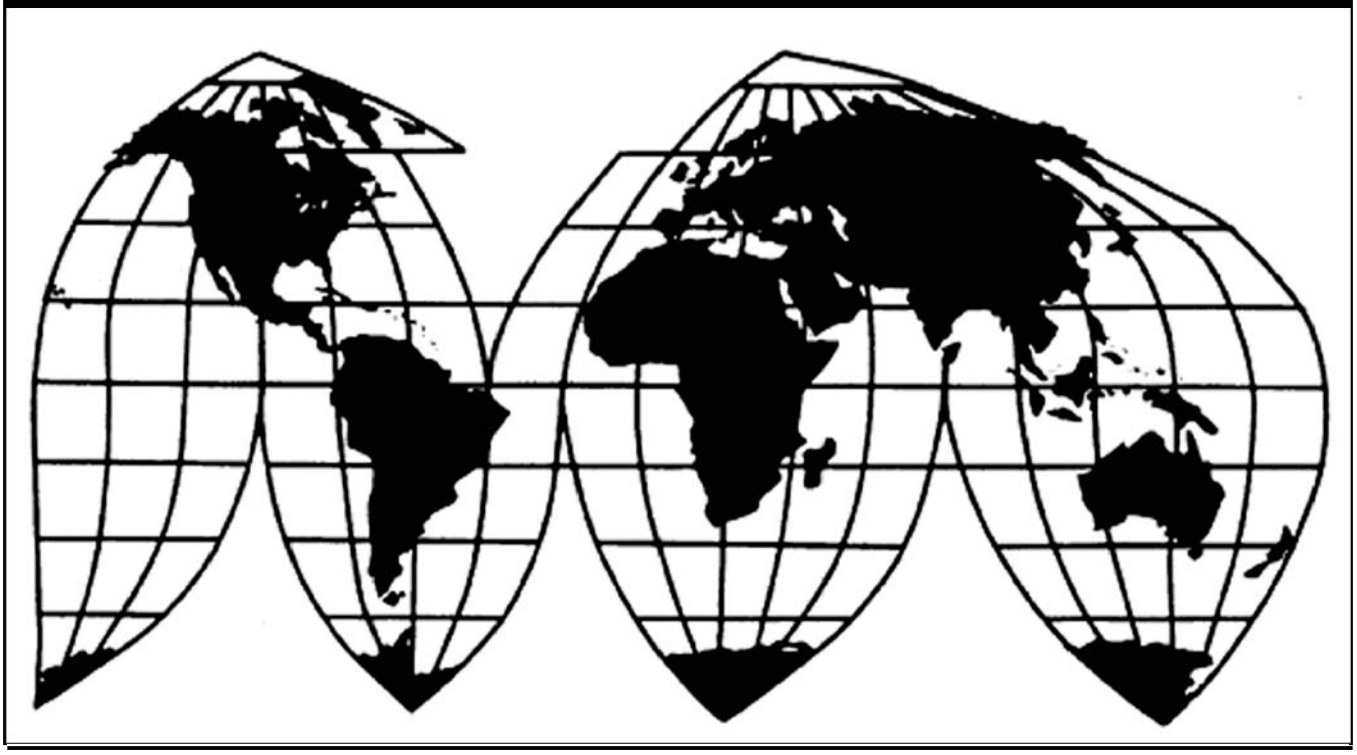
In the Matter of

Certain Probe Card Assemblies, Components Thereof and Certain Tested DRAM and NAND Flash Memory Devices and Products Containing Same

Investigation No. 337-TA-621

Publication 4149 **June 2010**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C. 20436

In the Matter of CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME	Investigation No. 337-TA-621

NOTICE OF COMMISSION FINAL DETERMINATION OF NO VIOLATION OF SECTION 337; TERMINATION OF INVESTIGATION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined that there is no violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the above-captioned investigation. The Commission has terminated the investigation.

FOR FURTHER INFORMATION CONTACT: Michael Liberman, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-3116. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, SW, Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *http://www.usitc.gov*. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: This investigation was instituted on December 19, 2007, based on a complaint filed by FormFactor, Inc. ("FormFactor") of Livermore, California. The complaint alleged violations of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain probe card assemblies, components thereof, and certain tested DRAM and NAND flash memory devices and products containing same by reason of infringement of certain claims of U.S. Patent Nos. 5,994,152 ("the '152 patent"); 6,509,751 ("the '751 patent"); 6,615,485; 6,624,648 ("the '648"patent); 7,168,162 ("the '162 patent"); and

7,225,538. The complaint named Micronics Japan Co., Ltd.; MJC Electronics Corp.; Phicom Corporation; and Phiam Corporation as respondents (collectively, "Respondents"). Subsequently, the '162 patent was terminated from the investigation.

On December 5, 2008, respondents Phicom Corp. and Phiam Corp., (collectively, "Phicom") jointly filed a motion for partial summary determination that claims 20 and 34 of the '648 patent are invalid as indefinite under 35 U.S.C. § 112. On February 11, 2009, the ALJ granted the motion in an ID (Order No. 46). The ID determined that claims 20 and 34, and any asserted claims depending therefrom, are invalid. Complainant FormFactor filed a petition for review of Order No. 46, which Respondents and the Commission investigative attorney "("IA") opposed. On March 11, 2009, the Commission determined to review Order No.46.

The evidentiary hearing in this investigation was held from February 24, 2009, through March 6, 2009. On June 29, 2009, the ALJ issued an Initial Determination on Violation of Section 337 and Recommended Determination on Remedy and Bond, finding no violation of section 337. All parties to this investigation, including the IA, filed timely petitions for review of various portions of the final ID, as well as timely responses to the petitions.

On September 17, 2009, the Commission determined to review the final ID in part, and issued a Notice to that effect. 74 *Fed. Reg.* 47822 (September 17, 2009). In the Notice, the Commission set a schedule for the filing of written submissions on the issues under review, including certain questions posed by the Commission, and on remedy, the public interest, and bonding. The parties have briefed, with initial and reply submissions, the issues under review and the issues of remedy, the public interest, and bonding.

On review, the Commission has determined as follows.

(1) With respect to the '751 patent:

(a) to reverse the ALJ's determination that Japanese Patent Application Publication H10-31034 to Amamiya et al. (RX-166) does not anticipate the asserted claims of the '751 patent under 35 U.S.C. § 102;

(b) to reverse in part the ID's conclusion that, *inter alia*, Phicom's accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751, *see* ID at 197, and, accordingly, to modify the ID's conclusion of law at issue by substituting the following: "Respondent Micronics' accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a). Respondent Phicom's (old) Type B and Type C accused products infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a); Phicom's new Type B and Type C accused products do not infringe."

(2) With respect to the '152 patent:

(a) to strike the ID's statement "Since three bases for no violation of claim 21 have been determined, no analysis of the invalidity arguments related to anticipation and obviousness of the dependent claims will be made," *see* ID at 191, and to take no position with respect to the validity of the dependent claims of the '152 patent.

(3) to affirm and adopt the ALJ's other findings contained in the final ID under review except insofar as they are inconsistent with the Commission Opinion to be issued later.

The Commission also determined to affirm ALJ Order No. 46 with certain modifications as will be detailed in the Commission's Opinion.

The Commission has determined that there is no violation of section 337 in this investigation, and has terminated the investigation.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and sections 210.41-.42, 210.50 of the Commission's Rules of Practice and Procedure (19 CFR § 210.41-.42, 210.50).

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: November 12, 2009

CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME	337-TA-621

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DETERMINATION OF NO VIOLATION OF SECTION 337; TERMINATION OF INVESTIGATION** has been served by hand upon the Commission Investigative Attorney Benjamin Levi, Esq. and the following parties as indicated, on November 12, 2009.

Marilyn R. Abbott, Secretary
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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, D.C.

In the Matter of CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME	Investigation No. 337-TA-621

COMMISSION OPINION

On November 12, 2009, the Commission issued notice of its final determination of no violation of section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) ("section 337") and termination of this investigation. This opinion sets forth the reasons for the Commission's determination on the issues it previously determined to review.

I. BACKGROUND AND PROCEDURAL HISTORY

On December 19, 2007, the Commission instituted an investigation under section 337, based on a complaint filed by FormFactor, Inc. ("FormFactor") of Livermore, California, alleging a violation of section 337 in the importation, sale for importation, and sale within the United States after importation of certain probe card assemblies, components thereof and certain tested DRAM and NAND flash memory devices and products containing same, by reason of infringement of, *inter alia*, one or more of claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485 ("the '485 patent"); claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 ("the '751 patent"); claim 19 of U.S. Patent No. 7,225,538 ("the '538 patent");

claims 21-23, 27-30, and 33-35 of U.S. Patent No. 5,994,152 patent ("the '152 patent"); claims 1-15, 18-22, 34, and 36 of U.S. Patent No. 6,624,648 ("the '648 patent"), and claims 1-4, 13, and 14 of U.S. Patent No. 7,168,162 ("the '162 patent"). 72 *Fed. Reg.* 71,954 (December 19, 2007). Complainant named Micronics Japan Co., Ltd. of Japan and MJC Electronics Corp. of Austin, Texas (together, "Micronics" or "MJC")[1], and Phicom Corp. of Seoul, Korea, and Phiam Corp. of San Jose, California, a subsidiary of Phicom Corp. (together, "Phicom") (collectively, "respondents") as respondents in this investigation. *Id.* The complainant also alleged a domestic industry in regard to each asserted patent. *Id.*

The technology at issue in this investigation relates to probe cards. In general, a "probe card" is an assembly of components used together to test integrated circuits. The probe cards at issue in this investigation are used to test semiconductor chips while such chips are still part of the silicon wafer on which they were fabricated. Such probe cards provide an interface "between the expensive durable testing equipment of the semiconductor industry and the ever evolving variety of integrated circuit designed on silicon wafers." ID at 10.

The patents involved in the subject investigation cover various aspects of designing, manufacturing, and using probe cards. More specifically, the '648 patent discloses a probe card assembly for testing semiconductor devices. The claimed probe card assembly includes certain mechanisms that alter the orientation of the probe substrate with respect to the probe card and allows it to keep the components of the probe card assembly in electrical contact, including during and after the probe card mechanism makes adjustments to the orientation of the probe

[1] MJC Electronics Corp. is a wholly-owned U.S. subsidiary of Micronics Japan Co., Ltd.

substrate relative to the probe card. (CX-0004).

The '485 patent claims a method for producing tested semiconductor devices that requires the use of a probe card assembly with certain features. Specifically, this invention teaches a method of producing a tested semiconductor device by adjusting the planarity of the probe substrate without altering the orientation of the probe card and ensuring that the electrical connections are maintained between the probe card and the probe substrate. (CX-0003).

The '751 patent claims a probe card assembly that incorporates a substrate with a surface having a number of contact elements and a planarizing element. The planarizing element transmits a force to the central region relative to the peripheral regions and modifies the shape of the surface of the substrate in order to planarize the surface. (CX-0002).

The '538 patent claims a method for fabricating contact structures which are used to make pressure connections to an electrical device. The patent discloses a method for forming a contact assembly by making resilient contact structures on a sacrificial substrate, destroying that sacrificial substrate, and gang-transferring the resilient contact structures for attachment to a probe card. (CX-0006).

The asserted claims of the '152 patent are directed to a method of fabricating cantilever elements. This method uses a release material, so that the cantilever elements can be removed from the support substrate. (CX-0001).

On December 5, 2008, respondent Phicom filed a motion for summary determination that the '648 patent is invalid. Phicom argued that claims 20 and 34 of the '648 patent are invalid as indefinite under 35 U.S.C. § 112. The ALJ issued an ID (Order No. 46) on February 11, 2009, granting summary determination that, *inter alia*, claims 20 and 34 are invalid as indefinite, and

"that there shall be no further submission of evidence, argument, briefing, or any materials made to the [ALJ] at the [then-] upcoming evidentiary hearing."[2] Complainant FormFactor petitioned for review of Order No. 46, and respondents and the Commission investigative attorney ("IA") opposed. The Commission issued a notice of decision to review Order No. 46 on March 11, 2009. In its notice issued on November 12, 2009, the Commission determined to affirm Order No. 46 with modifications that are detailed *infra* in this Opinion.

On June 29, 2009, the ALJ issued his final ID finding no violation of section 337 and his recommendation determination (RD) on remedy and bonding during the period of Presidential review should the Commission determine that there has been a violation. On September 17, 2009, the Commission determined to review the final ID in part, and issued a notice ("the Commission Notice"), in which the Commission specified the issues under review and the questions pertaining to such issues. 74 *Fed. Reg.* 47822 (September 17, 2009). In particular, the Commission determined to review:

(1) the ID's finding that Japanese Patent Application Publication H10-31034 to Amamiya et al. ("Amamiya" or RX-166) does not anticipate the asserted claims of the '751 patent under 35 U.S.C. § 102;

(2) the ID's conclusion of law regarding non-infringement of the '751 patent by Phicom's accused products;

(3) the ID's conclusion that no analysis of the validity of the asserted claims that depend

[2] Order No. 46 states that "Phicom's motion [] for summary determination that the '648 patent is invalid is [] granted." The Commission understands Order No. 46 to have determined that asserted claims 20 and 34, and any asserted claims depending therefrom, are invalid as indefinite.

from claim 21 of the '152 patent is needed.

The Commission determined not to review the remainder of the final ID. *Id.* at 47822.

On review, the Commission requested briefing on the above-listed issues with reference to the applicable law and the evidentiary record, and responses by the parties to certain questions pertaining to the issues under review. The Commission also requested briefing on the issues of remedy, the public interest, and bonding, should they become relevant, from the parties as well as from interested non-parties.

In accordance with the Commission Notice, all parties to this investigation filed timely written submissions regarding the issues under review and timely reply submissions. No submissions were received from interested non-parties.

II. STANDARD OF REVIEW

Commission review of an ID is limited to the issues set forth in the notice of review and all subsidiary issues therein. *Certain Bar Clamps, Bar Clamp Pads, and Related Packaging Display and Other Materials*, Inv. No. 337-TA-429, Commission Opinion at 3 (February 13, 2001). Once the Commission determines to review an initial determination, its review is conducted under a *de novo* standard. *Certain Polyethylene Terephthalate Yarn and Products Containing Same*, Inv. No. 337-TA-457, Commission Opinion at 9 (June 18, 2002). Upon review the "Commission has 'all the powers which it would have in making the initial determination,' except where the issues are limited on notice or by rule." *Certain Flash Memory Circuits and Products Containing Same,* Inv. No. 337-TA-382, Commission Opinion on the Issues Under Review and on Remedy, the Public Interest, and Bonding at 9-10 (June 2, 1997), USITC Pub. 3046 (July 1997) (quoting *Certain Acid-Washed Denim Garments and Accessories,*

Inv. No. 337-TA-324, Commission Opinion at 5 (Nov. 1992)).

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

III. DISCUSSION

A. Issues Under Review

1. The '751 Patent

(a) The ID's finding that Amamiya does not anticipate the asserted claims of the '751 patent under 35 U.S.C. § 102.

We reverse the ALJ's determination that Amamiya does not anticipate the asserted claims of the '751 patent under 35 U.S.C. § 102 and find that the IA, Phicom, and Micronics have shown by clear and convincing evidence that Amamiya anticipates the asserted claims of the '751 patent. In particular, we agree with the position taken by the IA and respondents (discussed in detail in the respective submissions filed by the parties)[3] that Amamiya discloses each and every limitation of the asserted claims of the '751 patent, including the one that FormFactor identified in its submission as disputed ("planarizing element"), *see* FF Submission at 6.

We disagree with FormFactor's argument that: (1) board **2** in Amamiya's device "cannot

[3] *See, e.g.*, IA's Submission at 10; *id. citing* FormFactor's July 21, 2009, Response to OUII's Petition for Review; *id. citing* RX-690C at Q.122 *et seq*; IA's Submission at 12 *citing* RX-166; *id. citing* RX-690C at Q.125, Q.133, and Q.138; *id. citing* Adler, Tr. 2209-10, 2216-17; *id. citing* RX-166 at ¶ 0011, ¶ 0013; Figures 1 and 2, IA's Submission at 13 *citing* (RX-166, Figure 1), *id. citing* Adler, Tr. 2209-10, 2216-17; *id. citing* RX-690C at Q.125 - Q.127, Q.132, Q.133, and Q.136 - Q.138. *See* also Micronics' Submission at 18-19; Phicom's Submission at 7-10.

achieve deformation;" and (2) Amamiya's center screw **4** "cannot be deemed . . . capable of transmitting a force to the central region." FF Submission at 5, 9. With respect to the first argument, we agree with the IA and respondents that the record evidence supports the conclusion that both boards will deflect, to varying degrees. *See, e.g.*, Phicom's Reply at 12 *citing* RX-382 at Q/A 529; RDX-239 at 1; Adler Tr., 2209:8-20, 2215:8-2217:22; RX-690C at Q/A 123, 125-128, 133; RDX-67 at 1. Even if board **2** deflects less for a given force, the adjustment of a screw must deform the board **2** to some extent, so that the probe tips on the board can be planarized. *See* Phicom's Reply at 12. We agree with the IA that the premise of FormFactor's argument, *i.e.*, that the forces caused by turning screws **3** and/or **4** would not necessarily result in deformation, is contrary to the laws of physics and to the disclosure of Amamiya. *See* IA's Reply at 4; Micronics Reply at 10; RX-166 ¶¶ 0012-0013.

