. As discussed above, however, Broadcom's domestic industry products do not practice the '187 patent. Based on the foregoing, I find that the secondary considerations identified by Broadcom do not weigh in favor of non-obviousness.

# X. THE '104 PATENT

## A. Background and Specification

The '104 patent, entitled "Method and Apparatus for Combining Measurements and Determining Clock Offsets Between Different Satellite Positioning Systems," issued on December 2, 2014 from an application filed on June 2, 2013. JX-0002.00003. Through intervening applications, the '104 patent is a continuation of an application filed on March 18, 2005. *Id.* Frank van Diggelen is the sole-named inventor of the '104 patent. *Id.*

The '104 patent is directed to concurrently processing satellite signals from two different satellite positioning systems. *Id.* Examples of satellite positioning systems include the United States' GPS system, the European GALILEO system, and the Russian GLONASS system. *Id.* at 1:34-37. Each satellite positioning system has its own constellation of satellites. *Id.* at 2:39-46. The different satellite positioning systems operate similarly. *Id.* A satellite signal receiver receives signals from a number of satellites and determines each satellite's pseudorange. *Id.* at 1:27-28. A pseudorange is computed from the time delay between the satellite's transmission of the signal and the receiver's reception of the signal. *Id.* at 1:27-28, 1:47-55. In addition to the pseudoranges, the receiver also will have to determine the position of each satellite at the time that the satellite transmitted the signal. *Id.* at 1:59-62. The receiver determines the positions of the satellites using ephemeris data, which identifies each satellite and its orbit, and absolute time information. *Id.* at 1:63-2:9. Both the ephemeris data and absolute time information are included in the signal transmitted by the satellite. *Id.*

If the receiver knows the absolute time, it can determine its position from the pseudoranges to four satellites. *Id.* at 1:55-58. At times, there may not be a sufficient number of satellites from the same satellite positioning system available to the receiver. *Id.* at 2:44-46.

Therefore, it would be beneficial if the receiver could determine its position using signals transmitted by satellites belonging to more than one satellite positioning system. A receiver capable of doing this is shown in Figure 1.

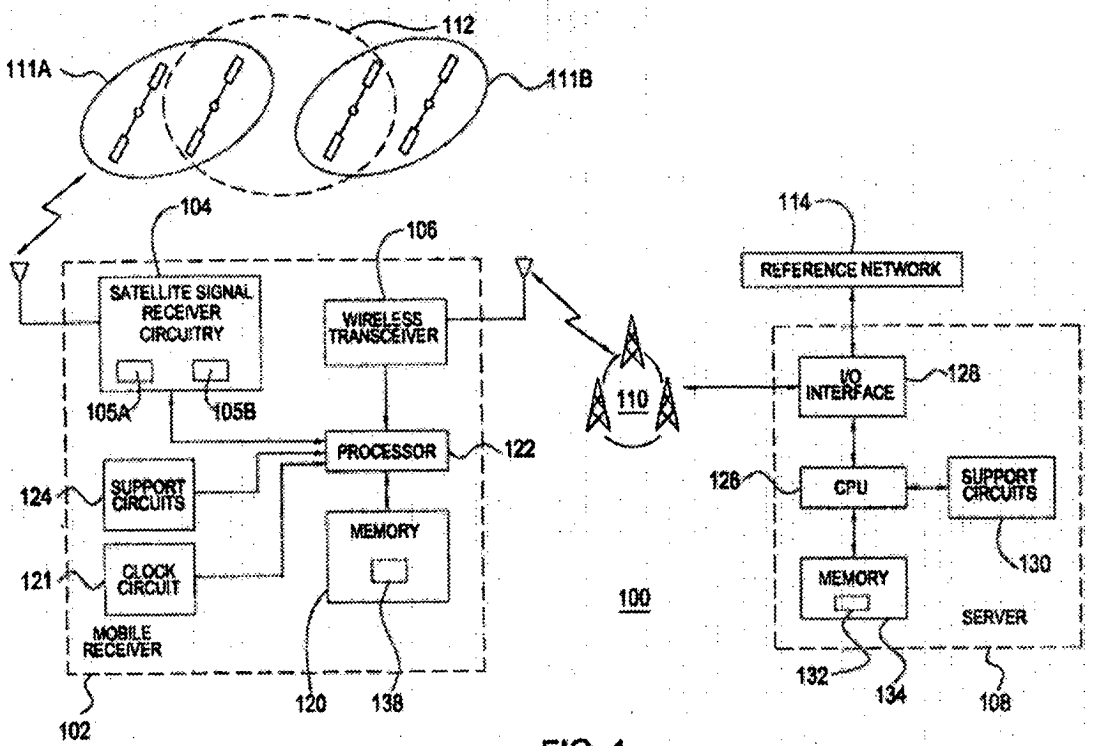


FIG. 1

The receiver in Figure 1 obtains pseudoranges "from satellites of a first satellite navigation system 111A (*e.g.*, GPS) and satellites of a second satellite navigation system 111B (*e.g.*, GALILEO)." JX-0002 at 3:57-63. In order to use satellite signals from two different satellite positioning systems, however, the receiver must overcome a problem. Different satellite positioning systems may use different time references for absolute time. *Id.* at 2:44-58. If the difference in time references is not compensated for, the result will be "an error in computed position proportional to the speed of light." *Id.* at 2:53-56. For instance, "an uncompensated 10 nanosecond offset will result in a 10 foot error in computed position." *Id.* at 2:56-58.

A method for compensating for the difference in time references is set forth in Figure 2 of the '104 patent.

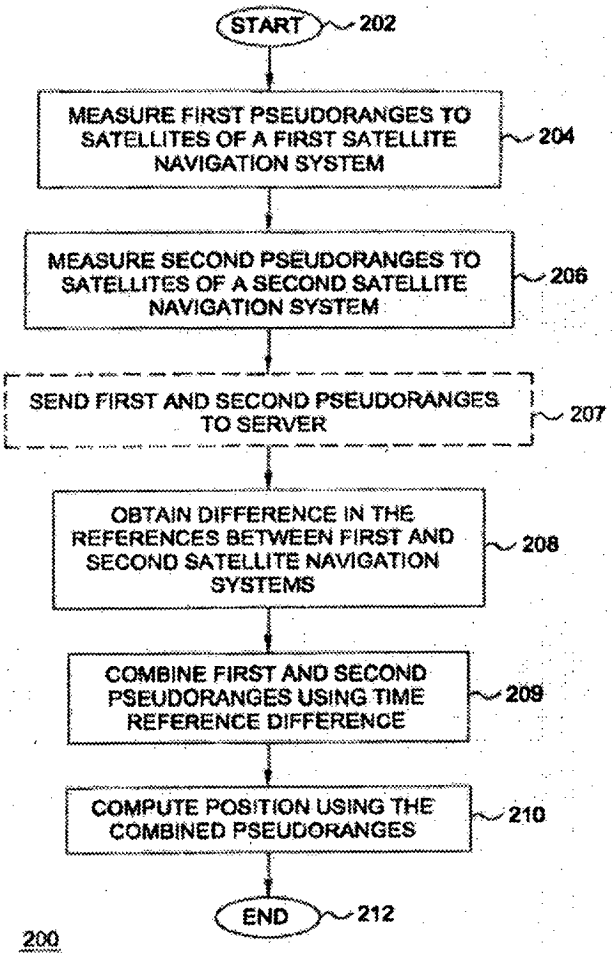


FIG. 2

According to the method shown in Figure 2, after the receiver determines a first set of pseudoranges to satellites in a first satellite navigation system (step 204) and a second set of pseudoranges to satellites in a second satellite navigation system (step 206), the receiver determines the difference between the time references used in the two satellite navigation

systems (step 208).[57] The receiver then "combine[s]" "the first and second pseudoranges . . . using the time reference difference obtained at step 208," so that "the first and second pseudoranges measured with respect to different satellite navigation systems [can] be used together to compute position and/or time." JX-0002 at 5:55-60. For instance, "the pseudoranges from one of the satellite systems 111A and 111B may be converted to the time reference of the other of the satellite systems 111A and 1118." *Id.* at 8:23-29. "[O]nce all of the pseudoranges have the same time reference, the position of the mobile receiver 102 may be computed using a navigation model in a well-known manner." *Id*.

### B. Asserted Claim

Broadcom asserts that JRC, u-blox, Pioneer, Panasonic, and Toyota infringe claim 12 of the '104 patent. Broadcom also asserts that claim 12 is practiced by its domestic industry products. Claim 12 is independent and recites:

> A mobile receiver, comprising:
>
> satellite receiver circuitry configured to receive first and second satellite signals from first and second satellites respectively, the first and second satellites corresponding to first and second respective satellite navigation systems; and
>
> a processor configured to:
>
> measure a first pseudorange from the mobile receiver to the first satellite of the first satellite navigation system based on the first satellite signal;
>
> measure a second pseudorange from the mobile receiver to the second satellite of the second satellite navigation system based on the second satellite signal;

[57] In an alternative embodiment, in step 207, the pseudoranges measured by the receiver are provided to a server, which performs the remaining steps shown in Figure 2. JX-0002 at 5:49-50. The use of a server and step 207, however, are optional. *Id.* at 5:51-54.

> determine a difference between a first time reference of the first satellite navigation system and a second time reference of the second satellite navigation system; and
>
> combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges.

JX-0002 at 10:7-27.

### C. Level of Ordinary Skill in the Art

For the '104 patent, the parties proposed the same definitions for the level of skill in the art that they proposed for the '187 patent. CMIB at 5-6; RRMB at 16 n. 7. For the reasons set forth above with respect to the '187 patent, for the '104 patent, I find that a person of ordinary skill would have "a Bachelor's Degree in an Engineering discipline such as Electrical, Aeronautical or Mechanical Engineering, or a Bachelor's Degree in Computer Science or Equivalent degree, plus at least two years of relevant experience with GNSS or similar systems." RRMB at 16 n. 7.

### D. Claim Construction

The parties dispute the construction of two terms from claim 12: "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges" and "configured to." The parties' disputes are addressed below.