Moreover, FormFactor's main argument that Amamiya's interconnect board **2** "cannot achieve deformation" improperly reduces Amamiya to only one exemplary embodiment, whereas Amamiya discloses that its invention can be applied to a variety of probe card assemblies, made of different materials, sizes, and thicknesses, and nothing in Amamiya requires board **2** to be thicker than board **5**. Such argument is incorrect as a matter of law because a prior art reference is not limited to its disclosed embodiments. *See Ultradent Products, Inc. v. Life-Like Cosmetics, Inc.*, 127 F.3d 1065, 1068 (Fed. Cir. 1997); *In re Schreiber*, 128 F.3d 1473, 1479 (Fed. Cir. 1997).

Furthermore, FormFactor's assertion that Amamiya's center screw **4** "can not be deemed . . . capable of transmitting a force to the central region" is also unavailing because, as the IA and respondents correctly point out, the center screw **4** cannot achieve parallelness adjustment unless

it exerts a force, and a user cannot adjust this screw, while planarizing the virtual surface defined by the test pin tip portions, without both applying a force and deforming the substrate to achieve movement of at least a few microns. *See, e.g.*, RX-166, ¶ 13. Express provisions in Amamyia support such a conclusion. Paragraph 12 provides, *inter alia*, that "the adjusting screws **3** in the four corners were extended such that the virtual plane formed by the plurality of test pin tip portions was visually approximately parallel to the reference [plane]." RX-166, ¶ 12 at 6. Amamyia next teaches that "[f]urther precise adjustment of parallelness was performed . . .." RX-166, ¶ 13 at 6. According to Amamyia, such further precise adjustment is performed in two steps. The first step includes "turning each adjustment screw **3** with a hexagonal Allen wrench such that the tip portions of each test tip are in focus at the same height." RX-166, ¶ 13 at 6. The second step involves "further tightening of the central affixing screw **4** . . .." After these two steps, "the parallelness [is] measured using the optical microscope . . .." Therefore, Amamyia expressly teaches that "further tightening" is necessary for an adjustment of parallelness. This teaching necessarily precludes FormFactor's contention that Amamiya's center screw **4** "can not be deemed . . . capable of transmitting a force to the central region" because without transmitting a force to the central region "further tightening of the central affixing screw **4**" expressly disclosed by Amamyia would be impossible. Therefore, we reject FormFactor's argument as contradicting the express disclosure in Amamyia. Our conclusion is consistent with the positions taken by the IA and respondents.[4] In short, we conclude that, as the record evidence indicates,

[4] Micronics, *e.g.*, argues that Amamiya discloses every limitation of the asserted claims of the '751 patent. It specifically submits that the disputed third limitation of claim 1, namely, "at least one planarizing element capable of transmitting a force to the central region of said substrate to modify a shape of the first surface at said central region relative to a shape of said

the center screw **4** is necessarily capable of applying a force, as also required by the asserted claims of the '751 patent. *See* RX-382 at Q/A 529; RDX-239 at 1; Adler Tr., 2209:8-20, 2215:8-2217:22; RX-690C at Q/A 123, 125-128, 133; RDX-67 at 1.

Furthermore, we agree with the IA and respondents that Amamiya inherently anticipates the asserted claims of the '751 patent.[5] A patent is invalid as anticipated if a prior art reference

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first surface at each peripheral region, whereby, the first surface can be made planar," is disclosed by Amamiya's central screw **4** and its operation described in paragraph 13. *See* Micronics' Reply at 5 *citing* RX-690C at Q/A 120-126; RX-543; RDX-47; Amamiya at Fig.1 and 2, 8, 10, 13. Micronics explains that, in Amamiya, central screw **4** is held with a "spring washer" to the backside of board **5**, and the elements of the disclosed apparatus work together as follows:

(a) tightening central screw **4** causes central screw **4** to thread into substrate **2**, and compresses the "spring washer" an increased amount, which causes the substrate **2** to move towards the board **5**, decreasing the distance between substrate **2** and board **5** and bending the substrate at the middle as compared to the periphery;

(b) loosening central screw **4** causes the central screw **4** to unthread from substrate **2**, and decompresses the spring washer, resulting in a smaller spring force, and causing the center of substrate **2** to move away from the board **5**, increasing the distance between substrate **2** and board **5** and lessening the bend at the middle of the substrate **2** as compared to the periphery;

(c) because the forces of the central screw **4** and "regulating" screws **3** are opposite, and the goal is "parallelism" (planarization), the substrate **2** must bend when the central screw **4** is adjusted. *See* Micronics' Submission at 6. Micronics compares the structures and operation of the apparatuses disclosed in the '751 patent and Amamiya, and concludes that they are identical and that, therefore, Amamiya anticipates the asserted claims of the '751 patent. *See* Micronics' Reply at 6-9.

Micronics further argues that the parallelism that is measured is the planarity of the probe tips located on the measuring terminals, Amamiya at ¶ 5, and because the probe tips are measured for planarity during the adjustment of the screws, it is essential that substrate **2** is deformed by adjustment of the screws – otherwise, parallelism (planarity) of the probe tips would not be affected. *See* Amamiya at ¶ 15 ("the parallelism between the plane of the subject to be measured and the virtual plane formed by the tips of measuring terminals can be regulated easily within a short time and with a high accuracy."); *id.* *See also* Phicom's Reply at 14.

[5] *See, e.g.*, IA's Submission at 14 *citing* RX-166 at ¶ 0011, ¶ 0013 and at Figures 1 and 2; *id. citing* RX-690C at Q.123, Q.125 - 127, Q.132, Q.133, Q.136 - 139; *id.* Adler, Tr. 2209-10, 2216-17. *See also* Micronics' Submission at 18-19; Phicom's Submission at 7-10.

discloses, either explicitly or inherently, every limitation of the claimed invention. *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371, 1381 (Fed. Cir. 2007) (*citing Telemac Cellular Corp. v. Topp Telecom, Inc.*, 247 F.3d 1316, 1327 (Fed. Cir. 2001)). We agree with Micronics that it does not matter whether Amamiya explicitly describes bending the probe substrate because Amamiya discloses structures that are capable of bending the probe substrate and discloses use of those structures in a manner that actually bends the probe substrate when central screw **4** is turned. *See* Micronics' Reply at 14 *citing Schering Corp. v. Geneva Pharmaceuticals*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted).

As for FormFactor's argument that Amamiya does not disclose the "free standing spring elements" recited in claim 3 of the '751 patent and the "space transformer" recited in claim 25 of the '751 patent, we agree with the IA and respondents that, by not raising these arguments until this stage of the investigation, FormFactor waived this argument as a matter of law. *See, e.g., Hazani v. U.S. International Trade Comm'n*, 126 F.3d 1473, 1479 (Fed. Cir. 1997) (finding argument not raised before the ALJ waived). As the IA points out, FormFactor argued that only the "control member" and "planarizing element" limitations were missing from Amamiya in its post hearing briefs, and in its response to IA's petition for review. *See* IA's Reply at 3 *citing* FormFactor's June 1, 2009, Revised Opening Post-hearing Brief at 50-57; FormFactor's June 1, 2009, Revised Post-hearing Reply Brief at 27-30; and FormFactor's July 21, 2009, Response to OUII's Petition for Review at 5-10. *See also* Micronics' Reply at 12 *citing* FormFactor Inc.'s Pre-Trial Brief at 306-309; FormFactor's Post Hearing Brief at 52-57; FormFactor's Post

Hearing Reply Brief at 23-25; ALJ Order No. 18 at 12. [6]

Based on the foregoing, we determine that the IA and respondents have demonstrated clearly and convincingly that Amamiya anticipates the asserted claims of the '751 patent. FormFactor failed to adequately address and rebut the arguments of the IA, Phicom, and Micronics on this issue. Accordingly, we reverse the ALJ's determination that Amamiya does not anticipate the asserted claims of the '751 patent under 35 U.S.C. § 102.

(b) The ID's conclusion of law regarding non-infringement of the '751 patent by Phicom's accused products.

We modify the ID's conclusion of law that Phicom's and Micronics' products do not infringe the '751 patent for the following reasons.

The ID found that Phicom's (old) Type B and Type C MEMS Cards infringe the asserted claims of the '751 patent. ID at 101. In particular, the ID stated:

> Phicom does not contest that its Type B and C MEMS Cards fall within the undersigned's claim construction for the asserted claims of the '751 patent.[7] Thus, it is undisputed that Phicom's Type B and C MEMS Cards infringe the asserted claims of the '751 patent.

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[6] Moreover, we find that Micronics and Phicom have demonstrated that, with respect to this issue, FormFactor's position on the merits is not supported by the record evidence either. *See* Micronics' Reply at 13 *citing* RX-690C at Q/A 38, 74, 87; Khandros Tr. at 242:19-244-14; Amamiya at ¶ 14; RFF V.D.2.27-32; RX-690C at Q/A 129; RX-543; Amamiya at Fig. 1, ¶ 7,
¶ 10; Micronics Reply at 13 *citing* RFF V.D.2.34-35; RX-690C at Q/A 130; RDX-48; RX-543; Amamiya at Figs. 1 and 2. *See also* Phicom's Reply at 15; RX-166, ¶ 11, RX-166, Abstract, ¶ 14; RX-690C at Q/A 10.

[7] ID at 101 *citing* RRB 23; CIB 38-39. The ID also found that Phicom's (old) Type B probe card assemblies are obsolete and no longer manufactured, ID at 101 n. 378 *citing* Taber Tr. 1458:22-1459:5, and that Phicom's (old) Type C probe card assemblies illustrated in RX-102C, without a fixed center bolt, are obsolete and no longer manufactured, ID at 101 n. 378 *citing* Taber Tr. 1458:22-1459:5.

ID at 101. Thus, the ID's conclusion of law that "Respondents Micronics' and Phicom's accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a)," ID at 197, is unsupported by its own findings with respect to Phicom's (old) Type B and Type C Probe Cards.

As for Phicom's new design Type B and Type C MEMS Cards, the ALJ determined that FormFactor failed to prove, by a preponderance of the evidence, that Phicom's [new design] MEMS Cards meet each and every limitation of claim 1 of the '751 patent.[8] The ALJ specifically based this determination on his finding that FormFactor has failed to show that the fixed center bolt in Phicom's [new design] MEMS Cards meets the "planarizing element" limitation of claim 1 because there is no evidence that the bolt is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the MPH substrate. ID at 106 (citations omitted). The ALJ also considered the testimony of Phicom's expert witness Mr. Taber to the effect that the fixed center bolt in Phicom's new probe card design assemblies is not used for planarization and is not capable of applying a force to, or changing the shape of, the

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[8] The ALJ considered Phicom's representation that its redesigned MEMS Cards have a "fixed center bolt that keeps the Phicom PCB and MPH at a fixed relative position, so that the distance between the PCB and the MPH cannot be modified at the location of the bolt." (All of Phicom's MEMS Cards contain, *inter alia*, a printed circuit board, or "PCB," and a probe substrate called a Micro Probe Head, or "MPH," *see* ID at 12.) The ALJ also took into consideration that, according to Phicom, all its Type C MEMS Cards manufactured since December 2008 use a fixed center bolt, and, other than the fixed center bolt, Phicom's redesigned MEMS Cards sold since December 2008 are the same as Phicom's previous Type C probe card assemblies. The ALJ further relied on Phicom's submission that the "fixed center bolt" is locked in place between the MPH substrate and the PCB and that it has a "single designed length," which cannot be moved or adjusted to change length or to "transmit a force to modify a surface shape" of the MPH substrate, thus preventing deformation at the center of the MPH. ID at 104-105 (citations omitted).

MPH substrate. ID at 106-107 (citations omitted).

We find that, with respect to Phicom's redesigned Type B and Type C cards, the ID's conclusion of no infringement is supported by its findings and should not be disturbed. The arguments on this issue advanced by FormFactor and Phicom are not supported by the record evidence.[9]

Accordingly, we determine to modify the ID's conclusion of law at issue to reflect the fact that Phicom's (old) Type B and C MEMS Cards infringe the '751 patent. This decision, however, will not change the ID's conclusion that there is no violation of section 337 in this investigation in light of our determination, explained earlier, that the Amamiya reference anticipates the '751 patent.

Therefore, we reverse the ID's conclusion of law that Phicom's accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751, and we determine to modify the ID's conclusion of law No. 4 on page 197 of the ID by substituting the following:

> Respondent Micronics' accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a). Respondent Phicom's (old) Type B and Type C accused products infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a); Phicom's new design Type B and Type C accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a).

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[9] FormFactor takes the position that the ID's conclusion of no infringement is not supported by its own findings with respect to both (old) Type B and Type C Probe Cards, and Phicom's redesigned Type B and Type C cards. FF Submission at 2. Phicom argues that the ID's conclusions regarding no infringement are supported by its findings and that some ID findings to the contrary are "not supported by any citation to the record." Moreover, Phicom argues that the ID has not "set forth specific findings showing that FormFactor has met its burden, with evidentiary proof of record." Phicom's Submission at 11.

2. The '152 Patent

(a) The ID's conclusion that no analysis of the validity of the asserted claims that depend from claim 21 of the '152 patent is needed.

We determine to modify the ID's statement that no analysis is needed regarding invalidity arguments related to anticipation and obviousness of the asserted claims that depend from claim 21 of the '152 patent. The ID apparently based this conclusion in part on its determination that the Kubena reference anticipates independent claim 21. ID at 191. Such reliance is incorrect as a matter of law. Federal Circuit law "requires that 'each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; [and] dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim.'" *Dayco Products, Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1370 (Fed.Cir. 2003) *citing* 35 U.S.C. § 282 (2000). *See Sandt Tech., Ltd. v. Resco Metal & Plastics Corp.*, 264 F.3d 1344, 1356 (Fed. Cir. 2001) ("Because dependent claims contain additional limitations, they cannot be presumed to be invalid as obvious just because the independent claims from which they depend have been properly so found."); *Wahpeton Canvas Co., Inc. v. Frontier, Inc.,* 870 F.2d 1546, 1553 n. 10 (Fed. Cir. 1989) ("If validity were in issue, dependent claims might serve a useful role, for a necessarily narrower dependent claim may be valid when the claim from which it depends is not.")

Accordingly, we decline to adopt the ID's statement that "no analysis is needed." *See* ID at 191. We further determine to take no position with respect to the validity of claims 22, 23, 28-30, and 33-35 that depend from claim 21 of the '152 patent. *See Beloit Corp. v. Valmet Oy*,

742 F.2d 1421, 1423 (Fed. Cir. 1984) (the Commission need not rule on every nondispositive issue).

3. The '648 Patent

(a) ALJ Order No. 46

The ALJ issued Order No. 46 granting respondent Phicom's motion for summary determination that claims 20 and 34 of the '648 patent are invalid as indefinite under 35 U.S.C. § 112. Specifically, Phicom argued that summary determination was appropriate in light of the ALJ's claim construction order (Order No. 37), which concluded that the limitations "probe card means for providing electrical contacts to a tester" in claim 20 and "probe card means for providing an interface to a semiconductor tester" in claim 34 were indefinite.

Order No. 46 relates to claims drafted in "means plus function" format under 35 U.S.C. § 112, ¶ 6.[10] When a claim uses the term "means" to describe a limitation, a presumption arises that the inventor used the term to invoke the means-plus function format authorized by 35 U.S.C. § 112, ¶ 6. *Altiris, Inc. v. Symantec Corp.,* 318 F.3d 1363, 1375 (Fed. Cir. 2003). "This presumption can be rebutted when the claim, in addition to the functional language, recites structure sufficient to perform the claimed function in its entirety." *Id.* Once a court concludes

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[10] The relevant portion of section 112 provides:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. § 112, ¶ 6.

that a claim limitation is a means-plus-function limitation, two steps of claim construction remain: (1) the court must first identify the function of the limitation; and (2) the court must then look to the specification and identify the corresponding structure for that function. *Biomedino LLC v. Waters Technologies Corp.*, 490 F.3d 946, 950 (Fed. Cir. 2007). If there is no structure in the specification corresponding to the means-plus-function limitation, the claim will be found invalid as indefinite. Interpretation of what is disclosed in the specification must be made in light of the knowledge of one skilled in the art. *Atmel Corp. v. Info. Storage Devices, Inc.,* 198 F.3d 1374, 1380 (Fed. Cir. 1999).

Having reviewed the transcripts of the ALJ's evidentiary hearing on claim construction, as well as the parties' submissions on claim construction, we have concluded that FormFactor's argument that the patent specification provides a definition of "tester" lacks merit. As noted by respondents, the portion cited by FormFactor appears in the "Background of the Invention" and is therefore not discussed as part of the invention; was not raised at the hearing on claim construction; and – most importantly – provides no clear definition of "tester."

FormFactor argued that the unnumbered pad in Figure 7, which connects to cable **704**, provides the contacts from the probe card to the tester. Respondents disagreed with FormFactor and, in their turn, argued that Figure 7 related to alignment, and not to semiconductor testing. Claim Constr. Hear. Tr. at 19-20; '648 Patent, 30:42-45. Respondents argued that while the asserted claims are directed to semiconductor testing, aligning of the device is quite different from such testing. Claim Constr. Hear. Tr. at 20-21. We agree with respondents' argument that Figure 7 does not concern semiconductor testing, and therefore does not provide corresponding structure to the limitations at issue.

Accordingly, we find that FormFactor did not present any valid support for reversing the ALJ's conclusion that there is no structure disclosed to provide an interface to a semiconductor tester, and that the claims are therefore invalid for failing to meet the requirements of 35 U.S.C. § 112 ¶ 6. We affirm the ALJ's grant of partial summary determination in Order No. 46 with the following modification.

The Commission notes, and hereby corrects, the misstatement of the relevant limitation in claim 20 made in Order No. 46. The relevant limitation in claim 20 is "probe card means for providing electrical contacts to a tester," rather than "probe card means for providing an interface to a semiconductor tester," as stated in Order No. 46. The Commission further notes, however, that the parties agreed that the scope of the two limitations is identical, and both should be construed as "providing an interface to a semiconductor tester." Finally, the Commission adds to Order No. 46 that the parties' agreement on the construction of the claim limitations at issue (*i.e.*, the limitations "probe card means for providing electrical contacts to a tester" in claim 20 and "probe card means for providing an interface to a semiconductor tester" in claim 34) forecloses the possibility that Figure 7, which does not concern semiconductor testing, discloses the structure corresponding to either means-plus-function limitation at issue.

B. Conclusion on Violation

We affirmed the ID's ultimate conclusion of no violation in this investigation. Accordingly, we determine that no remedy, *i.e.*, no exclusion order or cease and desist order will issue in this investigation.

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: December 10, 2009

CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME **337-TA-621**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney Benjamin Levi, Esq. and the following parties as indicated, on December 10, 2009.

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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-621**

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

Administrative Law Judge Charles E. Bullock

(June 29, 2009)

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APPENDIX OF EXHIBIT LISTS A1

LIST OF ABBREVIATIONS

CDX	Complainant's demonstrative exhibit
CFF	Complainant's proposed findings of fact
CIB	Complainant's initial post-hearing brief
CORFF	Complainant's objections to Respondents' proposed findings of fact
COSFF	Complainant's objections to Staff's proposed findings of fact
CPX	Complainant's physical exhibit
CRB	Complainant's reply post-hearing brief
CX	Complainant's exhibit
Dep	Deposition
JX	Joint Exhibit
RDX	Respondents' demonstrative exhibit
RFF	Respondents' proposed findings of fact
RIB	Respondents' initial post-hearing brief
ROCFF	Respondents' objections to Complainant's proposed findings of fact
ROSFF	Respondents' objections to Staff's proposed findings of fact
RPX	Respondents' physical exhibit
RRB	Respondents' reply post-hearing brief
RX	Respondents' exhibit
SFF	Staff's proposed findings of fact
SIB	Staff's initial post-hearing brief
SOCFF	Staff's objections to Complainant's proposed findings of fact
SORFF	Staff's objections to Respondents' proposed findings of fact
SRB	Staff's reply post-hearing brief
Tr.	Transcript

CONTAINS CONFIDENTIAL BUSINESS INFORMATION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-621**

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

Administrative Law Judge Charles E. Bullock

(June 29, 2009)

Pursuant to the Notice of Investigation and Rule 210.42(a) of the Rules of Practice and Procedure of the United States International Trade Commission, this is the Administrative Law Judge's Initial Determination in the matter of certain probe card assemblies, components thereof and certain probe card assemblies, components thereof and certain tested DRAM and NAND flash memory devices and products containing same, Investigation No. 337-TA-621.

The Administrative Law Judge hereby determines that a violation of Section 337 of the Tariff Act of 1930, as amended, has not been found in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain probe card assemblies, components thereof and certain probe card assemblies, components thereof and certain tested DRAM and NAND flash memory devices and products containing same, in connection with claims 1, 3, 4,

18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485; claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751; claim 19 of U.S. Patent No. 7,225,538; and claims 21-23, 27-30, and 33-35 of U.S. Patent No. 5,994,152 patent. Furthermore, the Administrative Law Judge hereby determines that a domestic industry in the United States exists that practices U.S. Patent No. 6,509,751 and does not exist that practices U.S. Patent Nos. 6,615,485; 7,225,538; and 5,994,152.

DISCUSSION

I. Introduction

A. Procedural History

This investigation was instituted by the Commission on December 13, 2007 and the notice of investigation was published in the Federal Register on December 19, 2007.[1] Administrative Law Judge Essex set a fifteen-month target date of March 19, 2009 for completion of this investigation by the Commission in Order No. 4.[2]

On January 22, 2008, Judge Essex issued the procedural schedule in this investigation, which was modified on February 5, 2008 and February 7, 2008.[3]

On July 11, 2008, the Commission issued a notice of decision to reassign this investigation to the undersigned. On July 17, 2008, the undersigned issued Order No. 18, changing the ground rules in this investigation.

On July 10, 2008, FormFactor filed a motion for partial termination of the investigation as to certain claims of the asserted patents, which was granted by initial determination in Order No. 19, issued on July 29, 2008. Specifically, FormFactor moved to terminate claims 4, 51-54, and 59 of U.S. Patent No. 5,994,152 against Respondent Phicom; claims 5-7 and 13 of U.S. Patent No. 6,509,751 against Respondents Micronics and Phicom; claims 10, 11, 23, 24, 36, and 37 of U.S. Patent No. 6,615,485 against Respondent Micronics; claims 1-15, 18, 19, 36 of U.S. Patent No. 6,624,648 against respondents Micronics and Phicom; claims 2 and 3 of U.S. Patent No. 7,168,162

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[1] See 72 Fed. Reg. 71,954 (December 19, 2007).

[2] See Order No. 4 (January 22, 2008).

[3] See Order No. 4 (January 22, 2008), Order No. 6 (February 5, 2008), and Order No. 7 (February 7, 2008).

against Respondent Micronics; and claims 8, 9, 13, 20-22, 27-33, 37-41, 44, 45, 47-49 of U.S. Patent No. 7,225,538 against Respondent Micronics. The Commission issued a notice of determination not to review this initial determination on August 27, 2008.

On July 22, 2008, Respondent Micronics filed a motion for *Markman*[4] hearing and for modification of the target date, which was granted by initial determination in Order No. 20, issued on August 5, 2008. Specifically, the undersigned extended the target date by five months to twenty months, or until August 19, 2009, and set a *Markman* hearing for September 15-16, 2008. The Commission issued a notice of determination not to review this initial determination on August 25, 2008.

On August 27, 2008, the undersigned issued a modified procedural schedule for this investigation.[5]

On September 15-16, 2008, a *Markman* hearing was conducted. On September 23, 2008, Respondent Micronics filed a motion for correction to the Markman hearing transcript dated September 15, 2008, which was granted by Order No. 26, issued on October 7, 2008. On January 23, 2009, the undersigned issued Order No. 37, an order construing the terms of the asserted claims of the patents at issue. As stated in that order, all briefing in this investigation is governed by the claim construction order and "*[a]ll* other claim terms shall be deemed as undisputed and shall be interpreted by the undersigned in accordance with 'their ordinary meaning as viewed by one of ordinary skill in the art.'"[6] Order No. 37 is hereby incorporated by reference into this Initial

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[4] *Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996) ("*Markman*").

[5] See Order No. 21 (August 27, 2008).

[6] See Order No. 37, p. 9 (January 23, 2009) (emphasis in original).

Determination.

On November 6, 2008, Respondents Micronics and Phicom filed a motion for partial summary determination that the relief FormFactor seeks with respect to certain DRAM and NAND flash memory devices and products containing same of non-respondents based on infringement of U.S. Patent No. 6,615,485 is unavailable under recent Federal Circuit precedent, which was granted by initial determination in Order No. 34, issued on November 25, 2008. On December 22, 2008, the Commission issued a notice of decision to review Order No. 34 and concluded that Order No. 34 is not an initial determination, since it relates exclusively to the issue of remedy and that such issues should be addressed in a recommended determination at the conclusion of the proceedings before the undersigned.

On December 11, 2008, the undersigned issued an initial determination extending the target date by two months, or twenty-two months, or October 19, 2009, and modifying the procedural schedule.[7] The Commission issued a notice of determination not to review this initial determination on January 8, 2009.

On January 29, 2009, FormFactor filed a motion for partial termination of the investigation as to certain claims of the asserted patents, which was granted by initial determination in Order No. 29, issued on January 29, 2009. Specifically, FormFactor moved to terminate claims 1, 4, 13, and 14 of U.S. Patent No. 7,168,162 against Respondent Micronics; claims 1-7, and 14-18 of U.S. Patent No. 7,225,538 against Respondent Micronics; and claims 1-2, 7-12, and 15 of U.S. Patent No. 5,994,152 against Respondent Phicom. The Commission issued a notice of determination not to

[7] See Order No. 36 (December 11, 2008). Note that the procedural schedule was revised in Order No. 38, issued on January 29, 2009.

review this initial determination on February 17, 2009.

On December 5, 2008, Respondent Phicom filed a motion for summary determination that U.S. Patent No. 6,624,648 is invalid under 35 U.S.C. § 112, ¶ 6, which was granted by initial determination in Order No. 46, issued on February 11, 2009. The Commission issued a notice of decision to review this initial determination on March 11, 2009.

On July 1, 2008, FormFactor filed a motion (621-031) for sanctions against Micronics and Phicom. In that motion, FormFactor asserts that Micronics and Phicom did not comply with Order No. 14 and that sanctions, in the form of adverse inferences that Micronics and Phicom infringe the asserted patents, that Micronics' and Phicom's customers directly infringe the asserted patents, and that Micronics and Phicom induce their customers to infringe the asserted patents, should be imposed. On July 16, 2008, Micronics and Phicom both filed oppositions to the motion. On July 17, 2008, Staff filed an unopposed motion for a one day extension of time to file its response to the motion for sanctions, which is hereby granted, along with Staff's response, which opposed the motion. The opposing parties assert that FormFactor has not met its burden of proof and that adverse inferences are not warranted. On July 22, 2008, FormFactor filed a motion (621-044) for leave to file a reply, which is hereby denied. On July 31, 2008, Phicom filed an opposition to FormFactor's motion for leave to file a reply. Based on a review of the motion and the oppositions thereto, the undersigned agrees with Respondents and Staff that adverse inferences are not warranted. Accordingly, the motion for sanctions is hereby denied.

The parties have stipulated as to certain material facts. Particular stipulated facts that are relevant to this Initial Determination are cited accordingly.

An evidentiary hearing on liability was conducted before the undersigned from February 24,

2009 through March 6, 2009. In support of its case-in-chief and rebuttal case, FormFactor called the following witnesses:

- Dr. Igor Khandros (FormFactor's founder and Executive Chairman of the Board of Directors)[8];
- Mr. Richard Freeman (FormFactor's Senior Vice President of Operations)[9];
- Mr. Benjamin Eldridge (FormFactor's Senior Vice President and Chief Technology Officer);[10]
- Dr. Roger Howe (FormFactor's expert witness on the '485 and '751 patents)[11]; and
- Dr. Bruno Frazier (FormFactor's expert witness on the '152, '538, and '162 patents).[12]

In support of its case-in-chief and rebuttal case, Respondents called the following witnesses:

- Jong Ae Hong (Phicom's Deputy Manager for Overseas Sales);[13]
- Jun Tae Hwang (Phicom employee in MEMS business division);[14] and
- Mr. Frederick Taber (Phicom's expert witness on the '485 and '751 patents)[15];
- Dr. Joseph McAlexander (Phicom's expert witness on the '152 patent)[16];
- Mr. Takahiro Igarishi (Micronics' Associate Director and General Manager, Sales Department, Semiconductor Test Equipment Division)[17];

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[8] CX-730C (Khandros Direct).
[9] CX-729C (Freeman Direct).
[10] CX-728C (Eldridge Direct).
[11] CX-732C (Howe Direct); CX-750C (Howe Rebuttal); CX-760C (Howe Supplemental).
[12] CX-731C (Frazier Direct); CX-749C (Frazier Rebuttal).
[13] RX-380C (Hong Direct).
[14] RX-381C (Hwang Direct).
[15] RX-382 (Taber Direct); RX-415C (Taber Rebuttal); RX-418C (Taber Supplemental Rebuttal).
[16] RX-383C (McAlexander Direct); RX-414C (McAlexander Rebuttal).
[17] RX-692C (Igarishi Direct); RX-858C (Igarishi Rebuttal).

- Mr. Albert Hutton (MJC's President)[18];
- Mr. Tatsuo Inoue (Micronics' Director of the Aomori factor)[19];
- Dr. David Adler (Micronics' expert witness on the '485 and '751 patents)[20]; and
- Mr. Ronald Leckie (Micronics' expert witness on the '538 patent).[21]

On March 10, 2009, FormFactor and Respondents filed a joint motion to enter certain exhibits into evidence after the close of the evidentiary hearing, which was granted by Order No. 52, issued on March 11, 2009.

On March 13, 2009, Respondent Micronics filed an unopposed motion to enter one additional exhibit, RX-831C, into evidence, which was granted by Order No. 53, issued on March 16, 2009.

On March 30, 2009, Respondent Phicom filed a motion to enter an additional exhibit, RX-419, into the evidentiary record. On April 9, 2009, FormFactor filed an opposition to the motion. According to Phicom, RX-419 is the PTO's rejection of FormFactor's patentability arguments in the reexamination of the '485 patent, dated March 18, 2009. Phicom asserts that this document is directly related to RX-242 (request for reexamination) and RX-248 (first office action in reexamination). FormFactor opposes the request because there is no sponsoring witness. The undersigned finds good cause to admit this additional exhibit, as it is relevant to the investigation, and is dated after the close of the hearing and therefore could not have been admitted during the hearing. It needs no sponsoring witness because it is a decision of the PTO. Accordingly, RX-419 is hereby received into evidence.

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[18] RX-689C (Hutton Direct); RX-859C (Hutton Rebuttal).
[19] RX-857C (Inoue Rebuttal).
[20] RX-690C (Adler Direct); RX-861C (Adler Rebuttal).
[21] RX-691C (Leckie Direct); RX-860C (Leckie Rebuttal).

After the hearing, post-hearing briefs and reply briefs, together with proposed findings of fact, conclusions of law and rebuttals to the same, were filed on March 30, 2009, and April 10, 2009, respectively.

B. The Parties

1. Complainant

Complainant FormFactor, Inc. ("FormFactor") is a Delaware corporation with its principal place of business in Livermore, California.

2. Respondents[22]

a. Micronics

Respondent Micronics Japan Co., Ltd. is a company organized under the laws of Japan and is headquartered in Japan. Respondent MJC Electronics Corp. is a wholly-owned U.S. subsidiary of Micronics Japan Co., Ltd., with its principal place of business in Austin, Texas. The terms "Micronics" and "MJC" will be used interchangeably throughout this initial determination.

b. Phicom

Respondent Phicom Corp. is a company organized under the laws of South Korea and is headquartered in Seoul, Korea. Respondent Phiam Corp. is a U.S. subsidiary of Phicom Corp. and is located in San Jose, California.

C. Overview of the Technology

"Probe card" is a generic term for an assembly of components used together to test integrated circuits on silicon wafers. The asserted patents deal with probe cards that are used to test

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[22] In general, the undersigned will refer to each respondent by name, i.e. Phicom and Micronics/MJC when that respondent is making a specific argument with respect to itself, and "Respondents" when both sets of respondents are asserting similar arguments.

semiconductor chips while such chips are still part of the silicon wafer on which they were fabricated. Probe cards provide an interface between the expensive durable testing equipment of the semiconductor industry and the ever evolving variety of integrated circuit designed on silicon wafers.