#### 1. "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges"

| Claim Term | Respondents' Proposed Construction | Broadcom's Proposed Construction |
|---|---|---|
| "combine the first pseudorange and the second pseudorange using the difference to generate combined first and | Indefinite; alternatively "accounting for the difference in time references between the two satellite navigation systems and using the difference to generate pseudoranges that can be used together" | "accounting for the difference in time references between the two satellite navigation systems and using the difference to generate pseudoranges that can be used together at least once without using absolute time" |

| | | |
|---|---|---|
| second pseudoranges" | | |

Claim 12 requires a processor that is "configured to" perform four functions: (1) measure a first pseudorange to a first satellite of a first satellite navigation system; (2) measure a second pseudorange to a second satellite of a second satellite navigation system; (3) determine the difference between the time references used in the first and second satellite navigation systems; and (4) "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges." JX-0002 at 10:14-29. The parties raise two disputes concerning the fourth function. First, whether the claimed function is indefinite. Second, if the fourth step is not indefinite, whether the processor must be able to perform the claimed function "at least once without using absolute time."

**a) The fourth function is not indefinite.**

According to Respondents, the "combine" limitation requires that the processor be able to perform a two-step function: (1) "combine the first pseudorange and the second pseudorange using the difference" and (2) "generate combined first and second pseudoranges." RMIB at 43. Respondents concede that the first step—"combine the first pseudorange and the second pseudorange using the difference"—is definite and is "specifically addresse[d]" in the following excerpt of the specification:

> The pseudorange measurements are "combined" by accounting for the difference in time references between, [*sic*] the two satellite navigation systems. In other words, a process is performed that allows the pseudorange measurements to be used together, despite the measurements being made with respect to two different satellite navigation systems.

*Id.* (quoting JX-0002 at 8:59-65) (internal quotation marks omitted). Respondents argue, however, that the second step is indefinite because the claim and the specification provide "no guidance as to what the 'combined first and second pseudoranges' are, let alone how 'combined

first and second pseudoranges' are 'generated.'" *Id.* Respondents base their indefiniteness argument on interpreting the fourth step to require "***combining*** two things (two pseudoranges) [to] create two new things (two pseudoranges)." *Id.* at 43-44 (emphasis in original).

Respondents' argument is unpersuasive. Contrary to Respondents' interpretation of the step, the "combine" limitation is not a two-step function, but a single-step function. The "combined" first and second pseudorange are the result of combining the first and second pseudoranges with the time reference difference. The combined first and second pseudoranges are a set or a bundle of pseudoranges that can used to determine the receiver's position. As explained in the specification, combining "the first and second pseudoranges . . . using the time reference difference" is a process "that allows the first and second pseudoranges measured with respect to different satellite navigation systems to be used together to compute position and/or time." JX-0002 at 5:55-60; *see also id.* at 8:59-65 ("The pseudorange measurements are 'combined' by accounting for the difference in time references between, [*sic*] the two satellite navigation systems. In other words, a process is performed that allows the pseudorange measurements to be used together, despite the measurements being made with respect to two different satellite navigation systems."). The specification provides the following example of such a process:

> Once the time reference difference has been obtained, the pseudoranges from one of the satellite systems 111A and 111B may be converted to the time reference of the other of the satellite systems 111A and 1118. Once all of the pseudoranges have the same time reference, position of the mobile receiver 102 may be computed using a navigation model in a well-known manner.

*Id.* at 8:23-29. Accordingly, I find that Respondents have failed to meet their burden of showing that claim 12 is indefinite.[58]

**b) The "combine" limitation does not have be performed at least once without absolute time.**

Broadcom argues that the "combine" limitation means "accounting for the difference in time references between the two satellite navigation systems and using the difference to generate pseudoranges that can be used together at least once without using absolute time." As an alternative to indefiniteness, Respondents propose a construction that is identical to Broadcom's except that it does not contain the language "at least once without absolute time."

In support of its proposed requirement, Broadcom points to the specification's description of an embodiment that uses a "time-free" mathematical model to determine the receiver's position without using absolute time. Broadcom, however, does not argue that this description of a "time-free" embodiment constitutes either lexicography or disclaimer. In fact, Broadcom acknowledges that the specification only teaches that the time-free model "can be used" with the disclosed invention, not that such a model must be used:

> The '104 Patent also explains that this "combining" step can be used to compute states without knowing the absolute time. The '104 Patent explains that one way of doing this is by using a "time-free" mathematical model.

CMIB at 46. Instead, Broadcom suggests that adopting Respondents' alternative construction would somehow exclude the "time-free" embodiment. *Id.* at 48 ("Accordingly, because the '104 Patent discusses combining pseudoranges from two different satellite systems using a time-free

[58] The PTO instituted *inter partes* reviews of claim 12 in response to two petitions filed by Respondents u-blox, JRC, and DENSO. In neither petition did these Respondents assert that the "combine" limitation was indefinite. IPR2019-00737, Decision to Institute at 8-10; IPR2019-00816, Decision to Institute at 8-10.

mathematical model (without absolute time) that computes position and time state updates, and it is improper to construe claim terms in a way that excludes embodiments. . . .").

Broadcom's argument, however, is groundless. Respondents' alternative construction is identical to Broadcom's proposed construction except that it does not require that the processor be able to perform the function "at least once without using absolute time." As such, Respondents' proposed construction is broader: it encompasses time-free embodiments, like the one discussed by Broadcom, but is not limited to such embodiments. Moreover, even if all of the embodiments disclosed in the specification used a time-free model, this would not be a basis for limiting the claims. It is well established that limitations from preferred embodiments should not be imported into the claims. *Hill-Rom Service, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014) ("While we read claims in view of the specification, of which they are a part, we do not read limitations from the embodiments in the specification into the claims."). Standing alone, the description of a preferred embodiment does not constitute either lexicography or disavowal. *Id.* ("Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.") (quoting *SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001)) (internal quotation marks and alteration in original omitted).

For the foregoing reasons, I find that the term "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges" means "accounting for the difference in time references between the two satellite navigation systems and using the difference to generate pseudoranges that can be used together."

**2. "configured to"**

| Claim Term | Respondents' Proposed Construction | Broadcom's Proposed Construction |
|---|---|---|
| "satellite receiver circuitry ***configured to*** receive first and second satellite signals …"<br><br>"a processor ***configured to***" | "having a combination of hardware and software that make the device operable to" | "capable of" |

Claim 12 recites the term "configured to" twice. Claim 12 requires that the mobile receiver have satellite receiver circuitry "configured to" receive satellite signals from two satellites belonging to different satellite navigation systems and a processor "configured to" perform various functions. JX-0002 at 10:8-27. Respondents contend that the term requires that the satellite receiver circuitry and processor "hav[e] a combination of hardware and software that make the device operable to" perform the claimed functions. Broadcom counters that the claim only requires that the satellite receiver circuitry and processor be "capable of" performing the recited functions.

The Federal Circuit's analysis of the claim term "adapted to" has a direct bearing on the parties' dispute. In three cases, the Federal Circuit has addressed the construction of the term "adapted to." In each case, the Federal Circuit has noted that "the phrase 'adapted to' is frequently used to mean 'made to,' 'designed to,' or 'configured to,' but it can also be used in a broader sense to mean 'capable of' or 'suitable for'" *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1349 (Fed. Cir. 2012); *see also In re Man Mach. Interface Tech. LLC,* 822 F.3d 1282, 1286-87 (Fed. Cir. 2016); *In re Giannelli,* 739 F.3d 1375, 1379-81 (quoting *Aspex,* 673 F.3d at 1349). In so doing, the Federal Circuit acknowledges that "configured to" is

narrower in scope than "capable of." Accordingly, I reject Broadcom's proposed construction as overly broad.

In contrast to Broadcom's proposed construction, Respondents' proposed construction of "configured to" is consistent with the term's plain and ordinary meaning. *See, e.g.,* Webster's Ninth New Collegiate Dictionary (1984) at 275 (defining "configure" to mean "to set up for operation esp. in a particular way"). Respondents' proposed construction is also consistent with how other courts have interpreted the term. *See, e.g., Carucel Inv., L.P. v. Novatel Wireless, Inc.,* 2017 WL 1394068, at *3-*4 (S.D. Cal. 2017) (construing "configured to" to mean "constructed to"); *Solocron Media, LLC v. Verizon Commc'n Inc.,* 2015 WL 1011310, at *11-*12 (E.D. Tex. 2015) (construing "'configured to' to have its plain meaning, 'which the Court understands to require not merely being capable of being configured but rather being actually configured'"); *Mitek Sys., Inc. v. TIS America Inc.,* 2014 WL 3891237, at *2 (D. Del. 2014) (refusing to construe "configured" to mean capable of, but instead construing it to mean "arranged or set-up to perform a specified function"); *SwimWays Corp. v. Zuru, LLC,* 2014 WL 934447, *12-*13 (E.D. Va. 2014) (finding that the plain and ordinary meaning of "configured to" to "require[d] not merely being capable of being configured but rather being actually configured"); *Intellectual Ventures I LLC v. Altera Corp.,* 2013 WL 3913646 (D. Del. 2013) (construing "configured to" to mean "to set up for operation especially in a particular way"); *SIPCO, LLC v. Abb, Inc.,* 2012 WL 3112302, at *11 (E.D.Tex. July 30, 2012) ("[T]he claims mandate that the devices are 'configured to' perform particular functions. Interpreting 'configured to' as requiring only mere capability would eliminate any meaningful limits to the claims. Accordingly, the Court finds that 'configured to' means 'actually programmed or equipped with hardware or software to.' ").

Based on the foregoing, I find that term "configured to" means "having a combination of hardware and software that make the device operable to" the recited functions.

**E. Infringement**

Broadcom accuses various u-blox products and the JRC [redacted] and downstream products containing accused u-blox and JRC products of infringing claim 12. With regard to the accused u-blox products, Broadcom argues that the u-blox [redacted] is representative of the following products: [redacted] products. CIB at 251. Respondents do not contest Broadcom's representativeness contentions. Accordingly, I find that the u-blox [redacted] is representative of all of the accused u-blox products.