D. The Patents at Issue

1. The '485 Patent

The '485 patent is entitled "Probe Card Assembly and Kit, and Methods of Making Same" which was issued on September 9, 2003, based on Application Serial No. 10/034,543, filed on December 27, 2001. The named inventors are Benjamin N. Eldridge, Gary W. Grube, Igor Y. Khandros, and Gaetan L. Mathieu and the patent was assigned to FormFactor, the current owner of the '485 patent. The '485 patent has a total of 43 claims. Two independent claims, claims 1 and 32 are at issue here. Dependent claims 3, 4, 18, 19 , 23, 24, 29, 33, 36, 37, and 41 are also at issue here.[23]

2. The '751 Patent

The '751 patent is entitled "Planarizer for a Semiconductor Contactor" which was issued on January 21, 2003, based on Application Serial No. 09/528,064, filed on March 17, 2000. The named inventors are Gaetan L. Mathieu, Benjamin N. Eldridge, and Gary W. Grube, and the patent was assigned to FormFactor, the current owner of the '751 patent. The '751 patent has a total of 25 claims. Three independent claims, claims 1, 12, and 24, are at issue here. Dependent claims 2, 3, and 25 are also at issue here.[24]

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[23] See JX-3 ("the '485 patent") and JX-8 ("the '485 prosecution history").
[24] See JX-2 ("the '751 patent") and JX-7 ("the '751 prosecution history").

3. The '538 Patent

The '538 patent is entitled "Resilient Contact Structures Formed and Then Attached to a Substrate" which was issued on June 5, 2007, based on Application Serial No. 10/038,633, filed on December 28, 2001. The named inventors are Benjamin N. Eldridge, Gary W. Grube, Igor Y. Khandros, and Gaetan L. Mathieu, and the patent was assigned to FormFactor, the current owner of the '538 patent. The '538 patent has a total of 49 claims. One independent claim, claim 19, is at issue here.[25]

4. The '152 Patent

The '152 patent is entitled "Fabricating Interconnects and Tips Using Sacrificial Substrates" which was issued on November 30, 1999, based on Application Serial No. 08/788,740, filed on January 24, 1997. The named inventors are Igor Y. Khandros, Benjamin N. Eldridge, and Gaetan L. Mathieu, and the patent was assigned to FormFactor, the current owner of the '152 patent. The '152 patent has a total of 60 claims. One independent claim, claim 21, is at issue here. Dependent claims 22, 23, 27-30, and 33-35, which depend from claim 21, are also at issue here.[26]

E. The Products at Issue

At issue in this investigation are certain probe card assemblies, components thereof and certain probe card assemblies, components thereof and certain tested DRAM and NAND flash memory devices and products containing same.

The accused Phicom products are probe card assemblies manufactured, used, offered for sale, and sold by Phicom under the name "MEMS Card." There are four different types of Phicom MEMS

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[25] See JX-5 ("the '538 patent") and JX-10 ("the '538 prosecution history").
[26] See JX-1 ("the '152 patent") and JX-6 ("the '152 prosecution history").

Cards, depending on the date of manufacture and the size of the probe substrates, categorized into A, B, C, or D Type MEMS Cards. All of Phicom's MEMS Cards have the following components: a printed circuit board, or "PCB," to provide an interface with the tester; a probe substrate called Micro Probe Head, or "MPH"; an array of spring probe elements called Micro Probes mounted on the wafer side surface of the MPH; an interconnecting structure providing electrical connections between the Micro Probes to the PCB, consisted in a form of New Interface Pins and guide films; and a multiple planarizing bolts and screws designed to minimize the height variations between the probe elements.

The accused Micronics products are probe card assemblies manufactured, used, offered for sale, and sold by Micronics under the name "U-Probe." All of Micronics' U-Probes have the following components: [

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II. Jurisdiction and Importation

Section 337 confers subject matter jurisdiction on the International Trade Commission to investigate, and if appropriate, to provide a remedy for, unfair acts and unfair methods of competition in the importation of articles into the United States. 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.[27]

A. Subject Matter Jurisdiction/In Rem Jurisdiction

The complaint alleges that Respondents have violated Subsection 337(a)(1)(A) and (B) in the importation and sale of products that infringe certain of the asserted patents. Respondents do not dispute that the importation requirement has been satisfied.[28] Accordingly, the Commission has subject matter jurisdiction over Respondents in this investigation.[29]

As to the issue of whether the Commission possesses jurisdiction over Phicom's new probe card design in this investigation, FormFactor does not renew the arguments made in its Motion for Determination that this Court does not have jurisdiction over Phicom's New Probe Card Assembly Design, filed on March 2, 2009, other than making a cursory statement in their reply brief stating that "FormFactor maintains its position that the New Design MEMS Card is not part of this Investigation."[30] Staff addresses FormFactor's motion for determination in its post-hearing brief.[31] As noted by Staff, during the hearing, the undersigned issued an oral ruling during the hearing that the motion for determination would be denied, but that the parties would be allowed to raise the issue in their post hearing briefs.[32] While Staff raises the issue of the motion for determination in its post-hearing brief, FormFactor does not raise the issue on its own in its own post-hearing brief.

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[27] 19 U.S.C. § 1337; *also see Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Commission Memorandum Opinion, 215 U.S.P.Q. 229, 231 (1981) ("*Certain Steel Rod*").

[28] RIB 18-19.

[29] *See Amgen, Inc. v. U.S. Int'l Trade Comm'n*, 902 F.2d 1532, 1536 (Fed. Cir. 1990) ("*Amgen*").

[30] CRB 4.

[31] SIB 8-14.

[32] Bullock, Tr. 1364 (3/3/09).

According to Phicom, Phicom has fully complied with its discovery obligations as to the new probe card design and that there should be no sanction to the effect of being precluded from receiving a ruling as to infringement. Furthermore, Phicom asserts that FormFactor has not even renewed its motion for determination in its post-hearing brief and has therefore waived the issue.[33]

According to Staff, while there has been no evidence of importation of the new probe card design, an exercise of jurisdiction is proper because Phicom stands ready and willing to sell its new probe cards to customers in the United States upon receipt of an order.[34] Staff also asserts, however, that Phicom should be precluded from obtaining adjudication on its new probe card assemblies as a sanction for its discovery misconduct.[35] Furthermore, Staff asserts that because Phicom did not address the issue of the motion in its post-hearing brief, that Phicom has waived all arguments in opposition to FormFactor's motion.[36]

As to whether the Commission possesses jurisdiction to adjudicate Phicom's new probe card design assembly, the undersigned agrees with Phicom and Staff that the Commission has jurisdiction over Phicom's new probe card design. The undersigned disagrees with Staff, however, that Phicom should be precluded from obtaining a determination on its new probe card assembly as a discovery sanction, as FormFactor, the original moving party, failed to raise this issue in its post-hearing brief. Accordingly, while there is some evidence that Phicom improperly blocked discovery on the new

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[33] RRB 9.

[34] SIB 15-16 citing *Amgen, Inc. v. Int'l Trade Comm'n,* 519 F.3d 1343 (Fed. Cir. 2008) ("*Amgen II*"). See also Staff's letter dated May 1, 2009, which states that, while the Federal Circuit has vacated its decision in *Amgen, Inc. v. Int'l Trade Comm'n*, No. 2007-1014, Slip Op. at 2 (Apr. 30, 2009), that the Staff's underlying position is still sound based on *Certain Flash Memory Circuits and Products Containing Same*, Inv. No. 337-TA-382, Commission's Notice of Issuance of Limited Exclusion Order (June 2, 2007).

[35] SIB 16.

[36] SRB 6-7.

probe card assembly design during the deposition of its 30(b)(6) witness, a sanction in the form of non-adjudication of the issue on the new design is not warranted.

Accordingly, the undersigned finds that the Commission has jurisdiction over Phicom's new probe card design and will make a ruling as to whether Phicom's new probe card design infringes the relevant asserted patents.

B. Personal Jurisdiction

Respondents have responded to the complaint and notice of investigation, participated in the investigation, including participating in discovery, made an appearance at the hearing, and submitted post-hearing briefs, thereby submitting to the personal jurisdiction of the Commission.[37]

III. Relevant Law

A. Infringement

1. Literal Infringement

Literal infringement is a question of fact.[38] Literal infringement requires the patentee to prove that the accused device contains each limitation of the asserted claim(s). Each element of a claim is considered material and essential, and in order to show literal infringement, every element must be found to be present in the accused device.[39] If any claim limitation is absent from the accused device, there is no literal infringement of that claim as a matter of law.[40]

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[37] *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, U.S.I.T.C. Pub. No. 1948, Initial Determination (unreviewed by Commission in relevant part) at 4, 1986 WL 379287 (U.S.I.T.C., October 15, 1986) ("*Certain Miniature Hacksaws*").

[38] *Tegal Corp. v. Tokyo Electron Am., Inc.*, 257 F.3d 1331, 1350 (Fed. Cir. 2001) ("*Tegal*"), *cert. denied*, 535 U.S. 927 (2002).

[39] *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991) ("*London*").

[40] *Bayer AG v. Elan Pharm. Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000) ("*Bayer*").

Direct infringement of a method claim requires "each step of the claimed method [to be] performed."[41] Although direct infringement requires a single party to perform every step of the claimed method, it is well established that a defendant cannot avoid liability for direct infringement by having someone else carry out one or more of the claimed steps on its behalf.[42] Thus,

> where the actions of multiple parties combine to perform every step of a claimed method, the claim is directly infringed only if one party exercises "control or direction" over the entire process such that every step is attributable to the controlling party, *i.e.*, the "mastermind." At the other end of this multi-party spectrum, mere "arms-length cooperation" will not give rise to direct infringement by any party.[43]

2. Doctrine of Equivalents

Where literal infringement is not found, infringement nevertheless can be found under the doctrine of equivalents based on "the substantiality of the differences between the claimed and accused products or processes, assessed according to an objective standard" judged from "the vantage point of one of ordinary skill in the relevant art."[44] Determining infringement under the doctrine of equivalents "requires an intensely factual inquiry."[45]

In *Warner-Jenkinson*, the Supreme Court noted that the doctrine of equivalents is subject to several limitations, including applying the doctrine to individual elements of a claim and not to the invention as a whole.[46] The court acknowledged that the commonly used "function-way-result" test

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[41] *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1328 (Fed. Cir. 2008) ("*Muniauction*").

[42] *Id.* at 1329.

[43] *Id.* at 1329 (citations omitted).

[44] *Hilton Davis Chem. Co. v. Warner-Jenkinson Co., Inc.*, 62 F.3d 1512, 1518-1519 (Fed. Cir. 1995) ("*Hilton Davis*"), *rev'd*, 520 U.S. 17 (1997) ("*Warner-Jenkinson*").

[45] *Vehicular Tech. Corp. v. Titan Wheel Int'l, Inc.*, 212 F.3d 1377, 1381 (Fed. Cir. 2000) ("*Vehicular Technologies*").

[46] *Warner-Jenkinson*, 520 U.S. at 29.

is suitable in some instances, including analyzing mechanical devices.[47]

3. Indirect Infringement

Indirect infringement may be either induced or contributory. Direct infringement must first be established in order for a claim of indirect infringement to prevail.[48]

a. Induced Infringement

Section 271(b) of the Patent Act prohibits inducement: "[w]hoever actively induces infringement of a patent shall be liable as an infringer."[49] As the Federal Circuit stated:

> To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they "actively and knowingly aid [ed] and abett[ed] another's direct infringement." However, "knowledge of the acts alleged to constitute infringement" is not enough. The "mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven."[50]

In addition, the burden of proof is on the complainant.[51]

b. Contributory Infringement

Under 35 U.S.C. § 271(c), a seller of a component of an infringing product can be held liable for contributory infringement if: "(1) there has been an act of direct infringement by a third party; (2) the accused contributory infringer knows that the combination for which its component was made was both patented and infringing; and (3) there are no substantial non-infringing uses for the

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[47] *See Hilton Davis*, 62 F.3d at 1518 ("In applying the doctrine of equivalents, it is often enough to assess whether the claimed and accused products or processes include substantially the same function, way, and result").

[48] *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 697, (Fed. Cir. 2008) ("*Broadcom*"); *ACCO Brands, Inc. v. ABA Locks Mfr. Co.*, 501 F.3d 1307, 1312 (Fed. Cir. 2007) ("*ACCO*").

[49] 35 U.S.C. § 271(b) (2008).

[50] *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) (citations omitted) ("*DSU*").

[51] *Broadcom*, 543 F.3d at 698.

component part, *i.e.*, the component is not a 'staple article' of commerce."[52]

B. Domestic Industry

In a patent-based complaint, a violation of Section 337 can be found "only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established."[53] This "domestic industry requirement" has an "economic" prong and a "technical" prong.[54]

The term "domestic industry" in Section 337 is not defined by the statute, but the Commission has interpreted the intent of Section 337 to be "the protection of domestic manufacture of goods."[55] The Commission has further stated that "[t]he scope of the domestic industry in patent-based investigations has been determined on a case by case basis in light of the realities of the marketplace and encompasses not only the manufacturing operations but may include, in addition, distribution, research and development and sales."[56]

In making this determination, Section 337(a)(2) provides that for investigations based on patent infringement, a violation can be found "only if an industry in the United States, relating to the articles protected by the patent . . . concerned, exists or is in the process of being established." 19 U.S.C. § 1337(a)(2). Section 337(a)(3) sets forth the following economic criteria for determining the existence of a domestic industry in such investigations:

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[52] *Certain Flash Memory*, Commission Opinion at 9-10.

[53] 19 U.S.C. § 1337(a)(2).

[54] *Certain Stringed Musical Instruments and Components Thereof*, Inv. No. 337-TA-586, Commission Opinion at 12-14 (April 24, 2008) ("*Certain Stringed Instruments*").

[55] *Certain Dynamic Random Access Memories, Components Thereof and Products Containing Same*, Inv. No. 337-TA-242, U.S.I.T.C. Pub. No. 2034 (November 1987), Commission Opinion at 61, 1987 WL 450856 (U.S.I.T.C., September 21, 1987) ("*Certain DRAMs*").

[56] *Id.* at 62 (footnotes omitted).

> 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 . . . 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.[57]

As the statute uses the disjunctive term "or," a complainant can demonstrate this so-called "economic prong" of the domestic industry requirement by satisfying any one of the three tests set forth in Section 337(a)(3).[58] The complainant bears the burden of establishing that the domestic industry requirement is satisfied.[59]

In addition to meeting the economic criteria of the domestic industry requirement, a complainant in a patent-based Section 337 investigation must also demonstrate that it is practicing or exploiting the patents at issue.[60] In order to find the existence of a domestic industry exploiting a patent at issue, it is sufficient to show that the domestic industry practices any claim of that patent, not necessarily an asserted claim of that patent.[61] Fulfillment of this so-called "technical prong" of

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[57] 19 U.S.C. § 1337(a)(3).

[58] *See Certain Plastic Encapsulated Integrated Circuits*, Inv. No. 337-TA-315, U.S.I.T.C. Pub. No. 2574 (November 1992), Initial Determination at 83, 1992 WL 813952 (U.S.I.T.C., October 15, 1991) (unreviewed by Commission in relevant part) ("*Certain Encapsulated Circuits*").

[59] *See Certain Set-Top Boxes and Components Thereof*, Inv. No. 337-TA-454, U.S.I.T.C. Pub. No. 3564 (November 2002), Initial Determination at 294, 2002 WL 31556392 (U.S.I.T.C., June 21, 2002), *unreviewed by Commission in relevant part*, Commission Opinion at 2 (August 29, 2002) ("*Certain Set-Top Boxes*").

[60] *See* 19 U.S.C. § 1337(a)(2) and (3); *also see Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Commission Opinion at 8, 1996 WL 1056095 (U.S.I.T.C., January 16, 1996) ("*Certain Microsphere Adhesives*"), *aff'd sub nom. Minnesota Mining & Mfg. Co. v. U.S. Int'l Trade Comm'n*, 91 F.3d 171 (Fed. Cir. 1996) (Table); *Certain Encapsulated Circuits*, Commission Opinion at 16.