With regard to downstream products, it is undisputed that the accused u-blox products are incorporated into Pioneer head units, which in turn are incorporated into Toyota vehicles. *See, e.g.*, CIB at 262-263. It is also undisputed that the JRC [redacted] is incorporated into Panasonic head units, which in turn are incorporated into Toyota vehicles. *See id.*

**1. u-blox [redacted]**

In support of its infringement case, Broadcom relies on the infringement analysis of its expert Dr. Goldberg. In his witness statement, Broadcom's expert Dr. Goldberg opines that an [redacted] into a downstream product and a [redacted] incorporated into an accused Pioneer head unit have the same functionality. CX-0005C (Goldberg WS) at Q/A 179-185. On this basis, Dr. Goldberg provided an element-by-element infringement analysis of the [redacted], but confined his infringement analysis of the Pioneer head units to citing back to his analysis of the [redacted]. *Id.* Respondents argue that Dr. Goldberg's

approach is flawed because the [redacted] are not imported into the United States and a [redacted]. RIB at 280. The first part of Respondents' argument—[redacted]—overstates the evidence. *Id.* u-blox stipulated that the [redacted] products were "imported into the United States by one or more u-blox entities as of December 2018." JX-0020C at ¶ 4. A review of the supporting documentation submitted with u-blox's stipulation indicates that these were importations [redacted]. *Id.* at Exhibit 1.

With respect to the [redacted], Respondents' only challenge Broadcom's infringement analysis as to one limitation. In particular, Respondents' dispute whether the [redacted] processor is configured to "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges." According to Respondents, [redacted]. RIB at 274-275. A pseudorange residual is the difference between a measured pseudorange and an expected pseudorange. JX-0002 at 10:40-50; *see also* RX-0017C (Pullen RWS) at 207. Broadcom counters that [redacted]. CRB at 140-141. Broadcom's argument is unpersuasive.

The claims explicitly distinguish pseudorange residuals from measured pseudoranges. For instance, claim 16 depends from claim 12 and requires that the processor "be further configured to" form pseudorange residuals from the measured pseudoranges and compute the receiver's position using the pseudorange residuals. JX-0002 at col. 10:40-50. Broadcom argues that claim 16 supports its position because it "narrows the 'combine' element by reciting

'compute a position update of a position of the mobile receiver using the first and second pseudorange residuals.'" CRB at 140-141. Claim 16, however, does not further limit claim 12's "combine" limitation; claim 16 does not refer to the "combine" limitation. Claim 16 requires that the processor be able to perform functions in addition to the ones recited in claim 12. In so doing, claim 16 distinguishes "pseudorange residuals" from "pseudoranges" by defining the pseudorange residuals as the difference between the expected pseudorange and the measured pseudorange.

Because the [redacted] does not satisfy claim 12's "combine" limitation literally. Broadcom has not asserted that the limitation is satisfied under the doctrine of equivalents. Accordingly, I find that the unintegrated [redacted] does not infringe claim 12.

**2. The Accused Pioneer Products and Toyota Vehicles Incorporating Accused Pioneer Products**

The accused Pioneer products contain a [redacted] chip. On this basis, Broadcom argues that the accused Pioneer products infringe claim 12 for the same reasons that the [redacted] infringes. As discussed above, however, the [redacted] does not infringe because it does not have a processor configured to "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges." Accordingly, the accused Pioneer products do not infringe claim 12 for the same reason that the [redacted] product does not. Moreover, the accused Pioneer products also do not infringe claim 12 for an additional reason.

[redacted]

RX-0017C (Pullen RWS) at Q/A 218. Because the [redacted]

[redacted], it is not "configured to" either receive or process satellite signals from two satellite systems. *Id.*

The [redacted] that Pioneer receives from u-blox [redacted]. *Id.* at Q/A 219. In addition, Pioneer source code [redacted]. *Id.*; RX-0012C (Mayo RWS) at Q/A 43-44; JX-0043C (Furuyama Dep.) at 48:20-50:10. In other words, [redacted]. *Id.*

Broadcom does not dispute that the functionality needed to [redacted], but argues that the products still infringe because (1) it is irrelevant whether the accused functionality is active or inactive and (2) the Pioneer head units are "configured to" perform the accused functionalities in the period of time between after the Toyota vehicle is started and before the [redacted]. Both of these arguments are unavailing.

**a) A product that must be modified in order to perform a claimed function is not "configured to" perform the function.**

First, Broadcom argues that u-blox customers [redacted]. CIB at 252. Broadcom's argument fails to acknowledge that u-blox's customers [redacted]. Pioneer purchases the [redacted] from u-blox and manufactures head units incorporating the [redacted]. For the head units bound for the U.S., [redacted]

[redacted]. JX-0043C (Furuyama Dep.) at 48:20-50:10. There is no evidence that anyone in the United States has ever modified a Pioneer head unit to receive and process signals from more than one satellite navigation system. There is no evidence showing that it is even possible to do so. Broadcom's expert did not testify that he was able to set or modify one of the accused Pioneer head units to perform the claimed functions.

Simply put, the Pioneer head units are not "configured to" receive and process signals from two satellite navigation systems, as required by claim 12. JX-0002 at 10:18-27. Broadcom argues the [redacted] processor is "configured to" perform the claimed functions because the [redacted]. CIB at 252-253. According to Broadcom, it does not matter whether the code for performing the claimed functions is disabled or enabled, so long as the code is present. Broadcom's argument is inconsistent with the construction of "configured to" adopted above: "having a combination of hardware and software that make the device operable to." Moreover, Broadcom's argument is based on a misreading of the law.

The claim language requires a processor "configured to" perform the claim functions, not a processor that is "configurable" to perform the claim functions. "Configurable" only requires that an accused product be capable of being configured to perform a claimed function, whereas "configured to" requires that the accused product be actually configured to perform the claimed function. Two Federal Circuit cases illustrate the distinction between these two concepts.

In *Intel Corp. v. Int'l Trade Comm'n*, the accused infringer argued that the accused EPROMs did not satisfy a functional limitation because, "although GI/M's 'old' design 51 Series EPROMs are *capable* of performing page mode addressing, the EPROMs were never sold to operate in page mode," and "[n]o customer was ever told how to convert the chip to page mode

operation—or even that such conversion was possible." 946 F.2d 821, 832 (Fed. Cir. 1991). The Federal Circuit rejected this argument because the claim language only required a "*programmable* selection means" that performs the claimed function "*when*" the function is selected. *Id.*

In *High Tech Medical Instrumentation v. New Image Indus., Inc.*, the Federal Circuit clarified its holding in *Intel*. 49 F.3d 1551, 1555 (Fed. Cir. 1995). In *High Tech*, the district court issued a preliminary injunction after finding that the patent owner had made a "clear showing" of infringement. *Id.* at 1553-1554. The district court made this finding even though the asserted claim required a "rotatably coupled" camera, while the camera in the accused product could not rotate because of two set screws. *Id.* at 1553. Interpreting *Intel* "to mean that if a particular device can be altered without undue difficulty to operate in an infringing manner, the device, as sold, must be deemed to infringe," the district court found that the accused product still satisfied the "rotatably coupled" limitation because loosening the two screws would allow the camera to rotate. *Id.* at 1555.

The Federal Circuit rejected the district court's interpretation of *Intel*. As the *High Tech* court explained, the limitation at issue in *Intel* only required that the accused device be "programmable" to operate in a certain manner. *Id.* at 1555-56. In other words, it did not matter that the accused product in *Intel* was not specifically designed or sold to perform the recited function, so long as it could be programmed to do so. *Id.* In contrast, with regard to the accused product in *High Tech*, the Federal Circuit found that the "fact that it is possible to alter the AcuCam so that the camera becomes 'rotatably coupled' to its housing is not enough, by itself, to justify" an infringement finding. *Id.* at 1556.

Claim 12 requires that the accused Pioneer head units be "configured to" operate in a certain way, not merely that they can be configured to operate a certain way. *See, e.g., Radware I* (construing "configured to" to mean "Programmed to [perform certain functions]").[59] The cases cited by Broadcom in support of its infringement argument are inapposite. In *Audionics Sys., Inc. v. AAMP of Florida, Inc.*, 2015 WL 11182054, at *9 (C.D. Cal. 2015) cited by Broadcom, the district court construed the phrase "adapted to" to mean "capable of." Claim 12, however, does not recite the term "adapted to," it recites the term "configured to." As discussed above, the Federal Circuit has noted that the term "adapted to" can be used in a narrower sense and broader sense. *Aspex,* 672 F.3d at 1349; *Man Machine,* 822 F.3d at 1286-87; *Giannelli,* 739 F.3d at 1379-81. The narrower sense means "configured to," while the broader sense means "capable of." *Id.*

Broadcom also cites a number of cases in which the court considered software designed to allow customers to select the accused functionalities. While Broadcom mischaracterizes one of these cases as involving functionalities that have been disabled, *see* CIB at 253-54 (parenthetical description of *Versata Software, Inc. v. SAP Am., Inc.*, 717 F.3d 1255, 1263 (Fed. Cir. 2013)), all of the cases involve the same issue: software that provides the end user the option of selecting the accused functionality. *Versata,* 717 F.3 at 1263 ("Versata's expert did not

[59] *Radware I, II,* and *III* are used herein to refer to three district court orders from two cases in which Radware was the plaintiff. A10 Networks, Inc. is the defendant in the first (C-13-2021) and F5 Networks is the defendant in the second (C-13-02024). The cases involved the same patents and were designated as being related. *Radware I* (*Radware Ltd. v. A10 Networks, Inc.*, 2014 WL 1572644 (N.D. Cal. Apr. 18, 2014)) is a *Markman* order issued in both cases. *Radware II (Radware, Ltd. v. A10 Networks, Inc.*, 2014 WL 2738538 (N.D. Cal. June 11, 2014)) is an order ruling on motions for summary judgement of invalidity and non-infringement filed in both cases. *Radware III* (*Radware, Ltd. v. F5 Networks, Inc.*, 2016 WL 4733018 (N.D. Cal. Sept. 12, 2016), aff'd, 697 F. App'x 700 (Fed. Cir. 2017)) is an order ruling on F5 Networks' motion for summary judgment of non-infringement.

alter or modify SAP's code in order to achieve the claimed functionality. Rather, he followed SAP's own directions on how to implement pricing functionality in its software and activated functions already present in the software: data structures, access sequences, pricing procedures, and condition types. SAP's own expert admitted that each alleged alteration was part of the software's capability, that it was not unusual for customers to perform the same actions, and that it was 'expected that SAP's customers who use the pricing functionality' will use it with a similar data setup."); *Brocade Commc'ns Sys., Inc. v. A10 Networks, Inc.*, 2013 WL 831528, at *11-*12 (N.D. Cal. Jan. 10, 2013) (the accused functionality was an option that could be selected by end user); and *Radware I*, 2014 WL 1572644, at *12-*14 and *Radware II,* 2014 WL 2738538, at *11, *14 (holding that it does not matter whether the end user activates the accused functionality, so long as the end user has the option doing so).

In contrast, there is no evidence that [redacted]. In order to activate such functionality, the Pioneer software would have to be modified. The potential for such a modification, however, is not a suitable basis for infringement. *See Fantasy Sports Properties, Inc. v. Sportsline.com, Inc.*, 287 F.3d 1108, 1118 (Fed. Cir. 2002) ("[I]n order to infringe the [] patent, the code underlying an accused fantasy football game must be written in such a way as to enable a user of that software to utilize the function of awarding bonus points for unusual plays such as out-of-position scoring, without having to modify that code."); *Radware III,* 2016 WL 4733018, at *2-*3 (finding that the accused products were not "configured to select" ISP links, as required by the claim language, because, "as shipped," the "products are programmed not to select ISP links").

Based on the foregoing, I find that accused Pioneer products are not "configured to" perform the recited functions of claim 12.

**b) Broadcom waived its argument that the [redacted] satisfies the claim 12 [redacted].**

In its post-hearing brief, Broadcom argues that [redacted] CIB at 256. In other words, Broadcom contends that [redacted]. Broadcom, however, did not raise this argument in its pre-hearing brief, CPHB at 629-44. Accordingly, this argument has been waived. Ground Rule 8.2.

**3. JRC [redacted]**

Broadcom's expert Dr. Goldberg opines that a [redacted] unincorporated into a downstream product and a [redacted] incorporated into an accused Panasonic head unit have the same functionality. CX-0005C (Goldberg WS) at Q/A 164-170. Relying on this understanding, Dr. Goldberg's infringement analysis of the accused Panasonic products was limited to incorporating by reference his element-by-element infringement analysis of an unincorporated [redacted]. *Id.* Respondents argue that the unincorporated [redacted] are not imported into the United States and a [redacted] incorporated into a Panasonic head unit has different functionality than an unincorporated [redacted]. RIB at 280. Respondents' argument is persuasive.

There is no evidence that a [redacted] unincorporated into a Panasonic head unit has ever been imported into the United States. While JRC stipulated that it "does not dispute that at least one unit of the [redacted] was imported into the United States," the stipulation does not indicate

whether the [redacted] is imported into the United States as an unintegrated chip or as a component in a head unit. JX-0017C at ¶ 3. The only evidence of importation is of [redacted] incorporated into Panasonic head units. JX-0018C at ¶ 3. An unincorporated [redacted] sold overseas to foreign manufacturers does not infringe claim 12. *See Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 711 F.3d 1348, 1371 (Fed. Cir. 2013) ("It is axiomatic that U.S. patent law does not operate extraterritorially to prohibit infringement abroad."). Moreover, not only is there no evidence that JRC or anyone else has ever imported unincorporated [redacted], Broadcom has not argued and has not pointed to any evidence that would support a finding that JRC sold the [redacted] for importation. *See Certain Inkjet Ink Cartridges with Printheads & Components Thereof*, Inv. No. 337-TA-723, Initial Determination, 2011 WL 3489151, at *12 (June 10, 2011), *aff'd in relevant part by* Comm'n Op. (Dec. 1, 2011) ("To prove a 'sale for importation,' a complainant must prove that a respondent sold infringing articles and knew or should have known that those articles would be subsequently exported to the United States.").

**4. The Accused Panasonic Products and Toyota Vehicles**

Broadcom argues that the Panasonic head units infringe claim 12 because the [redacted] can be set to a mode in which either (1) GPS and Galileo signals or (2) GPS and GLONASS signals are concurrently received. CIB at 258.[60] As incorporated into the Panasonic head units, the functionalities for receiving and processing Galileo and GLONASS signals are disabled in the [redacted]. The [redacted] that Panasonic receives from JRC are set to a default configuration in

[60] In addition to circuitry for receiving and processing GPS, GLONASS, and Galileo signals, the [redacted] also has circuitry for receiving and processing signals from the BeiDou (BDS) and QZSS satellite navigation systems. JX-0105C.5 ("The IC is capable of receiving the signals for position fixing from the USA GPS, the Russian GLONASS, the Chinese BDS, the Japanese QZSS and the European Galileo (hardware ready)."). Broadcom, however, has not accused the functionality relating to the BDS and QZSS signals of infringing claim 12.

which the [redacted]. RX-0017C (Pullen RWS) at Q/A 135-136. In this configuration, the [redacted]. *Id.* at Q/A 136. In addition, in the default configuration, the [redacted]'s CPU "is not configured to process any" Galileo or GLONASS signals. *Id.* Therefore, as provided to Panasonic, the [redacted] cannot concurrently receive and process either both GPS and Galileo signals or both GPS and GLONASS signals, as alleged.

While Panasonic could have enabled the functionality for receiving and processing GLONASS and Galileo signals, the configuration of the [redacted] incorporated into the Panasonic head units mirrors the default configuration, *viz.*, the functionality needed to receive and process GLONASS and Galileo signals is disabled. *Id.* at Q/A 137. The head units use software provided to Panasonic by [redacted]. *Id.* at Q/A 138; RX-0320C at ¶ d. [redacted][61] A user of the Panasonic head unit cannot change the configuration of the [redacted] to enable to receive and process Galileo and GLONASS signals. RX-0017C (Pullen RWS) at Q/A 141. Accordingly, as sold and used in Toyota vehicles, the accused Panasonic head units are not "configured to" receive and process signals from two different satellite navigation systems as required by claim 12.

Broadcom does not dispute that the Panasonic head units as configured cannot perform the functions required by claim 12, but argues that the functionality of the [redacted] relating to the

[61] In addition, the [redacted]. RX-0017C (Pullen RWS) at Q/A 137-140; RX-0320C at ¶ c.

reception and processing of Galileo and GLONASS signals can be enabled. Broadcom, however, does not allege that the Panasonic head units provide the user with the option of doing so. Rather, Broadcom's argument is a re-hash of the argument that it made with respect to the accused Pioneer head units: the software used in the head units can be altered so that the relevant functionality is enabled. This argument fails with respect to the accused Panasonic head units for the same reason that it failed with respect to the accused Pioneer head units.

**F. Domestic Industry**

Broadcom relies on its [redacted] to satisfy the technical prong of the domestic industry product. CIB at 264. Broadcom alleges that the [redacted] is representative of all of the domestic industry products. *Id.* at 265-66. In support of this contention, Broadcom points to witness statement of its expert Dr. Goldberg and the deposition transcript of [redacted]. According to these witnesses, with respect to the functions relevant to the '104 patent, [redacted] *Id.* at 182:-16, 182:4-16; CX-0005C (Goldberg WS) at Q/A 215. Respondents' do not challenge Broadcom's contention that the [redacted] is representative of all of the domestic industry products. *See* RIB at 286. Accordingly, with respect to the functions relevant to the '104 patent, I find that the [redacted]

Respondents do not dispute that the [redacted] practices claim 12 of the '104 patent. *See* RIB at 286. To the extent that the preamble is limiting, the [redacted] is a mobile receiver. CX-0005C (Goldberg WS) at Q/A 246; JX-0065C at 182:17-183:10. The [redacted]

[redacted]. CX-0005C (Goldberg WS) at Q/A 248-255. [redacted]

*Id.* at Q/A 253.

Based on the foregoing, I find that the Broadcom domestic industry products practice claim 12 of the '104 patent.

### G. Invalidity

There is no dispute that claim 12 is anticipated by Beser-96 and Rossbach-03 under the claim construction adopted for "combine the first pseudorange and the second pseudorange using the difference to generate combined first and second pseudoranges." *See* CIB at 269-70 (arguing that Beser-96 does not anticipate under Broadcom's proposed construction of the "combine" limitation, but not otherwise contesting anticipation), 272 (same for Rossbach-03).

#### 1. Beser-96

Beser-96 is a paper published by Jacques Beser, Ph.D. entitled "Integrated GPS/GLONASS User Equipment" (RX-0177). The prior art status of Beser-96 is undisputed. *See* CIB at 269-70. The '104 patent claims priority to an application filed on March 18, 2005.

'104 patent at cover. Beser-96 was published in 1996, RX-0177.39, and qualifies as prior art under 35 U.S.C. § 102(b).

To the extent that the preamble is limiting, Beser-96 discloses a mobile receiver. RX-0177.39, .49, .61, .62; RX-0004C (Pullen DWS) at Q/A 204-205. As required by claim 12, the receiver disclosed in Beser-96 has circuitry to receive signals from a first satellite belonging to a first satellite navigation system (GPS) and a second satellite belonging to a second satellite navigation system (GLONASS). RX-0177.49-.52, 52, .55-.56. Figs. 4-1, 4-2, 5-1, and 5-2; RX-0004C (Pullen DWS) at Q/A 206. The receiver disclosed in Beser-96 has a processor configured to perform the functions recited in claim 12. Specifically, the processor is configured to measure the pseudorange to the first satellite and the pseudorange to the second satellite. RX-0177.46-.50, .52-.54, 59-63; RX-0004C (Pullen DWS) at Q/A 208. The processor can also determine a difference between the time references used by the first and second satellite navigation systems. RX-0177.47-.48, .54; RX-0004C (Pullen DWS) at Q/A 209. The processor can account for the difference in time references between the two satellite navigation systems and use the difference to generate pseudoranges that can be used together. RX-0177.47-.48; RX-0004C (Pullen DWS) at Q/A 210.

Based on the foregoing, I find that Beser-96 anticipates claim 12.