[61] *Certain Microsphere Adhesives*, Commission Opinion at 7-16.

the domestic industry requirement is not determined by a rigid formula, but rather by the articles of commerce and the realities of the marketplace.[62]

The test for claim coverage for the purposes of the technical prong of the domestic industry requirement is the same as that for infringement.[63] "First, the claims of the patent are construed. Second, the complainant's article or process is examined to determine whether it falls within the scope of the claims."[64] As with infringement, the first step of claim construction is a question of law, whereas the second step of comparing the article to the claims is a factual determination.[65] To prevail, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent either literally or under the doctrine of equivalents.[66]

C. Validity

A patent is presumed valid.[67] The party challenging a patent's validity has the burden of overcoming this presumption by clear and convincing evidence.[68] Since the claims of a patent measure the invention at issue, the claims must be interpreted and given the same meaning for purposes of both validity and infringement analyses. As with an infringement analysis, an analysis

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[62] *Certain Diltiazem Hydrochloride and Diltiazem Preparations*, Inv. No. 337-TA-349, U.S.I.T.C. Pub. No. 2902, Initial Determination at 138, 1995 WL 945191 (U.S.I.T.C., February 1, 1995) (unreviewed in relevant part) ("*Certain Diltiazem*"); *Certain Double-Sided Floppy Disk Drives and Components Thereof*, Inv. No. 337-TA-215, 227 U.S.P.Q. 982, 989 (Commission Opinion 1985) ("*Certain Floppy Disk Drives*").

[63] *Certain Doxorubicin and Preparations Containing Same*, Inv. No. 337-TA-300, Initial Determination at 109, 1990 WL 710463 (U.S.I.T.C., May 21, 1990) ("*Certain Doxorubicin*"), *aff'd*, Views of the Commission at 22 (October 31, 1990).

[64] *Id.*

[65] *Markman,* 52 F.3d at 976.

[66] *See Bayer,* 212 F.3d at 1247.

[67] 35 U.S.C. § 282; *Richardson-Vicks Inc. v. Upjohn Co.*, 122 F.3d 1476, 1480 (Fed. Cir. 1997) ("*Richardson-Vicks*").

[68] *Richardson-Vicks Inc., supra; Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044 (Fed. Cir.) ("*Uniroyal*"), *cert. denied*, 488 U.S. 825 (1988).

of invalidity involves two steps: the claim scope is first determined, and then the properly construed claim is compared with the prior art to determine whether the claimed invention is anticipated and/or rendered obvious.[69]

1. Anticipation, 35 U.S.C. § 102

A patent may be found invalid as anticipated under 35 U.S.C. § 102(a) if "the invention was known or used by others in this country, or patented or described in a printed publication in this country, or patented or described in a printed publication in a foreign country, before the invention thereof by the applicant for patent." 35 U.S.C. § 102(a). A patent may be found invalid as anticipated under 35 U.S.C. § 102(b) if "the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States."[70] Under 35 U.S.C. § 102(e), a patent is invalid as anticipated if "the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent."[71] Anticipation is a question of fact.[72]

Under the foregoing statutory provision, a claim is anticipated and therefore invalid when "the four corners of a single, prior art document describe[s] every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the

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[69] *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1351 (Fed. Cir. 2001) ("*Amazon.com*").

[70] 35 U.S.C. § 102(b).

[71] 35 U.S.C. § 102(e).

[72] *Texas Instruments, Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1177 (Fed. Cir. 1993) ("*Texas Instruments II*").

invention without undue experimentation."[73] To be considered anticipatory, the prior art reference must be enabling and describe the applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention.[74] But, the degree of enabling detail contained in the reference does not have to exceed that contained in the patent at issue.[75]

Further, the disclosure in the prior art reference does not have to be express, but may anticipate by inherency where the inherency would be appreciated by one of ordinary skill in the art.[76] To be inherent, the feature must necessarily be present in the prior art.[77] Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient. This modest flexibility in the rule that "anticipation" requires that every element of the claims appear in a single reference accommodates situations where the common knowledge of technologists is not recorded in the reference; that is, where technological facts are known to those in the field of the invention, albeit not known to judges.[78]

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[73] *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000), *cert. denied*, 532 U.S. 904 (2001) ("*Advanced Display Systems*").

[74] *Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000) ("*Helifix*"); *In re Paulsen,* 30 F.3d 1475, 1478 (Fed. Cir. 1994) ("*Paulsen*").

[75] *Paulsen*, 30 F.3d at 1481 n.9.

[76] *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047 (Fed. Cir.), *cert. denied*, 516 U.S. 988 (1995) ("*Glaxo*").

[77] *See Finnigan Corp. v. U.S. Int'l Trade Comm'n*, 180 F.3d 1354, 1365-66 (Fed. Cir. 1999) ("*Finnigan*").

[78] *See Cont'l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268-69 (Fed. Cir. 1991) ("*Continental Can*"); *Finnigan*, 180 F.2d at 1365.

2. Obviousness, 35 U.S.C. § 103

Under 35 U.S.C. § 103(a), a patent is valid unless "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."[79] The ultimate question of obviousness is a question of law, but "it is well understood that there are factual issues underlying the ultimate obviousness decision."[80]

Once claims have been properly construed, "[t]he second step in an obviousness inquiry is to determine whether the claimed invention would have been obvious as a legal matter, based on underlying factual inquiries including : (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) secondary considerations of non-obviousness" (also known as "objective evidence").[81]

Although the Federal Circuit case law also required that, in order to prove obviousness, the patent challenger must demonstrate, by clear and convincing evidence, that there is a "teaching, suggestion, or motivation to combine, the Supreme Court has rejected this "rigid approach" employed by the Federal Circuit in *KSR Int'l Co. v. Teleflex Inc.*:[82]

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its

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[79] 35 U.S.C. § 103(a).

[80] *Richardson-Vicks Inc.*, 122 F.3d at 1479; *Wang Lab., Inc. v. Toshiba Corp.*, 993 F.2d 858, 863 (Fed. Cir. 1993) ("*Wang Laboratories*").

[81] *Smiths Indus. Med. Sys., Inc. v. Vital Signs, Inc.*, 183 F.3d 1347, 1354 (Fed. Cir. 1999) ("*Smiths Industries*"), citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966) ("*Graham*").

[82] *KSR Int'l Co. v. Teleflex Inc.*, 500 U.S. 398 (2007) ("*KSR*").

> actual application is beyond his or her skill. Sakraida and Anderson's-Black Rock are illustrative–a court must ask whether the improvement is more than the predictable use of prior art elements according to their established function.
>
> Following these principles may be more difficult in other cases than it is here because the claimed subject matter may involve more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement. Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicitly. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusions of obviousness"). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.
>
> [. . .]
>
> The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents. The diversity of inventive pursuits and of modern technology counsels against limiting the analysis in this way. In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends. Granting patent protection to advance that would occur in the ordinary course without real innovation retards progress and may, in the case of patents combining previously known elements, deprive prior inventions of their value or utility.[83]

"Secondary considerations," also referred to as "objective evidence of non-obviousness," such as "commercial success, long felt but unsolved needs, failure of others, etc." may be used to understand the origin of the subject matter at issue, and may be relevant as indicia of obviousness

[83] *KSR*, 500 U.S. at 401, 419.

or non-obviousness.[84] Secondary considerations may also include copying by others, prior art teaching away, and professional acclaim.[85]

Evidence of "objective indicia of non-obviousness," also known as "secondary considerations," must be considered in evaluating the obviousness of a claimed invention, but the existence of such evidence does not control the obviousness determination. A court must consider all of the evidence under the *Graham* factors before reaching a decision on obviousness.[86] In order to accord objective evidence substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention, and a *prima facie* case is generally made out "when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent."[87] Once the patentee has made a *prima facie* case of nexus, the burden shifts to the challenger to show that the commercial success was caused by "extraneous factors other than the patented invention, such as advertising, superior workmanship, etc."[88]

3. Written Description & Enablement, 35 U.S.C. § 112, ¶ 1

Section 112, ¶ 1 of Title 35 requires that the specification describe the manner and process

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[84] *Graham*, 383 U.S. at 17-18.

[85] *See Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 894 (Fed. Cir. 1984) ("*Perkin-Elmer*"), *cert. denied*, 469 U.S. 857 (1984); *Avia Group Int'l, Inc. v. L.A. Gear California*, 853 F.2d 1557, 1564 (Fed. Cir. 1988) ("*Avia*") (copying by others); *In re Hedges*, 783 F.2d 1038, 1041 (Fed. Cir. 1986) ("*Hedges*") (prior art teaching away; invention contrary to accepted wisdom); *Kloster Speedsteel AB v. Crucible Inc.*, 793 F.2d 1565 (Fed. ir. 1986) ("*Kloster*"), *cert. denied*, 479 U.S. 1034 (1987) (wide acceptance and recognition of the invention).

[86] *Richardson-Vicks Inc.*, 122 F.3d at 1483-84.

[87] *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995) ("*GPAC*"); *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988), *cert. denied*, 488 U.S. 956 (1988) ("*Demaco*"); *Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, Commission Opinion (March 15, 1990),15 U.S.P.Q.2d 1263, 1270 ("*Certain Crystalline*").

[88] *Id.* at 1393.

of making and using the invention "in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same."

The issue of whether a disclosure is enabling is a matter of law.[89] "To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'"[90] "Patent protection is granted in return for an enabling disclosure of an invention, not for vague, intimations of general ideas that may or may not be workable."[91] Although a specification need not disclose minor details that are well known in the art, "[i]t is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement," and in so doing the specification cannot merely provide "only a starting point, a direction for further research."[92] On the other hand, "[i]t is not fatal if some experimentation is needed, for the patent document is not intended to be a production specification."[93] "Undue experimentation" is "a matter of degree" and "not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed ...."[94]

It is well-settled that in order to be enabling under Section 112, "the patent must contain a

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[89] *Applied Materials, Inc. v. Advanced Semiconductor Materials America, Inc.*, 98 F.3d 1563, 1575 (Fed. Cir. 1996) ("*Applied Materials*").

[90] *Genentech, Inc. v. Novo Nordisk, A/S*, 108 F.3d 1361, 1365 (Fed. Cir. 1997) ("*Genentech*").

[91] *Id.* at 1366.

[92] *Id.*

[93] *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941 (Fed. Cir. 1990) ("*Northern Telecom*").

[94] *PPG Industries, Inc. v. Guardian Industries Corp.*, 75 F.3d 1558, 1564 (Fed. Cir. 1996) ("*PPG Industries*").

description sufficient to enable one skilled in the art to make and use the full scope of the claimed invention."[95] Section 112 requires that the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to such persons.[96]

D. Enforceability - Inequitable Conduct

A patent is unenforceable on grounds of "inequitable conduct" if the patentee withheld material information from the PTO with intent to mislead or deceive the PTO into allowing the claims.[97] Both materiality and intent must be proven by clear and convincing evidence.[98] When inequitable conduct occurs in relation to one or more claims of a patent, the entire patent is unenforceable.[99]

According to the rules of the PTO, the duty to disclose information "exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim."[100]

Generally, when withheld information is highly material, a lower showing of deceptive intent

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[95] *United States v. Teletronics, Inc.*, 857 F.2d 778, 785 (Fed. Cir. 1988) ("*Teletronics*"); *see also Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd.*, 927 F.2d 1200, 1213 (Fed. Cir. 1991) ("*Chugai*") (inventor's disclosure must be "sufficient to enable on skilled in the art to carry out the invention commensurate with the scope of his claims").

[96] *Application of Fischer*, 427 F.2d 833, 839 (C.C.P.A. 1970) ("*Fischer*").

[97] *LaBounty Mfr., Inc. v. U.S. Int'l Trade Comm'n*, 958 F.2d 1066, 1070-1074 (Fed. Cir. 1992) ("*LaBounty*").

[98] *Id.*; *Kingsdown Med. Consultants, Ltd. v. Hollister, Inc.*, 863 F.2d 867, 872 (Fed. Cir. 1988), *cert. denied*, 490 U.S. 1067 (1989) ("*Kingsdown*").

[99] *Kingsdown*, 863 F.2d at 874.

[100] 37 C.F.R. § 1.56(a).

will be sufficient to establish inequitable conduct.[101] Moreover, "[d]irect proof of wrongful intent is rarely available but may be inferred from clear and convincing evidence of the surrounding circumstances."[102] The conduct at issue must be viewed in light of all the evidence, including evidence of good faith.[103] In other words "where withheld information is material and the patentee knew or should have known of that materiality, he or she can expect to have great difficulty in establishing subjective good faith sufficient to overcome an inference of intent to mislead."[104]

"Information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent."[105] A patent applicant, however, has no obligation to disclose a reference that is cumulative or less pertinent than those already before the examiner.[106] Under the rules of the PTO, information is material when it is not cumulative to information of record and it either (i) "establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim"; or (ii) "it refutes, or is inconsistent with, a position the applicant takes" in either opposing the PTO's argument of unpatentability or asserting the applicant's own argument of patentability.[107] Close cases,

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[101] *Am. Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1363 (Fed. Cir.), *cert. denied*, 469 U.S. 821 (1984) ("*American Hoist*").

[102] *LaBounty*, 958 F.2d at 1076; *Bristol-Myers Squibb Co. v. Rhone-Poulenc Rorer, Inc.*, 326 F.3d 1226, 1239 (Fed. Cir. 2003) ("*Bristol-Myers*"); *GFI, Inc. v. Franklin Corp.*, 265 F.3d 1268, 1274 (Fed. Cir. 2001) ("*GFI*"); *Merck & Co. v. Danbury Pharmacal, Inc.*, 873 F.2d 1418, 1422 (Fed. Cir. 1989) ("*Danbury*").

[103] *Kingsdown*, 863 F.2d at 876.

[104] *Bristol-Myers*, 326 F.3d at 1239 (citing *Akron Polymer Container Corp. v. Exxel Container, Inc.*, 148 F.3d 1380, 1384 (Fed. Cir. 1998) ("*Akron*")); *see also GFI*, 265 F.3d at 1275.

[105] *LaBounty*, 958 F.2d at 1074; GFI, 265 F.3d at 1274; *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1179 (Fed. Cir. 1995) ("*Molins*").

[106] *Halliburton Co. v. Schlumberger Tech. Corp.*, 925 F.2d 1435, 1439-40 (Fed. Cir. 1991) ("*Halliburton*").

[107] 37 C.F.R. § 1.56(b).

however, "should be resolved by disclosure, not unilaterally by applicant."[108]

E. Patent Misuse

Patent misuse is an equitable defense to a claim of patent infringement.[109] As the Federal Circuit has explained:

> The policy of the patent misuse doctrine is "to prevent a patentee from using the patent to obtain market benefit beyond that which inures in the statutory patent right." Therefore, in evaluating a patent-misuse defense, "[t]he key inquiry is whether, by imposing conditions that derive their force from the patent, the patentee has impermissibly broadened the scope of the patent grant with anticompetitive effect."[110]

Patent misuse has been found, for example, when a patentee conditions a patent license on the purchase of unpatented goods,[111] or when a patent license requires royalty payments after the expiration of the licensed patents.

To determine if patent misuse exists, courts must conduct a three-part analysis.[112] First, the court determines whether the alleged misuse practice is immunized under Section 271(d) of Title 35 of the United States Code. Second, the court determines if the challenged practice fits into the very narrow category of *per se* misuse, such as "tying" arrangements. If a case is not resolved by the third step, the court must determine if the challenged practice is

> "reasonably within the patent grant, *i.e.,* that it relates to subject matter within the scope of the patent claims." If so, the practice does not have the effect of broadening the scope of the patent claims and thus cannot constitute patent misuse. If, on the

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[108] *Abbott Laboratories v. TorPharm, Inc.*, 300 F.3d 1367, 1379 (Fed. Cir. 2002) ("*Abbott*") *quoting LaBounty,* 958 F.2d at 1076.

[109] *U.S. Philips Corp. v. United States Int'l Trade Comm'n*, 424 F.3d 1179, 1184 (Fed. Cir. 2005) ("*Philips*").

[110] *Monsanto Co. v. McFarling*, 363 F.3d 1336,1341 (Fed. Cir. 2004) ("*Monsanto*") (citations omitted).

[111] See *Carbice Corp. of Am. v. Am. Patents Dev. Corp.*, 283 U.S. 27 (1931) ("*Carbice*").

[112] *Virginia Panel Corp. v. MAC Panel Co.*, 133 F.3d 860, 868 (Fed. Cir. 1997) ("*Virginia Panel*").

> other hand, the practice has the effect of extending the patentee's statutory rights and does so with an anti-competitive effect, that practice must then be analyzed in accordance with the "rule of reason." Under the rule of reason, "the finder of fact must decide whether the questioned practice imposes an unreasonable restraint on competition, taking into account a variety of factors, including specific information about the relevant business, its condition before and after the restraint was imposed, and the restraint's history, nature, and effect."[113]

Although there are similarities between patent misuse and a violation of the antitrust laws, patent misuse is a broader violation, and thus may be found even where there is no antitrust violation.[114]

F. Unclean Hands

The unclean hands doctrine provides that a court's equitable power "can never be exerted on behalf of one who has acted fraudulently, or who by deceit or any unfair means has gained an advantage."[115] Courts will only apply the doctrine when it has been shown that the inequitable conduct bears "an immediate and necessary relation to the equity" that the patent holder seeks in litigation.[116] Unclean hands must be proven by clear and convincing evidence.[117]

IV. The '485 Patent

A. Overview

Thirteen claims of the '424 patent are asserted against Respondents, namely independent claims 1 and 32, along with dependent claims 3, 4, 18, 19, 23, 24, 29, 33, 36, 37, and 41. These claims read as follows:

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[113] *Virginia Panel*, 133 F.3d at 868.