**2. Rossbach-03**

Rossbach-03 is a paper entitled "Positioning and Navigation Using the Russian Satellite System GLONASS" (RX-0200). Rossbach-03 was published in 2000, RX-0004 (Pullen DWS) at Q/A 230, and qualifies as prior art under 35 U.S.C. § 102(b). To the extent that the preamble is limiting, Rossbach-03 discloses a mobile receiver. RX-0200.36-.38, .100, .117, .146; RX-0004 (Pullen DWS) at Q/A 232. As required by claim 12, the receiver disclosed in Rossbach-03

has circuitry to receive signals from a first satellite belonging to a first satellite navigation system (GPS) and a second satellite belonging to a second navigation system (GLONASS). RX-0200.36, .117; RX-0004C (Pullen DWS) at Q/A 233. The receiver disclosed in Rossbach-03 has a processor configured to perform the functions recited in claim 12. Specifically, the processor is configured to measure the pseudorange to the first satellite and the pseudorange to the second satellite. RX-0200.84, .96-.99; RX-0004C (Pullen DWS) at Q/A 235. The processor can also determine a difference between the time references used by the first and second satellite navigation systems. RX-0200.42-.48, .99-.100; RX-0004C (Pullen DWS) at Q/A 236. The processor can account for the difference in time references between the two satellite navigation systems and use the difference to generate pseudoranges that can be used together. RX-0200.99-.100; RX-0004C (Pullen DWS) at Q/A 237.

Based on the foregoing, I find that Rossbach-03 anticipates claim 12.[62]

## XI. DOMESTIC INDUSTRY

Broadcom claims to satisfy the economic prong of the domestic industry requirement under section 337(a)(3)(A) and/or (B).[63] Respondents do not dispute that Broadcom satisfies the economic prong.

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[62] Respondents' anticipation arguments are based on their proposed construction of the "combine" limitation. Respondents also assert that claim 12 would have been obvious in view of Beser-96 in combination with one or more secondary references under Broadcom's proposed construction of the "combine" limitation. RIB at 288-89. Because Respondents' proposed construction was adopted, Respondent's obviousness argument and Broadcom's related secondary-considerations argument are moot.

[63] "The statutory text of section 337 does not limit sections 337(a)(3)(A) and (B) to investments related to manufacturing or any other type of industry." *Certain Solid State Storage Drives, Stacked Electronics Components, and Products Containing Same* ("*Solid State Storage Drives*"), Inv. No. 337-TA-1097, Comm'n Op. at 7-8 (June 20, 2018) (citing *Certain Variable Speed Wind Turbines & Components Thereof*, Inv. No. 337-TA-376, USITC Pub. No. 3003, Comm'n Op. at 15 (Nov. 1996)). *Id.*

Broadcom's economic expert, Philip Green, divides the patents into two categories: the "Video/Graphics Processing Patents," along with the "Power/Memory Management Patents," which Mr. Green designates as the "STB" patents; and products relating to navigation systems, which he designates as the "GPS" patents. CX-0007C (Green WS) at Q/A 21-22. The STB patents include the '844, '027, '752, and'583 patents. The GPS patents include the '187 and '104 patents. *Id.* at Q/A 21 (citing CDX-0003C.003). Mr. Green identifies the domestic industry ("DI) products as STB chips and GPS chips. *Id.* at Q/A 25.

Similarly, Mr. Green divides Broadcom's alleged domestic industry into two parts, consisting of (1) Broadcom's "Wireless Communications Combos," or "WCC" segment, which "is responsible for the design, development and distribution of Broadcom's family of GPS and GNSS semiconductor products, software and data services;" and (2) Broadcom's set-top box ("STB") division, which "is responsible for the design development and distribution of Broadcom's complete system on a chip, or 'SoC' solutions, primarily for its cable, satellite, and internet protocol applications." CX-0007C (Green WS) at Q/A 27; CX-0002C (Chapeaux WS) at Q/A 12. Mr. Green states that Broadcom separately tracks and reports the expense data relating to these two segments in the regular course of its business. CX-0007C (Green WS) at 28. Mr. Green's calculations regarding Broadcom's domestic injury are based on data from the company's internal records database, as well as discussions with Broadcom executives. *Id.* at Q/A 37-42.

Mr. Green's analysis entails a two-step process: (1) quantifying the investment or expenditure in plant and equipment, labor or capital and (2) evaluating whether the investments or expenditures are significant or substantial. *Id.* at Q/A 46. The quantification step includes allocating the company's expenditures to the DI products. *Id.* at Q/A 46-47.[64]

### A. Set-Top Box Products

Mr. Green's analysis focuses on domestic research and development ("R&D") and engineering. *Id.* at Q/A 54. To quantify the amount of pertinent investments and expenditures, he relies on Broadcom records as well as depositions of Broadcom personnel. *Id.* at Q/A 56. Based on this information, Mr. Green opines that the activities in which Broadcom invests include initial development of a product as well as sustaining engineering work after the product is available for sale. *Id.* at Q/A 57.[65]

With respect to plant and equipment, Mr. Green collected data on Broadcom's domestic expenditures for R&D in Irvine, Santa Clara, San Diego, and San Jose, California, as well as Andover, Massachusetts. *Id.* at Q/A 73; CDX-0003C.012. Mr. Green estimates that [redacted] square feet of space is used by the STB division in the U.S. CX-0007C (Green WS) at Q/A 73. He identifies a variety of technical equipment used for these R&D activities" "including

[64] Mr. Green opines that Broadcom satisfies the economic prong. *Id.* at Q/A 51. Mr. Green is an economic expert whose opinion on the legal issue of whether the DI requirement is satisfied is given no weight. Even if he purported to be a legal expert (as some economists do), his testimony on this issue would be inadmissible. *See* Ground Rule 9.2, Order No. 2 at 18 ("Legal experts may only testify as to procedures of the U.S. Patent and Trademark Office.")

[65] The underlying support for many of Mr. Green's opinions is set forth in a demonstrative exhibit, CDX-0003C. Although the exhibit itself is not in evidence, it includes citations to pertinent evidence that has been admitted.

emulators, oscilloscopes, testing and verification equipment, design workstations, mask sets, and computer servers." *Id.* at Q/A 75.

Mr. Green's quantification of the amount of DI activity entails several steps: identifying total domestic STB labor, plant and equipment expenditures relating to R&D and engineering; allocating the pertinent expenditures by headcount; and allocating expenditures to specific products by asserted patent. CX-0007C (Green WS) at Q/A 90-94, 99; CDX-0003C.18-.020, .023-.025.[66] Mr. Green allocates labor expenditures based on Broadcom's STB DI product unit sales volumes as a percentage of total DI product line unit sales. CX-0007C (Green WS) at Q/A 100; CDX-0003C.029-.031. He also allocates Broadcom's STB real estate and technical equipment expenditures based on Broadcom's STB DI product unit sales volumes as a percentage of total STB unit sales. *Id.*[67] The DI work includes both hardware and software development. CX-0007C (Green WS) at Q/A 58; CDX-0003C.011. Mr. Green testifies that he excluded from his DI calculations engineering activities related to marketing. CX-0007C (Green WS) at Q/A 69-70.

Mr. Green testifies that from fiscal year 2016 through the first half of fiscal year 2018, Broadcom invested [redacted] in U.S. labor related to DI products. *Id.* at Q/A 110; CDX-

[66] Allocation was necessary because Broadcom does not [redacted] *See* CX-0002C (Chapeaux WS) at Q/A 50. Mr. Green states that "most of Broadcom's STB engineering activities, in particular its software engineering activities, [redacted]." CX-0007C (Green WS) at Q/A 56.

[67] In relying on Mr. Green's analysis to support the conclusion that a domestic industry exists, I do not adopt every aspect of his calculations. His overall approach takes into account appropriate factors. Except with respect to the broad outlines noted above, however, my acceptance of Mr. Green's uncontested analysis establishes no precedent as to the methods he uses or the specific amounts he reports.

0003C.033. In addition, he states that Broadcom invested at least [redacted] in U.S. real estate related to software-based STB DI activities, and [redacted] in U.S. technical equipment related to software-based STB DI activities. CX-0007C (Green WS) at QA 111; CDX-0003C.033-.035. The amount of investment for the '583 patent is less because there are fewer DI products related to that patent. CX-0007C (Green WS) at Q/A 112; CDX-0003C.038.

Mr. Green opines that Broadcom's domestic activities "provide essential contributions" to the DI products and are significant. CX-0007C (Green WS) at Q/A 115. In reaching this conclusion, Mr. Green examines the context of the alleged DI expenditures, comparing domestic to foreign investments related to STB R&D and engineering, as well as considering "the amounts of investment in and of themselves." *Id.* at Q/A 117-135. Mr. Green calculates that Broadcom's expenditure in domestic labor for hardware and software related to its STB DI during FY 2016 and 2017 was [redacted] of its non-U.S. STB labor and R&D. *Id.* at Q/A 119; CDX-0003C.038-.039. He states that, during the same period, Broadcom spent [redacted] more on its STB DI technical equipment that it did on non-U.S. STB technical equipment. CX-0007C (Green WS) at Q/A 123; CDX-0003C.039. Mr. Green testifies that domestic technical equipment investments from FY 2016 through the first half of FY 2018 amount to [redacted] of Broadcom's total worldwide STB technical equipment expense. CX-0007C (Green WS) at Q/A 130; CDX-0003C.042. STB DI real estate investment, he states, accounts for [redacted] of Broadcom's total worldwide STB real estate expense during the same period. CX-0003C (Green WS) at Q/A 131.

Mr. Green notes that investments related to the '583 patent are less than the other asserted patents, but he points out that Broadcom's domestic STB investment related to that patent amounts to [redacted], or [redacted] of Broadcom's total worldwide STB R&D and labor expenses. *Id.* at Q/A 132. He notes, as well, that investments in products that practice the '583

patent "have grown each year." *Id.* Mr. Green adds that domestic technical equipment investments represent [redacted] of Broadcom's worldwide total, and the percentage for real estate investment related to the '583 patent is [redacted]%. *Id.*

Mr. Green also compares the STB R&D headcount and reports that the domestic activities related to software amounted to [redacted] of the worldwide activities related to STB R&D in FY 2017. *Id.* at Q/A 135; CDX-0003C.043. He reports that [redacted] STB Product Line Engineers are located in the U.S. and, of those, [redacted] work on STB DI product lines. *Id.*

Based on this undisputed evidence, Broadcom has satisfied the economic prong of the domestic industry requirement with respect to the STB DI products that have been asserted with respect to the '583 patent, '752 patent, '027 patent, and '844 patent. As discussed above, however, these products have only been shown to practice claims of the '752 patent.

**B. GPS Products**

Mr. Green conducts a similar analysis with respect to "investments and expenditures made by Broadcom in the U.S. directed to research, design, development, and support" of the GPS DI products, as well as labor and capital investment in plant and equipment. CX-0007C (Green WS) at Q/A 137-140; CDX-0003C.044. Mr. Green says that from 2016-2018 Broadcom made real estate and equipment investments in R&D relating to the GPS DI products at facilities in Irvine, Sunnyvale, Santa Clara, San Jose, and San Diego, California. CX-0007C (Green WS) at Q/A 143-144; CDX-0003C.012.

To derive the amount of expenditures related to GPS product lines, Mr. Green identifies which of the R&D and technical equipment expenditures relate specifically to the GPS product lines, as opposed to the entire WCC operation. CX-0007C (Green WS) at Q/A 146. "For GPS, U.S. research and development labor and technical equipment expenditures are recorded for the

whole WCC segment and are not separated for the GPS product lines," he explains. *Id.*[68] Mr. Green starts his analysis, therefore, with total WCC data that is maintained in Broadcom's records and allocates WCC expenditures to the GPS DI product lines based on the domestic GPS R&D headcount. *Id.* at Q/A 159-160; CDX-0003C.054.

Mr. Green uses Broadcom's records to identify personnel engaged in GPS R&D activities such as [redacted]. CX-0007C (Green WS) at Q/A 163. He states that [redacted] of all Broadcom's GPS research and development personnel are located in the U.S. *Id.* at Q/A 166; CDX-0003C.053. To determine the amount of Broadcom's investment in the DI products, Mr. Green "performed a sales-based allocation and allocated by revenue rather than unit sales." CX-0007C (Green WS) at Q/A 174. This allocation step pertains only to the DI products that practice the '104 patent; Mr. Green testifies that [redacted] of investments in the GPS product line are related to products that practice the '187 patent. *Id.*

Mr. Green calculates that Broadcom's total R&D investment in GPS DI products that practice the '187 patent is [redacted], and investments in plant and equipment are [redacted] and [redacted], respectively. CX-0007C (Green WS) at Q/A 176; CDX-0003C.058-.059. Investments in products that practice the '104 patent are [redacted] CX-0007C (Green WS) at Q/A 176.

To demonstrate the significance of these investments, Mr. Green relies on the amount of investment, its qualitative importance, and comparisons with other relevant measures. *Id.* at Q/A 178. He says Broadcom's U.S. employment of labor was nearly [redacted] than its

[68] In contrast, "[f]or STB, U.S. expenditures were recorded separately for the STB division within the Wired Infrastructure segment." *Id.*

foreign headcount for R&D on GPS products from 2016 through the first half of FY 2018. *Id.* at Q/A 182; CDX-0003C.064. In addition, he testifies that Broadcom's domestic employment for the GPS DI products "of [redacted] amounts to more than [redacted] of the total worldwide R&D labor expense for the entire WCC segment of [redacted]." CX-0007C (Green WS) at Q/A 185; CDX-0003C.065.

Mr. Green also compares technical equipment software investments for the same period, reporting that Broadcom's investment of more than [redacted] in GPS DI equipment is more than [redacted] of total WCC foreign technical equipment expenses, and [redacted] of total WCC expenses. CX-0007C (Green WS) at Q/A 188; CDX-0003C.066-.067. With respect to real estate, Mr. Green computes a total of [redacted] from FY 2017 through the first half of FY 2018, or [redacted] of Broadcom's total foreign WCC real estate expenses. CX-0007C (Green WS) at Q/A 188.

Based on this undisputed evidence, Broadcom has satisfied the economic prong of the domestic industry requirement with respect to the GPS DI products that have been asserted with respect to the '187 patent and '104 patent. As discussed above, however, Broadcom has not shown that these products practice any valid claim of the '187 patent or the '104 patent.

## XII. REMEDY AND BONDING

### A. Limited Exclusion Order

In the event the Commission finds a violation of section 337, Broadcom seeks a limited exclusion order ("LEO") directed to Respondents' infringing products. 19 U.S.C. § 1337(d). Respondents do not dispute that in the event a violation is found a LEO should issue, but they argue that any LEO should be "a narrowly-drafted" and "delayed" and should "not extend to downstream products." RRB at 290-291.

Respondents state that the parties agreed to narrow the evidence in the investigation to Toyota vehicles and (1) head units that are incorporated in Toyota vehicles for the U.S. Market and SoCs that are incorporated in such units; and (2) the peripheral monitoring system using DENSO TEN and Socionext components. Respondents contend that any remedial orders must reflect the narrow scope of the evidence.

The Commission's notice was directed to 'head units, rear seat entertainment units, units for displaying information or entertainment, and cameras, controllers, processing components, modules, chips, GNSS processing devices, and circuits used therein or therewith and automobiles that contain such infotainment systems and components.'" Notice of Investigation at 2 (June 7, 2018). As described by Broadcom, this encompasses "SoCs and GNSS processing devices supplied by the Tier 2 Respondents, infotainment systems supplied by the Tier 1 Respondents that incorporate these SoCs and GNSS processing devices, and Toyota automobiles that incorporate these infotainment systems." CIB at 291-292. Broadcom argues that any LEO should be directed to all the devices encompassed in the notice notwithstanding that the parties agreed to narrow the evidence to a subset of such devices.

The Commission has broad discretion to select the form, scope and extent of the remedy imposed for violation of section 337. *E.g., Hyundai Elecs. Indus. Co. v Int'l Trade Comm'n,* 899 F.2d 1204, 1208-09 (Fed. Cir. 1990). Long-standing Commission precedent supports issuance of remedial orders extending to "all products covered by the patent claims as to which a violation has been found, rather than limiting its orders to only those specific models selected for the infringement analysis." *Certain Hardware Logic Emulation Systems and Components Thereof,* Inv. No. 337-TA-383, Comm'n Op., 1998 WL 307240 at *9 (Mar. 1998) (citations omitted). This approach is consistent with the remedial purpose of the statute, the Commission has held.

"The central purpose of remedial orders is to ensure complete relief to the domestic industry," the Commission has stated, and an "exclusion order covering only specific models of an accused device could easily be circumvented, thereby denying complete relief." *Id. Accord, Certain Graphics Systems, Components Thereof, and Consumer Products Containing the Same,* Inv. No. 337-TA-1044, Comm'n Op. at 66 (Sept. 18, 2018) ("The LEO is not limited to any particular GPU model, however, but also extends to cover other GPUs of the named respondents that infringe the asserted claims of the '506 patent.").

Respondents point to no contrary precedent. Consistent with the Commission's traditional approach, I recommend that, if a violation is found, a LEO should be issued excluding all devices that infringe the asserted patents.

Respondents also seek to exclude from any LEO certain non-accused vehicles and repair and replacement parts. Respondents explain that "a small subset of imported Toyota vehicles contains head unit systems that are not at issue in this Investigation." RIB at 292. As Broadcom points out, however, Respondents do not propose any specific language that addresses their concern with products that are "'not at issue.'" CRB at 145-146 (citing RIB at 292). It is not possible to recommend that unspecified vehicles be carved out of any LEO.

With respect to an exemption for repair and replacement parts, the Commission has looked to four factors (1) availability of non-infringing products as substitutes for the infringing products; (2) respondents' warranty or contractual obligations indicating that customers expect replacement or warranty parts to be the same part; (3) detrimental effects on third parties due to the use of alternative, non-infringing parts; and (4) detrimental effects on performance or costs associated with the use of alternative, non-infringing parts. *See Certain Two-Way Radio Equipment and Systems, Related Software, and Components Thereof,* Inv. No. 337-TA-1053,

Comm'n Op. at 44 (Nov. 16, 2018) ("we do not find a service/repair exception appropriate here because the record evidence here is lacking for all four factors under *Optoelectronic Devices*"); *Certain Optoelectronic Devices for Fiber Optic Commc'ns, Components Thereof, and Prods. Containing the Same,* Inv. No. 337-TA-860, Comm'n Op. at 31-34 (May 9, 2014). Respondents assert that there are available, non-infringing products, and there is no evidence presented that satisfies any of the other criteria considered by the Commission.

Respondents state that Toyota vehicles are supported by 36 month/36,000 mile warranty coverage, and that "[t]he accused head units are specifically designed for Toyota vehicles and qualifying replacements takes considerable time." RIB at 292-293; JX-0041, 47:17-48:2. There is no evidence that customers expect warranty parts to be the same as those replaced, however. Accordingly, I do not recommend that the Commission exclude from any LEO warranty and replacement parts for Toyota vehicles.

Respondents also seek a "standard" certification provision "allowing Toyota to certify to Customs and Border Patrol ("Customs") that the goods it seeks to import are not covered by an exclusion order." RIB at 293 (citing *Certain Martin Sonar Imaging Devices, Including Downscan and Sidescan Devices, Products Containing the Same and Components Thereof,* Inv. No. 337-TA-921, Comm'n Op. at 80 (Jan. 6, 2016)). Such a provision is appropriate where Customs would be unable easily to determine whether imported courts are covered by a LEO. In the circumstances here, I recommend that any LEO include such a certification provision.

### B. Cease and Desist Order

In addition to, or in lieu of, an exclusion order, the Commission may issue a cease and desist order ("CDO") as a remedy for violation of section 337. 19 U.S.C. § 1337(f)(1). CDOs generally issue when respondents maintain commercially significant inventories of infringing

goods in the United States. *E.g., Certain Automated Teller Machines, ATM Modules, Components Thereof, and Prods. Containing the Same,* Inv. No. 337-TA-972, Comm'n Op. at 28 (May 19, 2017) (citations omitted). The "well-established purpose of cease and desist orders is to ensure complete relief to complainants when infringing goods are held in inventory in the United States and, therefore, beyond the reach of an exclusion order." *Certain Condensers, Parts Thereof and Prods. Containing Same, Including Air Conditioners for Automobiles Condensers,* Inv. No. 337-TA-334 (Remand), Comm'n Op. at 27 (Sept. 10, 1997).