[114] *Monsanto Co. v. Scruggs*, 459 F.3d 1328, 1339 (Fed. Cir. 2006) ("*Scruggs*").

[115] *Keystone Driller Co. v. General Excavator Co.*, 290 U.S. 240, 245 (1933) ("*Keystone*").

[116] *Certain Home Vacuum Packaging Products*, 337-TA-496, 2004 WL 1082507, Notice at 88-89 (March 2004) ("*Certain Home Vacuum Packaging*"); *see also Precision Instrument Mfg., Co. v. Automotive Maint. Mach. Co.*, 324 U.S. 806, 815 (1945) ("*Precision Instrument*").

[117] *In re Omeprazole Patent Litigation*, 483 F.3d 1364, 1374 (Fed. Cir. 2007) ("*Omeprazole*").

1. A method of producing a tested semiconductor device comprising: providing a probe card assembly, said probe card assembly including a probe card having a plurality of electrical contacts, a probe substrate having a plurality of elongate, resilient probe elements, and a compliant interconnection structure electrically connecting ones of said electrical contacts with ones of said probe elements; providing a plurality of semiconductor devices, each of said semiconductor devices including electrical contact pads; bringing said probe elements into contact with said electrical contact pads of said semiconductor device; and testing said semiconductor devices.

3. The method of claim 1, wherein said plurality of semiconductor devices are in wafer form.

4. The method of claim 1, wherein said method of producing a tested semiconductor device further comprises the step of dicing said wafer to singulate said semiconductor devices.

18. The method of claim 1 further comprising aligning tips of said probe elements by altering an orientation of said probe substrate with respect to said probe card.

19. The method of claim 18 wherein said altering comprises moving a moveable element disposed so as to affect an orientation of said probe substrate with respect to said probe card.

23. The method of claim 19, wherein moving said moveable element in a first direction causes at least a portion of said probe substrate to move toward said probe card.

24. The method of claim 23, wherein moving said moveable element in a second direction allows at least a portion of said probe substrate to move away from said probe card.

29. The method of claim 1, wherein said probe substrate comprises a space transformer.

32. A method of producing a tested semiconductor device comprising: providing a probe card comprising a plurality of electrical contacts; providing a probe substrate moveably affixed to said probe card and comprising a plurality of elongate, resilient probe elements, ones of said elongate resilient probe elements being in electrical communication with ones of said electrical contacts; aligning tips of said probe elements by altering an orientation of said probe substrate with respect to said probe card; providing a semiconductor device; bringing said tips into contact with said semiconductor device; and testing said semiconductor device.

33. The method of claim 32, wherein said altering comprises moving a moveable element disposed so as to affect an orientation of said probe substrate with respect to said probe card.

36. The method of claim 33, wherein moving said moveable element in a first direction causes at least a portion of said probe substrate to move toward said probe card.

37. The method of claim 36, wherein moving said moveable element in a second direction allows at least a portion of said probe substrate to move away from said probe card.

41. The method of claim 32, wherein said probe substrate comprises a space transformer.

As noted above, the undersigned has already construed the above claims in a *Markman* order.[118] A summary of the claims construed in that order is detailed below:

Claim	Term	Construction
Claim 1	providing a probe card assembly	placing or installing a probe card assembly
Claim 1	probe card	electronic component having a plurality of contact areas disposed on a surface thereof
Claim 1	probe substrate	electronic carrier
Claim 1	elongate, resilient probe elements	interconnection elements 524 having greater length than width that exhibit primarily elastic behavior in response to an applied load or contact force
Claim 1	compliant interconnection structure electrically connecting ones of said electrical contacts with ones of said probe elements	a compliant structure to electrically connect ones of said electrical contacts with ones of said probe elements
Claim 1	compliant	exhibiting both elastic and plastic behavior in response to an applied load or contact force
Claim 1	ones	more than one
Claim 18	aligning tips of said probe elements by altering an orientation of said probe substrate with respect to said probe card	plain meaning
Claim 19	[moving a] moveable element disposed so as to affect an orientation of said probe substrate with respect to said probe card and moveable element	a moveable mechanism capable of altering the orientation of the probe substrate with respect to the probe card
Claim 29	space transformer	an interconnect assembly that makes interconnections from one pitch to another pitch
Claim 32	providing a probe card	placing or installing a probe card

[118] See Order No. 37 (January 23, 2009).

Claim 32	moveably affixed to said probe card	secured in a manner to permit movement of the probe substrate from one fixed position to another fixed position relative to the probe card

B. Infringement

1. Phicom - In General

FormFactor asserts that Phicom's accused MEMS cards are custom-made probe card assemblies with no other use than for producing a tested semiconductor device, as described in the '485 patent. According to FormFactor, Phicom makes, offers for sale, sells to, and supports its accused products for semiconductor manufacturers, that, in turn, use these products in their intended manner which necessarily infringes the '485 patent. Specifically, FormFactor asserts that semiconductor device makers using Phicom Type A, B, C, and D MEMS cards to produce tested semiconductor devices infringe the asserted claims of the '485 patent literally or under the doctrine of equivalents.[119]

FormFactor asserts that Phicom MEMS cards [ ] includes all of the claimed elements of the probe card assembly disclosed in the '485 patent, including:

- a printed circuit board or "PCB," which satisfies the "probe card" limitation;[120]
- a space transformer called a Micro Probe Head or "MPH," which satisfies the "probe substrate" limitation;[121]

[119] CIB 3-4 citing JX-48C (Provost Dep) at 50; CX-732C (Howe Direct) at 34.

[120] CIB 5 citing CX-580C (Diagram); CX-732C (Howe Direct) at 36; CX-580C (Diagram); JX-39C (Hwang Dep) at 26; CX-760C (Howe Supplemental) at 8; Taber, Tr. 1565-66, 1568-69; Hwang, Tr. 1369-71.

[121] CIB 5 citing CX-580C (Diagram); CFF 392-397, 501-504.

• a Micro Probe spring, which satisfies the "elongate, resilient probe elements" limitation;[122]

• a New Interface Pin or "NIP," which satisfies the "compliant interconnection structure" limitation;[123] and

• planarization mechanisms, which satisfies the "moveable element" limitation.[124]

Phicom asserts that FormFactor has not met its burden of proving any direct infringement of the asserted claims because there is no evidence that any of Phicom's customers performs all of the asserted claim steps. Phicom assets that FormFactor's only allegations of direct infringement by a Phicom customer relate to the previous use by [ ][125]

a. Direct Infringement

(1) Claim 1

FormFactor asserts that any use of a Phicom type A, B, C, and D MEMS card to produce a tested semiconductor device infringes claim 1 of the '485 patent. According to FormFactor, the evidence shows that [ ] produced DRAM devices using Phicom MEMS cards, thereby practicing all the steps in claim 1 of the '485 patent, as detailed above.[126] Furthermore, FormFactor asserts that [ ] installed MEMS cards into its testers, provided wafers containing the semiconductor devices to be tested, and that by bringing Phicom's Micro Probes into contact with

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[122] CIB 5 citing JX-41C (Jeong Dep) at 40-41; CX-26C (Phicom IR Presentation); CX-653C (Pictures from Howe Report); CX-146C (PowerPoint Presentation); JX-39C (Hwang Dep) at 32; CX-147C (MEMS card document); CFF 403, 405-412.

[123] CIB 6 citing JX-3 ('485 patent) at 12; CFF 397, 414-417, 419, 425, 427-429, 434-436, 440, 443-444, 458-459, 464. Alternatively, FormFactor asserts that if NIPs do not literally infringe, they infringe under the doctrine of equivalents. CIB 6-7.

[124] CIB 7 citing CFF 502-505, 1128.

[125] RIB 19 citing RFF I.B.2.14.

[126] CIB 7-8 citing CFF 363-366, 381.

the electrical contact pads of the semiconductor devices, [ ] tested the semiconductor devices.[127]

Phicom asserts that its customers do not infringe independent claim 1, along with dependent claims 3, 4, 18, 19, 23, 24, and 29 because the probe card assemblies do not include a "compliant interconnection structure" or "probe card."[128] Specifically, Phicom asserts that, under the undersigned's claim construction of the term "compliant," its probe cards do not infringe because the Phicom PCB and MPH are connected by a plurality of interface pins (NIPs), which are not "compliant." According to Phicom, the NIPs are designed to maintain their resilience and do not show any plastic properties. Phicom asserts that it does not want the NIPs to exhibit any plasticity and that tests confirm that, under normal operating conditions, the NIPs do not plastically deform.[129]

Phicom also asserts that the claim requires the "complaint interconnection structure" to "electrically connect[] ones of said electrical contacts with ones of said probe elements," which the undersigned construed as "a compliant structure to electrically connect more than one of said electrical contacts with more than one of said probe elements." According to Phicom, its assembly has no such single structure that electrically connects contacts of the PCB to the probe elements of the MPH. Rather, Phicom asserts that there are a plurality of NIPs with each NIP individually providing communication between one socket in the Phicom PCB and on the MPH.[130]

Furthermore, Phicom asserts that independent claims 1 and 32 both require the assembly to include a "probe card having a plurality of electrical contacts," which the undersigned construed as "an electronic component having a plurality of contact areas disposed on a surface thereof." Phicom

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[127] CIB 8 citing CFF 364-366, 494-495.
[128] RIB 21 citing RFF IV.B.4-01-58.
[129] RIB 21-21 citing RFF IV.B.4.25-52.
[130] RIB 22-23 citing RFF IV.B.4. 25, 48-52.

argues that its PCB does not include contact areas disposed on its surface that electrically contact the NIPs. Rather, Phicom asserts that each NIP is inserted into a socket that is inside the PCB, not on its surface.[131]

Staff agrees with FormFactor that the evidence shows that Phicom's Type A and D probe card assemblies, and its old Type B and C probe card assemblies [ ] directly infringe claims 1, 3, 4, and 29 of the '485 patent. Staff also agrees with FormFactor that the these probe card assemblies also indirectly infringe claims 1, 3, 4, and 29 of the '485 patent.[132] According to Staff, Phicom's non-infringement argument centers around the "compliant interconnection structure electrically connecting ones of said electrical contacts with ones of said probe elements" and "probe card" limitations.

With regard to the "compliant" limitation, Staff asserts that the testimony of Mr. Hwang establishes that the NIPs satisfy the "compliant" limitation because his testimony that NIPs are purely elastic is not credible.[133] As Phicom's expert, Mr. Taber, relies heavily on Mr. Hwang's testimony, Staff asserts that Mr. Taber's testimony as to the elasticity of NIPs also lacks credibility.[134] Staff relies on Dr. Howe's testimony in support.[135]

As to Phicom's argument that Phicom's probe card assemblies do not satisfy the "compliant" limitation because there is no single structure that connects all of the contacts to all of the probe

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[131] RIB 23 citing RFF IV.B.4.04-07, 09-24.

[132] SIB 22-23.

[133] SIB 23-26 citing Hwang, Tr. 1354-54, 1373-78 and JX-39C (Hwang Dep) at 35 compare with RX-413 (Hwang Rebuttal) at Q/A 13; RX-381C (Hwang Direct) at Q/A 77-83; and Hwang, Tr. 1418-19.

[134] SIB 27 citing RX-418C (Taber Supplemental Rebuttal) at Q/A 13-18; RX-415C (Taber Rebuttal) at Q/A 103-05.

[135] SIB 27 citing CX-760C (Howe Supplemental) at Q/A 15-18.

elements, Staff asserts that while NIPs are individual pins, it does not necessarily follow that they cannot, collectively, be an "interconnection structure" because there is nothing in the undersigned's claim construction that requires the "interconnection structure" to be a "singular" structure. Furthermore, Staff asserts that construing the "interconnection structure" to be a "singular" structure would exclude the preferred embodiment.[136] Staff also cites to Dr. Howe's testimony in support.[137]

With regard to the "probe card" limitation, Staff asserts that Phicom's interpretation, which is that the "probe card" limitation requires the electrical contact areas to be on the "top" surface, as opposed to on "a" surface of the printed circuit board contained within a socket, is unsupported because the undersigned's claim construction makes no indication that "surface" must be on "top." Accordingly, Staff asserts that Phicom's probe card assemblies meet the "probe card" limitation. Staff cites to Mr. Hwang's testimony in support.[138]

Finally, Staff submits that there is circumstantial evidence that Hynix Eugene used Phicom's Type A and D MEMS Cards and its old Type B and C MEMS Cards to practice, and therefore, directly infringe claims 1, 3, 4, and 29.[139]

FormFactor counters Phicom's non-infringement arguments. First, as to Phicom's argument that the NIPs do not meet the "compliant interconnection structure" limitation, FormFactor asserts that Phicom's witness admitted that "depending upon the conditions under which [the NIP] is used, sometimes plastic deformation may occur," indicating that NIPs fall within the undersigned's claim

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[136] SIB 28 citing JX-3 (the '485 patent) at Fig. 3A, col. 20:66-21:8.
[137] SIB 28-29 citing CX-732C (Howe Direct) at Q/A 97, 237.
[138] SIB 29-30 citing Hwang, Tr. 1372; CX-732 (Howe Direct) at Q/A 96-105, 112-114.
[139] SIB 30 citing CX-732C (Howe Direct) at Q/A 96.

construction of the term "compliant."[140] Furthermore, FormFactor cites to Dr. Howe's testimony that, depending on how the NIPs are inserted into the PCB sockets, the tilt of the NIP can cause the tip of the NIP to offset from the intended position and result in a deformation of the NIP.[141] Finally, FormFactor asserts that Phicom's single structure argument, which was presented during the *Markman* hearing and rejected, should be rejected.[142]

Second, as to Phicom's argument that the PCB does not meet the "probe card" limitation, FormFactor asserts that, since the undersigned's claim construction does not require the contact areas be disposed on the top surface of the PCB, it therefore does not exclude a surface within a socket.[143] FormFactor also asserts that the PCB's surface area around the socket holes contains gold plated conductive material that extends all the way down to the sockets.[144]

Phicom, in reply, asserts that, while FormFactor has had an actual sample of Phicom's probe card assembly and the opportunity to perform tests to establish whether the NIPs in actual use are "compliant," FormFactor has produced no such testing results or evidence that the NIPs are "compliant." Rather, FormFactor merely relies on a theory that the NIPs are capable of being compliant.[145] Furthermore, Phicom asserts that FormFactor's theory is based on a NIP that is bent, but that FormFactor has not presented any evidence that a NIP was bent during use in the U.S.[146]

Phicom counters Staff's arguments that Mr. Hwang's testimony is not credible. First, Phicom asserts that Mr. Hwang's testimony on the hypothetical use of a NIP does not change or

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[140] CRB 1 citing Hwang, Tr. 1353-54.
[141] CRB 2 citing CX-751C (NIP Characteristics); CX-760C (Howe Supplemental) at Q/A 15.
[142] CRB 2.
[143] CRB 2.
[144] CRB 2-3 citing CX-580C (Diagram); CFF 382-391.
[145] RRB 3.
[146] RRB 4 citing RRCFF 425, 443, 444.

discredit his testimony. Phicom asserts that Mr. Hwang was just making a truthful acknowledgment of the undisputed fact that NIPs can theoretically be deformed plastically. Second, Phicom asserts that if Mr. Hwang's testimony is deemed as not being credible, then FormFactor cannot possibly carry its burden based on such testimony. Finally, Phicom asserts that Mr. Hwang's testimony neither strengthens or weakens the credibility of either party's experts.[147]

Phicom also counters Staff's argument regarding a singular interconnect structure. According to Phicom, while Staff asserts that requiring a single interconnect structure would exclude the preferred embodiment, such as in Figure 3A, Phicom counters that the interposer in Figure 3A, along with every other embodiment, is described and illustrated as a single structure made of a substrate to which a plurality of interconnectors are mounted. Phicom asserts that, because its assemblies have no such single structure, it does not infringe the '485 patent.[148]

Phicom also counters Staff's arguments that Phicom's contacts are on the surface. According to Phicom, Staff maintains that if the contacts are in the socket, they are still considered to be on the "surface." While Phicom disagrees with such a construction, Phicom asserts that there is still no infringement because there is still no "plurality of contact areas disposed on [that] surface."[149] Phicom also counters FormFactor's argument that the small lips of the sockets meet this claim limitation with Mr. Taber's testimony.[150]

The undersigned finds the arguments of Phicom to be persuasive and that FormFactor has failed to prove, by a preponderance of the evidence, that Phicom's probe card assemblies meet each

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[147] RRB 5-6.
[148] RRB 6.
[149] RRB 6-7.
[150] RRB 7 citing RFF IV.B.4.01-4.24.

and every limitation of claim 1 of the '485 patent. Specifically, FormFactor has failed to show that the NIPs in Phicom's probe card assemblies meet the "compliant" limitation because there is no evidence that the NIPs exhibit plastic behavior during normal operating use. The only evidence that FormFactor provides in support of infringement is a theory by Dr. Howe that the NIPs are capable of being plastically deformed. There is no evidence that any such deformation has taken place, as no tests were performed on the NIPs. As to Mr. Hwang's testimony, the undersigned finds that his testimony is not inconsistent, as the questions relied upon by FormFactor to discredit his testimony were hypothetical in nature and neither strengthen nor weaken the credibility of either party's experts.

As to Phicom's remaining non-infringement arguments, the undersigned agrees with FormFactor and Staff that, there is nothing in the undersigned's claim construction that requires the "interconnection structure" to be a "singular" structure, or that "surface" must be on "top." Accordingly, Phicom's remaining non-infringement arguments are hereby rejected.

In conclusion, Phicom's products do not infringe claim 1 of the '485 patent.

(2) Claim 3

FormFactor asserts that the additional limitation in claim 3 is a wafer requirement.[151] FormFactor argues that [ ] produced DRAM devices using Phicom MEMS cards and tested the devices on wafers.[152]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation

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[151] CIB 8 citing JX-3 (the '485 patent) at col. 36.
[152] CIB 8 citing JX-48C (Provost Dep) at 50-51; CFF 496-498.

of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 3.

(3) Claim 4

FormFactor asserts that the additional limitation in claim 4 is dicing the wafer to singulate the semiconductor devices.[153] FormFactor argues that after a semiconductor manufacturer tests a wafer using a Phicom type A, B, C, and D MEMS card, the wafers are diced or cut to singulate the individual tested semiconductor devices. Furthermore, FormFactor asserts that the only use of a tested semiconductor wafer tested using the Phicom type A, B, C, or D MEMS probe card occurs after its subsequent singulation.[154]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 4.

(4) Claim 18

FormFactor asserts that the additional limitation in claim 18, namely "aligning tips of said probe elements by altering an orientation of said probe substrate with respect to said probe card" is present in Phicom's Type A, B, C and D MEMS Cards because all of these cards have planarization mechanisms that include adjusting bolts employed to align the probe element tips by altering the orientation of the MPH with respect to that of the PCB.[155] Furthermore, FormFactor asserts that once implemented, the planarizing mechanisms in the MEMS Cards continue to alter the orientation of

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[153] CIB 8 citing JX-3 (the '485 patent) at col. 36.
[154] CIB 8 citing CFF 494-500.
[155] CIB 8-9 citing CFF 502-504.

the MPH with respect to that of the PCB throughout their useful lives, or until another adjustment. Therefore, FormFactor asserts that when [ ] installs Phicom's MEMS Cards, they continue to employ this limitation.[156]

As to when a Phicom MEMS Card requires readjustment for various reasons, such as wear, insertion into a new test assembly, or repair, FormFactor asserts that the altering of orientation is also performed at the facilities of the semiconductor manufacturers.[157] According to FormFactor, Phicom's assertion that Phicom is the only entity who uses the adjusting screw or planarization mechanism is contrary to fact. Furthermore, FormFactor asserts that whether it is the customer itself or Phicom that adjusts the MEMS Card, the step of altering the orientation of the probe substrate is clearly performed.[158]

As to Phicom's assertion of "divided infringement," FormFactor asserts that such a defense should be rejected because when the actions of more than one party combine to perform every step of a claimed method, the claim is infringed if "one party exercises 'control or direction' over the entire process.[159] According to FormFactor, Phicom is performing the tip alignment on behalf of its customer, at the customer's direction.[160]

Phicom asserts that alignment of Phicom's probe card assembly is not a customer activity because Phicom performs alignment of its probe card assemblies at its factory in Korea before the

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[156] CIB 9 citing CFF 517.

[157] CIB 9 citing CFF 506-07.

[158] CIB 9 citing CFF 507-509, 511, 514, 515.

[159] CIB 10 citing *Muniauction*, 532 F.3d at 1329; *Certain GPS Devices and Prods. Containing Same*, Inv. No. 337-TA-602 (Comm. Op. January 27, 2009) ("*Certain GPS*").

[160] CIB 10.

PCB is shipped to the customer.[161] Phicom also asserts that it has taken steps to prevent customers from having access to alignment features, such as plates that are held in place by special screws that require a special tool and covered with a Loctite seal. Phicom asserts that these have been used for all probe assemblies since 2006. According to Phicom, FormFactor has not shown that any Phicom customer performs any adjustment of Phicom probe card assemblies with the secured and sealed cover plates.[162] Therefore, Phicom asserts that it does not infringe claims 18, 19, 23, and 24.[163]

Staff asserts that the evidence does not show direct infringement of claims 18, 19, 23, 24, 32, 33, 36, 37, and 41.[164] Specifically, Staff asserts that, while there is conflicting evidence, the preponderance of the evidence does not show that either Phicom [ ] to be the "mastermind" over the actions of the other.[165]

FormFactor counters Phicom's non-infringement argument that the "aligning" step is not performed by the semiconductor manufacturers because there is no dispute that the MEMS cards go through the aligning step prior to their shipment from Phicom's Korean factory, which is done at the request and specification of the customers.[166] Furthermore, FormFactor asserts that there is evidence that customers have adjusted Phicom's MEMS cards on site, and that Phicom encourages such activities.[167] Alternatively, FormFactor asserts that when Phicom customers send their MEMS cards for readjustment, it is clear that the adjustment is performed on behalf of the customers.[168]

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[161] RIB 23 citing RFF IV.B.5.14-16, 34-35.
[162] RIB 24 citing RFF IV.B.5.19-23.
[163] RIB 23-24.
[164] SIB 32-33.
[165] SIB 32.
[166] CRB 3.
[167] CRB 4 citing CFF 506-509, 511, 514, 515.
[168] CRB 4 citing CFF 516, 512, CX-226C, CX-289C.

Phicom, in reply, asserts that regardless of whether any of Phicom's customers have performed the "altering" step, FormFactor has not proven that Phicom is guilty of any indirect infringement and that Phicom has undertaken numerous steps to prevent its customers from adjusting its probe card assemblies.[169] Phicom also counters FormFactor's "mastermind" theory and asserts that the evidence shows that Phicom shares an arms-length relationship with its customers.[170]

FormFactor is asserting a theory of "joint" direct infringement. The case law makes clear that such joint infringement is permissible. However, mere "arms-length cooperation" will not give rise to direct infringement.[171] The undersigned agrees with Phicom and Staff that FormFactor has failed to show, by a preponderance of the evidence, that there is direct infringement of claim 18 because the evidence does not show that Phicom's customers are the "mastermind" or are in "control" over Phicom when adjustments are made to the probe card assemblies. Rather, the evidence shows that there is merely an arms-length relationship between Phicom and its customers. Accordingly, the undersigned finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claim 18 of the '485 patent, in addition to not meeting each and every limitation of claim 1 of the '485 patent.

(5) Claim 19

FormFactor asserts that the additional limitation of "said altering comprises moving a moveable element disposed so as to affect an orientation of said probe substrate with respect to the probe card" in claim 19 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that the adjusting bolts of the Phicom MEMS Card's planarization mechanisms are moveable

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[169] RRB 7-8.
[170] RRB 7-8 citing RRCFF 505, 512, 516.
[171] *Muniauction*, 532 F.3d at 1329.

elements.[172]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 1 and 18 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 19.

(6) Claim 23

FormFactor asserts that the additional limitation of "moving the moveable element in one or the other direction causes a portion of probe substrate to move toward the probe card" in claim 23 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that turning the adjusting bolts in a clockwise direction causes the relevant portion of the probe substrate to move toward the probe card.[173]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 1, 18, and 19 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 23.

(7) Claim 24

FormFactor asserts that the additional limitation of "moving the moveable element in one or the other direction causes a portion of probe substrate to move away from the probe card" in claim 24 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that turning the adjusting bolts in a counterclockwise direction causes the relevant portion of the probe substrate to

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[172] CIB 11 citing CFF 518-520.
[173] CIB 11 citing CFF 521.

move away from the probe card.[174]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 1, 18, 19, and 23 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 24.

(8) Claim 29

FormFactor asserts that the additional limitation of a "space transformer" in claim 29 is practiced by Phicom's MPH. Specifically, FormFactor asserts that Phicom's probe substrate is a ceramic substrate with terminals disposed at a first pitch on one surface and corresponding terminals disposed at a second pitch on the opposite surface.[175]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 29.

(9) Claim 32

FormFactor asserts that claim 32 has many limitations that overlap with claims 1 and 18, including a "probe card" containing electrical contacts; a "probe substrate" "moveably affixed" to the probe card; "elongate, resilient probe elements" on the probe substrate being in electrical communication with the electrical contacts; and alignment of tips of the probe elements by altering an orientation of the probe substrate with respect to the probe card. According to FormFactor,

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[174] CIB 11 citing CFF 521.
[175] CIB 11-12 citing CX-653C (Pictures from Howe Report); CFF 522-525.

Phicom's Type A, B, C, and D MEMS Cards include all these elements.[176] Furthermore, FormFactor asserts that [ ] produced DRAM devices using Phicom's MEMS Cards, thereby practicing each and every element of claim 32.[177]

Phicom asserts that claims 32, 33, 36, 37, and 41 include similar claim limitations as those in dependent claims 18, 19, 23, and 29, therefore these claims do not infringe for the same reasons. Specifically, as to claim 32, Phicom asserts that Phicom's PCB does not have a plurality of contacts on its surface, nor is there any proof that the "altering an orientation" limitation in claims 32, 33, 36, 37, and 38 are practiced by any of Phicom's customers who have received Phicom's probe assemblies with cover plates made and sold since 2006.[178]

As the parties have not presented any new arguments as to claim 32 with regard to the claim limitations "probe card," "probe substrate," "moveably affixed," and "elongate, resilient probe elements," and the undersigned has already found that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 1 and 18 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 32 for the same reasons.

(10) Claim 33

FormFactor asserts that the additional limitation of "altering of orientation comprises moving a moveable element" in claim 33 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that Phicom's MEMS Card includes adjusting bolts that are rotated in order to alter

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[176] CIB 12 citing CFF 528-31; CX-580C (Diagram); CX-185C (Job Procedure Form).
[177] CIB 13 citing CFF 532.
[178] RIB 24.

orientation of the probe substrate with respect to the probe card.[179]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claim 32 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 33.

(11) Claim 36

FormFactor asserts that the additional limitation of "moving the moveable element in one or the other direction causes a portion of probe substrate to move toward the probe card" in claim 36 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that Phicom's MEMS Cards have planarizing mechanisms that cause the relevant portion of the probe substrate to move toward the probe card by turning the adjusting bolts in a clockwise direction.[180]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 32 and 33 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 36.

(12) Claim 37

FormFactor asserts that the additional limitation of "moving the moveable element in one or the other direction causes a portion of probe substrate to move away from the probe card" in claim 37 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that Phicom's MEMS Cards have planarizing mechanisms that cause the relevant portion of the probe substrate to

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[179] CIB 13 citing CFF 534.
[180] CIB 13 citing CFF 535-537.

move away from the probe card by turning the adjusting bolts in a counterclockwise direction.[181]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claims 32, 33, and 36 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 37.

(13) Claim 41

FormFactor asserts that the additional limitation of "space transformer" in claim 41 is practiced by Phicom's MEMS Cards. Specifically, FormFactor asserts that Phicom's MEMS Cards include a space transforming probe substrate in the form of an MPH, which is a ceramic substrate with terminals disposed at a first pitch on one surface and corresponding terminals disposed at a second pitch on the opposite surface.[182]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of claim 32 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies infringe claim 41.

b. Indirect Infringement

(1) Contributory Infringement

In support of its assertion of indirect infringement, FormFactor asserts that Phicom has had knowledge of the '485 patent since at least December 2007, which is when this investigation was instituted, and that Phicom has continued infringing the '485 patent by importing the accused

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[181] CIB 13 citing CFF 535-537.
[182] CIB 13 citing CFF 538.

products into the U.S.[183] Furthermore, FormFactor asserts that Phicom has affirmatively and actively engaged with its customers in designing, building, using, and repairing the custom-made accused products that have no non-infringing uses.[184] [

]185

Phicom asserts that because FormFactor has not proved direct infringement, it cannot prove contributory infringement. Phicom also asserts that FormFactor has failed to prove that Phicom knew that its probe card assembly was especially made or adapted for use in a manner that would infringe the '485 patent. Furthermore, Phicom asserts that it does not have the requisite knowledge, as it asserts that its probe cards do not infringe. According to Phicom, its MEMS probe card assemblies include a plurality of elastic NIPs to interconnect the MPH and PCB, do not use an interposer, and use cover plates, special screws, and Loctite to prevent access to planarization screws.[186]

The undersigned agrees with Phicom that, because FormFactor has not proven direct infringement, it cannot prove contributory infringement. Accordingly, FormFactor has failed to show that Phicom contributorily infringes the asserted claims of the '485 patent.

(2) Induced Infringement

Phicom asserts that because FormFactor has not proved direct infringement, it cannot prove

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[183] CIB 4 citing CFF 363-367.

[184] CIB 4 citing CX-144C (User Guide), CX-289C (MEMS Order Form), CX-313C (DC 512M DDR2 63 DUT), JX-48C (Provost Dep).

[185] CIB 4 citing CX-570C (E-mail), CX-235C (Indemnification Agreement), and CFF 369-378.

[186] RIB 25.

induced infringement. Phicom also asserts that FormFactor has failed to prove that Phicom actively took steps to cause a customer to practice the claimed methods, or that it do so with the requisite intent to cause infringement. According to Phicom, it has taken active steps to avoid infringement of the asserted patents. Phicom argues that FormFactor has failed to identify any specific steps that Phicom has taken that induce its customers to infringe the '485 patent.[187]

The undersigned agrees with Phicom that, because FormFactor has not proven direct infringement, it cannot prove induced infringement. Accordingly, FormFactor has failed to show that Phicom induces infringement of the asserted claims of the '485 patent.

c. Phicom's New Design

FormFactor asserts that Phicom's MEMS Card with the new design of a "fixed center bolt" infringes all of the asserted claims of the '485 patent because the center bolt is the only difference between the new design and the old design. According to FormFactor, the fixed center bolt does nothing to change infringement.[188]

Phicom asserts that its new design has all the components and structures of the earlier Type C probe card, except that it has a fixed center bolt in place of an adjustable center bolt. According to Phicom, this change does not have any effect upon the infringement analysis with respect to the '485 patent.[189]

Staff asserts that, because Phicom's new Type B and C probe card assemblies have not yet been imported into the United States, FormFactor cannot establish that such probe card assemblies

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[187] RIB 25-26.
[188] CIB 14 citing CFF 963-985, 539; CRB 4-5.
[189] RRB 8.

have been used in the United States to directly infringe any asserted claim of the '485 patent.[190] Furthermore, Staff asserts that there is no evidence, other than circumstantial evidence, that any of the new Type B and C probe card assemblies has actually been used to test semiconductors, which is required to directly infringe either claims 1 or 32 the '485 patent.[191]

As the parties have not presented any new arguments as to Phicom's MEMS Card with the new design of a "fixed center bolt," and the undersigned has already found that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's probe card assemblies meet each and every limitation of the asserted claims of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Phicom's new probe card assemblies with a "fixed center bolt" meet each and every limitation of the asserted claims for the same reasons.

2. Micronics - In General

FormFactor asserts that Micronics' U-Probes, [ ] practice the claimed invention. Furthermore, FormFactor asserts that because Micronics makes, offers for sale, sells to, and supports its accused products for semiconductor manufacturers, that, in turn, use these products in the intended manner, the '485 patent is necessarily infringed.[192] According to FormFactor, [ ] semiconductor manufacturers in the U.S. have used Micronics' U-Probe cards to produce tested semiconductor devices [

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[190] SIB 33 citing *Certain Acesulfame Potassium and Blends and Products Containing Same*, Inv. No. 337-TA-403, Final Initial Determination (March 1999) ("*Certain Acesulfame*").

[191] SIB 33-34 citing Hwang, Tr. 1327-31 and *Lucent Techs. Inc. v. Gateway, Inc.*, 543 F.3d 710, 723-24 (Fed. Cir. 2008) ("*Lucent*").