In this investigation, Broadcom requests that CDOs be issued against the domestic Toyota, Panasonic, Pioneer, DENSO TEN, u-box, and Renesas Respondents.[69] With respect to Toyota Motor Sales, U.S.A., Inc. ("TMS"), Broadcom states that in March 2019 the company possessed accused automobiles in the U.S. with a value of at least [redacted]. JX-0027C at ¶ 3 and Exh. 1. Broadcom alleges further that TMS had control of [redacted] accused Panasonic head units with a commercial value of [redacted], and [redacted] units of accused DENSO TEN head units with a value of [redacted]. *Id.* at ¶ 5 and Exh. 2. In addition, Broadcom points to Toyota's domestic inventory of accused service-replacement parts with a value of at least [redacted].

Broadcom asserts that Panasonic during two months of 2018 had within the U.S. [redacted] units of the accused [redacted] head unit with a commercial value of [redacted] and [redacted] units of the accused [redacted] head unit with a commercial value of [redacted]. JX-0019C at ¶ 2 and Exh. A. Broadcom asserts that there can be "little dispute" that domestic inventory totaling [redacted] in any given month is "significant." CIB at 295 (citing CX-

[69] Broadcom notes that the JRC, DENSO Corp., and Socionext Respondents have represented that they do not maintain any inventory of accused products in the U.S., and on that basis Broadcom seeks no CDOs against them.

0007C (Green WS) at Q/A 204). The cited testimony, however, does not support Broadcom's assertion. Mr. Green states only that for Respondents "that have provided inventory information, the amounts of inventory in and of themselves appear to be significant." CX-0007C (Green WS) at Q/A 204. The assertion that there is "little dispute" that Panasonic's inventory is significant does not appear in Mr. Green's witness statement, nor does his conclusory testimony support Broadcom's assertion.

Broadcom states that as of March 2019 Pioneer had U.S. inventory of [redacted] units of the accused [redacted] head unit with a commercial value of [redacted], and [redacted] units of the accused [redacted] head unit with a commercial value of [redacted]. *See* JX-0023C at ¶ 2 and Exh. 1. "Pioneer's domestic inventory of accused products . . . had a commercial value of at least [redacted]," Broadcom states. CIB at 295.[70] Broadcom again claims there can be "little dispute that this level of inventory is significant," CIB at 295 (citing CX-0007C (Green WS) at Q/A 204), but again, Mr. Green's testimony does not support this attorney argument.

Broadcom asserts that during July and August 2018 DENSO TEN America had within the U.S. [redacted] units of the accused [redacted] head unit with a commercial value of [redacted]; [redacted] units of the accused [redacted] head unit with a commercial value of [redacted]; and [redacted] units of the accused 16CY-DA-Dlx head unit with a commercial value of [redacted]. CIB at 295 (citing JX-0016C ¶ 2 and Exh. 1). The commercial value of

[70] There appears to be a discrepancy between Broadcom's representation that "Pioneer's domestic inventory of accused products as of [March 1, 2019] had a commercial value of at least [redacted]," CIB at 295, and Mr. Green's testimony that "Pioneer's inventory records show that as of March 1, 2019, it held approximately [redacted] of accused products in inventory." CX-0007C (Green WS) at Q/A 204. Both statements are supported by citation to JX-0023C.

DENSO TEN's domestic inventory of accused products in those two months was at least [redacted], Broadcom says, and there can be "little dispute" that this is a significant level of inventory, *id.* (citing CX-0007C (Green WS) at Q/A 204), although Mr. Green provides no support for this attorney argument in his cited answer, as explained above.

Broadcom asserts that as of December 2018 u-blox had in the U.S. "[redacted] units of the [redacted] device with a commercial value of [redacted] and [redacted] units of the accused [redacted] device with a commercial value of [redacted]." CIB at 296 (citing JX-0021C ¶ 3). Broadcom maintains there is "little dispute" that a domestic inventory worth "at least [redacted] is commercially significant. *Id.* (citing CX-0007C (Green WS) at Q/A 204). Again, Mr. Green provides no support for the contention that there can be "little dispute" that the u-blox inventory is commercially significant.

Broadcom asserts that in December 2018 Renesas Electronics America Inc. ("REA") held [redacted] of the accused SoCs in inventory in the U.S. with a commercial value of [redacted]. *Id.* (citing JX-0025C at Conf. Exh. 1). Broadcom does not assert that there is "little dispute" that this is a commercially significant amount.

Respondents argue in opposition that Broadcom's expert has not evaluated "the commercial significance of any inventory maintained in the United States by DENSO TEN." RIB at 294 (citing CX-0007C (Green WS) at Q/A 204). Indeed, Respondents contend that Broadcom's expert, Mr. Green, "presented no evidence on the inventory of any Respondents compared to, for example, its monthly sales," and that Broadcom's allegations of commercial significance are supported only by "expert say-so." *Id.*

Respondents assert further that Broadcom bears the burden of establishing the facts to support issuance of a CDO, citing *Certain Integrated Repeaters, Switches, Transceivers &*

*Prods. Containing Same ("Integrated Repeaters"),* Inv. No. 337-TA-435, Comm'n Op., 2002 WL 31359028, at *14 (Aug. 16, 2002). I have been directed to no Commission authority, however, to support Respondents' argument that the showing made by Broadcom in this instance is insufficient to carry its burden, and I am not persuaded that it is. On the other hand, I have been directed to no Commission authority that indicates what constitutes a significant amount of domestic inventory or indeed, how to go about deciding whether inventory of a certain amount should be deemed significant.[71] My general practice has been to recommend that a cease and desist order be issued against each a respondent that maintains more than minimal inventory (whatever that may be) of accused products in the U.S., on the ground that such inventory may cause competitive harm to a complainant.

Accordingly, I recommend that CDOs issue if a violation is found against Respondents TMC, Panasonic, Pioneer, DENSO TEN America, u-blox and Renesas.

### C. Bond

In the event a violation is found, Broadcom seeks a bond during the 60-day Presidential review period that is "sufficient to protect [it] from any injury" due to continued importation of the accused products. CIB at 296; 19 U.S.C. § 1337(j)(3). "The Commission frequently sets the bond by calculating the difference in sales prices between the patented domestic industry product

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[71] I am unaware of any precedent that provides a framework for evaluating inventory significance. Respondents here suggest as an appropriate measure a comparison between monthly sales and the amount of inventory, but why that comparison would show significance under section 337 is not explained. *If* the goal under section 337 goal is to preclude sales of an infringing item in the U.S., "even 'a single item of inventory could constitute a commercially significant inventory.'" *Certain Dental Implants*, Inv. No. 337-TA-934 (Comm'n Op.), 2016 WL 11603664 at *30 (May 11, 2016) (background) (citing *Certain Agricultural Vehicles and Components Thereof,* Inv. No. 337-TA-487), Comm'n Action Notice, 2004 ITC LEXIS 964, at *210 (Dec. 2004)). In that event, it would be beyond dispute that each of the Respondents that maintains inventory of accused products in the U.S. should be subject to a cease and desist order.

and the infringing product or based upon a reasonable royalty." *Certain Table Saws Incorporating Active Injury Mitigation Tech. and Components Thereof,* Inv. No. 337-TA-965, Comm'n Op. at 13 (Feb. 1, 2017). However, "[w]here there is neither information on the price of the subject merchandise nor information which would allow one to determine a reasonable royalty, the Commission has set the bond at 100% of the entered value of the imported infringing products." *Certain Inkjet Ink Supplies & Components Thereof,* Inv. No. 337-TA-691, 2011 WL 7464367 (Nov. 2011) (citing *Certain Energy Drink Products*, Inv. No. 337-TA-678, Comm'n Op. on Remedy, the Public Interest, and Bonding (Sept. 8, 2010)). Complainants bear the burden of establishing the need for a bond, and the failure to carry that burden may result in no bond being imposed. *Certain Personal Data and Mobile Communication Devices and Related Software,* Inv. No. 337-TA-710, Comm'n Op. at 85 (Dec. 29, 2011).

Broadcom seeks imposition of a bond of 100% of the value of the imported goods, on the ground that there is no reliable evidence of a price comparison or reasonable royalty rate. Broadcom's theory is that the substantial differences between the accused Respondents' products and Broadcom's own products makes setting a price differential impractical, citing *Certain Flash Memory Circuits and Prods. Containing Same,* Inv. No. 337-TA-382, Comm'n Op. at 41-42 (June 26, 1997). *See* CX-0007C (Green WS) at Q/A 193. Broadcom points out that its DI products are used in set-top boxes and smartphones, while the accused products are in semiconductors, infotainment system components, and automobiles. CIB at 297 (citing CX-0003C (Hellman WS) at Q/A 10, CX-0001C (Terronez WS) at Q/A 33, CX-0007C (Green WS) at Q/A 193).

Broadcom maintains that, in the event a 100% bond is not awarded, a bond in the amount of between [redacted] per accused product would be appropriate. CX-0007C (Green WS) at

Q/A 192. Broadcom's suggestion is based on a worldwide portfolio license agreement between Broadcom and [redacted] that includes royalty payments from [redacted] per vehicle sold. CX-0023C.00005. Broadcom reasons that, because [redacted] competes with Toyota in the U.S. car market, Broadcom would receive royalties of [redacted] per vehicle from [redacted] for sales it would make if Toyota were prohibited from selling its vehicles in the U.S. Tr. (Green) at 139:13-142.8; CX-0007C (Green WS) at Q/A 195-198. Broadcom asserts that this royalty rate is consistent with royalty rate information for related technologies, and would make Broadcom whole for potential loss of sales. *Id.* at Q/A 199-201.

Respondents argue that no bond is appropriate because Broadcom's DI products do not compete with any of Respondents products. Respondents point to testimony by Mr. Green that "Broadcom will not sell any more domestic industry products if the accused products are excluded." RIB at 295 (citing Tr. (Green) 127:14-20, 135:4-23). Respondents assert that Mr. Green has not determined whether [redacted] has the capacity to produce and sell the large number of vehicles that would be needed to replace any excluded Toyota automobiles. *See id.* at 136:19-22, 137:8-24.

Respondents also argue that Broadcom failed to present a proper price analysis and, as a result, the bond should be set at zero. Respondents state that the pricing information produced in this litigation could have formed the basis for Broadcom to determine a price differential, had Broadcom chosen to conduct the appropriate analysis. Respondents point to pricing information in the record for Broadcom's chips compared to the products made by DENSO, JRC, Renesas, Socionext and u-blox, citing CX-0612C (Broadcom); CX-0040C (DENSO Corp.); CX-0086C (JRC); CX-0150C (Renesas); CX-0159C (Socionext); and CX-0186C (u-blox). *See* RX-0011C (Kaplan RWS) at Q/A 112. Respondents argue that Broadcom's failure to conduct the

appropriate price comparison should result in a bond of $0. *See Certain Personal Transporters, Components Thereof, and Packaging Manuals Therefor,* Inv. No. 337-TA-1007/1021, RD (Aug. 22, 2017) (setting bond at zero where complainant filed to present price analysis between competitive accused and DI products), *aff'd in pertinent part by* Comm'n Op. at 9 (Jan. 12, 2018).

Respondents challenge the contention that the Broadcom-[redacted] licensing agreement furnishes a foundation on which to base an appropriate royalty. Respondents point out that the [redacted]. CX-0023C; CX-0007C (Green WS) at Q/A 195-198. There is no evidence, Respondents say, that the asserted patents played any role in the prices of the portfolio license with [redacted]. *See Certain Digital Video Receivers and Hardware and Software Components Thereof,* Inv. No. 337-TA-1001, Comm'n Op. at 47 (Dec. 6, 2017) (setting bond at zero where the complainant "made no effort to show the role, if any, that the asserted patents played in the price of the portfolio license it submitted as evidence.") Respondents maintain that Broadcom has failed to present any other license agreements that offer guidance as to as appropriate royalty rate. *See* RX-0011C (Kaplan RWS) at Q/A 112. And Respondents assert that different bond rates should apply where an infringing product is an electronic component used in a downstream product, citing *Certain Non-Volatile Memory Devices and Prods. Containing Same,* Inv. No. 337-TA-1046, RD at 8 (May 10, 2018).

Respondents rightly argue that Broadcom has the burden to show that it is not possible to derive meaningful price differentials. In contending that information was available that would have permitted a meaningful comparison between the prices of the patented products and the

accused products, Respondents do not any provide specific information about pricing, however. For example, Respondents cite generally to information contained in hundreds of pages of responses to interrogatories, without supplying point citations. *See* RIB at 297; RRB at 144.[72] Under these circumstances, it would be reasonable to find that Respondents had failed to carry their own evidentiary burden to support the argument that a price differential could have been derived from the evidence produced.

But Broadcom has failed to carry its initial burden of production on the issue of price differential. Plainly, comparing the cost of a chip or chipset to an entire downstream product like an automobile is not practical. Broadcom's expert, however, makes no attempt to analyze price differential with respect to accused products that can usefully be compared to Broadcom's DI product. Instead, Broadcom leaps to claim a 100% bond, without providing a reasoned basis to support that approach. As stated by Respondent's expert, Broadcom had or could have obtained data that would permit an economically sound price differential analysis. RX-0011C (Kaplan RWS) at Q/A 112. Further, I find that Broadcom's license agreement with [redacted] is not an appropriate model for determining a royalty rate, since the [redacted] agreement does not provide any specific information linking the royalties in the agreement to the patents at issue in this case or to comparable technology.

[72] Pricing information in the exhibits cited by Respondents may be found: with respect to DENSO Corp., CX-0040C, Interrogatory Resp. No. 53 (February 15, 2019) Conf. Ex. 4; with respect to JRC, CX-0086C, Interrogatory Resp. No. 52 (February 15, 2019) Conf. Ex. 2; with respect to Renesas, CX-0150C, Interrogatory Resp. Nos. 52 and 13 (February 12, 2019); with respect to u-blox, CX-0186C, Interrogatory No. 53 (February 1, 2019). With respect to Socionext, CX-0159C, the cited exhibit does not appear to reveal any pricing information.

Absent any persuasive evidence of an appropriate bond or any persuasive reason why information that might lead to the setting of an appropriate bond could not be obtained, I recommend that no bond be imposed in the event that a violation is found.

## XIII. CONCLUSIONS OF LAW

Based on the foregoing, and the record as a whole, it is my final initial determination that there is no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain infotainment systems, components thereof, and automobiles containing the same, with respect to the '583 patent, the '752 patent, the '027 patent, the '844 patent, the '187 patent, or the '104 patent.

This determination is based on the following conclusions of law:

1. The Commission has subject matter jurisdiction over this investigation, *in personam* jurisdiction over Respondents, and *in rem* jurisdiction over the accused infotainment systems, components thereof, and automobiles containing the same.

2. There has been an importation into the United States, sale for importation, or sale within the United States after importation of the accused products by the Toyota, Panasonic, DENSO TEN, DENSO Corp., Pioneer, Renesas, JRC, and u-blox Respondents.

3. The importation requirement has not been met with respect to Respondent Socionext Inc.

4. Claims 17 and 18 of the '583 patent are infringed by Respondents Renesas, DENSO Corp., and Toyota.

5. The domestic industry requirement has not been satisfied with respect to any claim of the '583 patent.

6. No asserted claims of the '583 patent have been shown to be invalid.

7. Claims 1, 2, 5, 7, and 8 of the '752 patent are infringed by Respondents Renesas, Panasonic, Pioneer, DENSO TEN, and Toyota.

8. The domestic industry requirement has been satisfied with respect to claims 1, 2, 4, 5, 6, and 7 of the '752 patent.

9. Claims 1, 2, 4, 5, 7, and 8 of the '752 patent are invalid.

10. No claims of the '027 patent have been shown to be infringed by any Respondent.

11. The domestic industry requirement has not been satisfied with respect to any claim of the '027 patent.

12. Claims 11 and 20 of the '027 patent are invalid.

13. No claims of the '844 patent have been shown to be infringed by any Respondent.

14. The domestic industry requirement has not been satisfied with respect to any claim of the '844 patent.

15. No asserted claims of the '844 patent have been shown to be invalid.

16. No claims of the '187 patent have been shown to be infringed by any Respondent.

17. The domestic industry requirement has not been satisfied with respect to any claim of the '187 patent.

18. Claims 1, 3, 5, and 9 of the '187 patent are invalid.

19. No claims of the '104 patent have been shown to be infringed by any Respondent.

20. The domestic industry requirement has been satisfied with respect to claim 12 of the '104 patent.

21. Claim 12 of the '104 patent is invalid.

I hereby certify the record in this investigation to the Commission with my final initial determination. Pursuant to Commission Rule 210.38, the record further comprises the Complaint and exhibits thereto filed with the Secretary, and the exhibits attached to the parties' summary determination motions and the responses thereto. 19 C.F.R. § 210.38(a).

Pursuant to Commission Rule 210.42(c), this initial determination shall become the determination of the Commission 45 days after the service thereof, unless a party files a petition for review pursuant to Commission Rule 210.43(a), the Commission orders its own review pursuant to Commission Rule 210.44, or the Commission changes the effective date of the initial determination. 19 C.F.R. § 210.42(h)(6).

This initial determination is being issued with a confidential designation pursuant to Commission Rule 210.5 and the protective order in this investigation. Within ten (10) days of the date of this initial determination, each party shall submit to 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. *See* 19 C.F.R. § 210.5(f). A party seeking to have a portion of this document deleted from the public version thereof must attach to its submission a copy of the document with red brackets indicating the portion(s) asserted to contain confidential business information.[73] The parties' submissions under this subsection shall not be filed with the Commission Secretary but shall be submitted by paper copy to the Administrative Law Judge and by e-mail to the Administrative Law Judge's attorney advisor.

**SO ORDERED.**

Dee Lord
Administrative Law Judge

[73] To avoid depriving the public of the basis for understanding the result and reasoning underlying the decision, redactions should be limited. Parties who submit excessive redactions may be required to provide an additional written statement, supported by declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in Commission Rule 201.6(a). 19 C.F.R. § 201.6(a).

**CERTAIN INFOTAINMENT SYSTEMS, COMPONENTS THEREOF, AND AUTOMOBILES CONTAINING THE SAME**

**Inv. No. 337-TA-1119**

## PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **INITIAL DETERMINATION** has been served by hand upon the following parties as indicated, on **December 13, 2019**.

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

**On Behalf of Complainants Broadcom Corporation:**

John M. Caracappa, Esq.
**STEPTOE & JOHNSON LLP**
1330 Connecticut Avenue, N.W.
Washington, DC 20036

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Toyota Motor Corporation, Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Manufacturing , Indiana, Inc., Toyota Motor Manufacturing, Kentucky, Inc., Toyota Motor Manufacturing Mississippi, Inc., Toyota Motor Manufacturing, Texas, Inc., Panasonic Corporation, Panasonic Corporation of North America, Denso Ten Limited, Denso Ten America Limited, Denso Corporation, Denso International America, Inc., Denso Manufacturing Tennessee, Inc., Denso Wireless Systems America, Inc., and Japan Radio Co., Ltd.:**

Paul Steadman, Esq.
**DLA PIPER LLP**
444 West Lake Street, Suite 900
Chicago, IL 60606

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Renesas Electronics Corporation, and Renesas Electronics America, Inc.:**

Daniel P. Muino, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW, Suite 6000
Washington, DC 20006

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Pioneer Corporation and Pioneer Automotive Technologies:**

Lora A. Brzezyski, Esq.
**DRINKER BIDDLE & REATHLLP**
1500 K Street, NW, Suite 1100
Washington, DC 20005

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents Socionext, Inc.:**

G. Brian Busey, Esq.
**MORRISON & FOERSTER LLP**
2000 Pennsylvania Ave., NW, Suite 6000
Washington, DC 20006

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

**On Behalf of Respondents u-blox, u-blox America, Inc., and u-blox San Diego, Inc.:**

Smith Brittingham IV, Esq.
**FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP**
901 New York Avenue, NW
Washington, DC 20001

☐ Via Hand Delivery
☑ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____