[192] CIB 14 citing CFF 542-544.

[ ][193]

FormFactor asserts that [ ] are Micronics' customers that directly infringe the '485 patent. Specifically, FormFactor asserts that these customers install U-Probes into the testers, provide wafers containing a plurality of semiconductor devices, and by bringing Micronics' U-Probes' probe elements into contact with the devices under test, the customers test the semiconductor devices.[194] According to FormFactor, the U-Probes include:

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Furthermore, FormFactor asserts that the [ ] have a plurality of electrical contacts.[196] FormFactor asserts that [

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[193] CIB 14-15 citing CFF 545-558, JX-57C (Kim Dep), JX-52C (Gatzemeier Dep), JX-45C (McBride Dep), and JX-60C (Kovit Dep).

[194] CIB 15 citing CFF 552-58.

[195] CIB 15 citing CFF 560-62.

[196] CIB 15 citing CFF 563.

[197] CIB 15-16 citing CFF 565.

[ ][198]

FormFactor asserts that the elongate, resilient probe elements in Micronics' U-Probes are [

][199] According to FormFactor, the [ ] cannot function properly if they were to exhibit significant inelastic behavior.[200]

FormFactor asserts that the compliant interconnection structure in Micronics' U-Probes is [

[201]

[202]

][203]

In the alternative, FormFactor asserts that the [ ] infringe the asserted claims of the '485 patent under the doctrine of equivalents. According to FormFactor, the [ ] perform the same function [

] in substantially the same way [

] to achieve the same result [ ]

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[198] CIB 16 citing CFF 660
[199] CIB 16 citing CFF 567-571.
[200] CIB 16 citing CFF 575.
[201] CIB 16 citing CFF 578-82.
[202] CIB 16 citing CFF 585-87.
[203] CIB 16-17.

[ ] In support, FormFactor asserts that one of ordinary skill in the art would have known that the interposer could be interchanged with other resilient structures.[204]

As to the "moveable element" limitation, FormFactor asserts that Micronics' U-Probes have [ ] According to FormFactor, the altering of the orientation requirement is satisfied with just a first-order planarization involving tilting of the probe substrate.[205]

a. Direct Infringement

(1) Claim 1

FormFactor asserts that the evidence shows that [ ] U.S. semiconductor manufacturers using Micronics' U-Probes practice each and every step of claim 1 of the '485 patent. According to FormFactor these Micronics' customers use the probe card assemblies to test multiple semiconductor devices in wafer form, as detailed above.[206]

Micronics asserts that it does not sell a probe card with a "compliant interconnection structure."[207] According to Micronics, [ ] of the U-Probe lack any plastic behavior in response to an applied load or force.[208] Micronics counters FormFactor's infringement theory that Micronics' [ ] in a U-Probe might become compliant if used for a long time with high forces. According to Micronics, FormFactor has never identified a single instance where [ ] has become compliant in this manner. Micronics asserts that if [ ] were to become compliant,

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[204] CIB 17-18.
[205] CIB 18 citing CFF 593-95, 607-12.
[206] CIB 18 citing CFF 552-58.
[207] RIB 31 citing RFF IV.C.3.01.
[208] RIB 32 citing RFF IV.C.3.53.

the [ ] would no longer function as a "compliant interconnection structure" because they would cease to electrically connect. Therefore, Micronics asserts that it does not infringe claim 1 of the '485 patent.[209] Furthermore, Micronics asserts that it does not infringe under the doctrine of equivalents because FormFactor has failed to offer any contentions regarding "compliant" under the doctrine of equivalents.[210]

Staff agrees with Micronics that FormFactor's affirmative evidence of the alleged plasticity in Micronics' [ ] is theoretical and speculative, and therefore not credible. Therefore, Staff asserts that FormFactor has not shown that Micronics' [ ] satisfy the "compliant interconnection structure" limitation because they are not "compliant."[211] Staff asserts that the preponderance of the evidence does not show that Micronics'[ ] satisfy the "compliant" limitation, either literally or under the doctrine of equivalents. Accordingly, Staff asserts that Micronics does not infringe claims 1, 3, 4, 18, 19, and 29 of the '485 patent.

FormFactor counters Micronics arguments that the U-Probe [ ] are not "compliant." According to FormFactor, the[ ] are not completely elastic and exhibit plastic behavior as well. FormFactor asserts that Micronics is misconstruing the undersigned's claim construction and that compliant does not mean only plastic. As to Micronics' assertion that if its [ ] were compliant they would plastically deform and no longer function, FormFactor asserts otherwise because compliancy does not necessarily lead to a broken electrical connection. Specifically, FormFactor asserts that Dr. Adler testified that [ ]

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[209] RIB 26-27 citing RFF IV.C.3.29, 3.30, 3.05, 3.54. See also RIB 31-34 citing RX-925C (Pogo Pin Spec).

[210] RIB 34.

[211] SIB 35.

[

] Therefore, FormFactor asserts that when the [ ] experience some plastic deformation, the electrical connection will remain intact unless the deformation [ ][212] In fact, FormFactor asserts that the fact that there are some broken electrical connections provides evidence that the [ ] exhibit plastic deformation.[213]

As to the tests performed by Dr. Adler, FormFactor argues that the testing method was faulty because the testing environment did not simulate the operational environment of actual probe card usage. Furthermore, FormFactor asserts that, because Dr. Adler lost all but one [ ] used in his first test, his test results cannot be verified.[214] Regardless, FormFactor asserts that it is not relying on the failure of the [ ] as infringement. Rather, FormFactor points to the failure of the [ ] as reliable confirming evidence that the [ ] exhibit plastic behavior when operational. Therefore, FormFactor assert that the [ ] meet the definition of compliant.[215]

Staff counters FormFactor's arguments that there is any evidence to suggests that Micronics' [ ] exhibit plastic behavior when operational. And according to Staff, the evidence shows otherwise and that [ ] stay within the elastic regime during normal operation.[216] Furthermore, Staff asserts that FormFactor overlooks the fact that the Micronics' probe card assemblies are new

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[212] CRB 6 citing Adler, Tr. 2132.
[213] CRB 6.
[214] CRB 6 citing Adler, Tr. 2160-70.
[215] CRB 8.
[216] SRB 2 citing RX-861C (Adler Rebuttal) at Q/A 41; RX-857C (Inoue Rebuttal) at Q/A 80, 83.

and therefore have not been operating for a long time under abnormally high loads.[217]

Micronics asserts that FormFactor is asserting new infringement theories, which should be rejected under Ground Rule. 8.2. Micronics asserts that FormFactor's argument that the initial installation and removal of bent or defective [ ] is evidence of plasticity is new and should be rejected on those grounds.[218] As to the substance of FormFactor's new theory, Micronics asserts that Dr. Adler has testified that plastic deformation is a permanent, non-reversible change in length and that[

]219

Furthermore, Micronics asserts that CX-115, a document that FormFactor relies upon, reinforces the opinions of Dr. Adler.[220]

Micronics counters FormFactor's argument that the [ ] in the U-Probe are "compliant." According to Micronics, FormFactor's reliance on Dr. Howe's testimony is not supported by any evidence. Specifically, while Dr. Howe refers to certain unspecified measurements of the load-deflection curve of standard [ ] and the hypothetical effects of long term compression of the[ ] Micronics notes that these measurements are not in evidence because they were specifically excluded by the undersigned during the pre-hearing conference.[221] Micronics asserts that the evidence which is in the record shows that the actual [ ] used in Micronics' U-Probes lack any plastic response, and therefore are not compliant.[222] As to FormFactor's argument

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[217] SRB 3.
[218] RRB 10.
[219] RRB 11-12 citing RFF IV.C.3.54, RX-859C (Hutton Rebuttal) at Q/A 36.
[220] RRB 12-13.
[221] RRB 10-11 citing Bullock, Tr. 53-62.
[222] RRB 11 citing RFF IV.C.3.53.

on the doctrine of equivalents, Micronics asserts that a [ ] that has no plastic response cannot be equivalent to the claimed compliant interconnect which requires a plastic response.[223]

The undersigned agrees with Micronics and Staff that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' U-probes satisfy the "compliant interconnection structure" limitation in claim 1. While FormFactor argues that the [ ] in Micronics' U-Probes may become compliant over time, such argument is pure speculation that is not based on any evidence or tests.[224] The evidence shows that Micronics' [ ] are elastic, not plastic, and therefore, do not meet the "compliant interconnection structure" limitation as construed.[225] Accordingly, Micronics' U-Probes do not literally infringe claim 1 of the '485 patent.

The undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' U-probes satisfy the "compliant interconnection structure" limitation in claim 1 under the doctrine of equivalents because FormFactor has not shown how a [ ] that does not have a plastic response is equivalent to the claimed compliant interconnect, which requires a plastic response. Accordingly, Micronics' probe card assemblies do not infringe claim 1 of the '485 patent under the doctrine of equivalents.

(2) Claim 3

FormFactor asserts that the additional limitation in claim 3 is a wafer requirement and that Micronics' customers practice this additional limitation because [ ]

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[223] RRB 13 citing RFF IV.C.3.59.

[224] RFF IV.C.3.57.

[225] RX-925C (Pogo Pin Spec); RX-861C (Adler Rebuttal) at Q/A 41; Adler, Tr. 2240; RX-857C (Inoue Rebuttal) at Q/A 80, 83, 165-66, 178; Inoue, Tr. 2043; RX-915C (U Probe test).

[ ][226]

Micronics asserts that it does not infringe claim 3 because there is no probe card with a "compliant interconnection structure" or equivalent thereof.[227]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 3.

(3) Claim 4

FormFactor asserts that the additional limitation in claim 4, the dicing requirement, is practiced by Micronics' customers because [

][228]

Micronics asserts that it does not infringe claim 4 because there is no probe card with a "compliant interconnection structure" or equivalent thereof.[229]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 4.

(4) Claim 18

FormFactor asserts that the additional limitation in claim 18, namely "aligning tips of said

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[226] CIB 19 citing CFF 601-603.
[227] RIB 31.
[228] CIB 19 citing CFF 604, 606.
[229] RIB 31.

probe elements by altering an orientation of said probe substrate with respect to said probe card" is present in Micronics' U-Probes because all these probes have [ ] for altering the orientation of the probe substrate with respect to that of the probe card. According to FormFactor, there are [

] FormFactor asserts that, for the purposes of infringement, there is no difference between these two types of [ ][230]

FormFactor argues that the purpose of the [ ] in Micronics' U-Probes is to alter the orientation of the probe substrate with respect to the probe card in order to align [

] FormFactor asserts that Micronics' has admitted that [ ] According to FormFactor, the alignment is performed prior to shipping each U-Probe to customers.[231] Furthermore, [ ] asserts that when customers install the U-Probes, they continue to employ the "aligning" step, because continuous alteration of orientation is necessary.[232]

FormFactor asserts that Micronics cannot get around infringement when it performs alignment on behalf of its customers. According to FormFactor, customers, such as [

] expressly provide specifications to Micronics for alignment. Furthermore, FormFactor asserts that even when Micronics' customers do not perform the "altering" step on their own, Micronics performs such alterations according to the customers' specification, or direction.[233]

Alternatively, FormFactor asserts that if literal infringement is not present, then Micronics

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[230] CIB 19 citing CFF 607-11, 618, 648-50.
[231] CIB 20 citing CFF 611-16, 619-22, 625, 630-31; CX-353C (Interrogatory Responses).
[232] CIB 21-22 citing CFF 633.
[233] CIB 22 citing *Muniauction*, 532 F.3d at 1329.

infringes under the doctrine of equivalents. FormFactor asserts that [

] perform the same function [

] and achieve the same results [ ] as moveable elements) as moveable elements, such as [ ][234]

Micronics asserts that it does not infringe claims 18, 19, 32, 33, or 41 of the '485 patent because no single entity practices all of the steps of the claimed methods. Specifically, Micronics asserts that it does not test semiconductors and does not perform the steps of "providing a plurality of semiconductor devices," "bringing said probe elements into contact," and "testing," as required by claims 1 and 32. Furthermore, Micronics asserts that its customers do not perform the step of "aligning tips of said probe elements by altering an orientation" as required by claims 18, 19, 32, 33, and 41.[235]

According to Micronics, its customers do not make any adjustments to their U-Probes if there is a problem with alignment because the U-Probes were not designed to be adjusted. While FormFactor asserts that Micronics [

] during repair of the U-Probe in Japan on behalf of and under the control of its customers, Micronics asserts that there is no evidence to support such a contention. Rather, the documentation merely shows that customers may return U-Probes to Micronics for repair, with no indication that the customers act as a "mastermind" or otherwise direct the details of any repair.[236] Micronics asserts that it and its customers operate at an arms length and that no single or joint party performs

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[234] CIB 20-21 citing CFF 646, 673; CX-81C (U-Probe Presentation).

[235] RIB 27-28 citing RFF IV.C.1.28,2.16, 1.32,1.21.

[236] RIB 28 citing RFF IV.C. 1.35-1.37, 1.47-1.53. See *BMC Resources, Inc. v.Paymentech, L.P.*, 498 F.3d 1373, 1379 (Fed.Cir. 2007) ("*BMC*").

or directs performance of all steps of claims 18, 19, 32, 33, and 41. Therefore, Micronics asserts that there is no direct infringement of claims 18, 19, 32, 33, and 41.

Staff asserts that it is undisputed that Micronics' customers do not perform the "aligning" step and that Micronics performs that step for its customers, but that the parties dispute whether Micronics' customers exercise "control or direction" over the step. In the Staff's view, the evidence does not show that Micronics' customers control the actions of Micronics such that the customers can be considered to have control over every step.[237] Therefore, Staff asserts that claims 18, 19, 32, 33, and 41 of the '485 patent are not infringed.

FormFactor counters Micronics' arguments that its customers do not practice the "aligning" step for the same reasons expressed above with respect to Phicom. According to FormFactor, Micronics performs tip aligning on behalf of its customers, who provide the specifications.[238]

Micronics counters FormFactor's argument that its customers are the "mastermind" of the planarity adjustment fails because FormFactor has not met its burden to prove that Micronics' customers exercise "control or direction" over the entire process, such that every step is attributable to the customers.[239] Rather, Micronics cites to the evidence which merely shows [

][240]

Micronics asserts that FormFactor is asserting new infringement theories, which should be rejected under Ground Rule. 8.2. Micronics asserts that FormFactor's argument that Micronics'

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[237] SIB 37 citing RX-858C (Igarishi Rebuttal).
[238] CRB 9-10 citing CFF 621, 626, 637, 640-42, 651.
[239] RRB 14-15.
[240] RRB 15 citing RFF IV.C.1.34-36, 2.20, 2.35-36.

customers perform the "align tips by altering an orientation" step by merely installing a Micronics' probe card is new and should be rejected.[241] As to the substance of FormFactor's argument, Micronics asserts that FormFactor has not offered any evidence to support its theory. According to Micronics, FormFactor cites to the testimony of Dr. Adler who merely states that [

] Micronics asserts that what is missing from FormFactor's argument, however, is that [

][242]

The parties dispute whether Micronics' customers exercise "control or direction" over the "aligning" step. The undersigned agrees with Micronics and Staff that performing a step "on behalf of" a customer is not indicative of exercising "control or direction" of the entire process so that the step is attributable to the customer. Rather, it appears that Micronics and its customers are in an arms-length commercial relationship that is typical between a seller and a buyer.[243]

Accordingly, the undersigned agrees with Micronics and Staff that FormFactor has failed to show, by a preponderance of the evidence, that there is direct infringement of claim 18 because the evidence does not show that Micronics' customers are the "mastermind" or are in "control" over Micronics when adjustments are made to the probe card assemblies. Rather, the evidence shows that there is merely an arms-length relationship between Micronics and its customers. Accordingly, the undersigned finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 18 of the '485 patent, in addition to not meeting each and every limitation of claim 1 of the '485 patent.

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[241] RRB 10, 15-16.
[242] RRB 15-16.
[243] RX-858C (Igarishi Rebuttal).

(5) Claim 19

FormFactor asserts that the additional limitation of "said altering comprises moving a moveable element disposed so as to affect an orientation of said probe substrate with respect to the probe card" in claim 19 is practiced by Micronics' U-Probe. Specifically, FormFactor asserts that the [ ] are moved in order to affect an orientation of the probe substrate with respect to the probe card.[244]

Micronics asserts that it does not infringe claim 19 because Micronics does not sell a probe card equipped with a probe substrate "moveably affixed" to a probe card. According to Micronics, the U-Probe is a fixed structure without any moving parts and is manufactured so that planarity is held within a tight tolerance. Micronics notes that, after assembly, the U-Probe is sealed shut so that the inner parts are fixed and immobile.[245] Micronics counters Dr. Howe's testimony that the U-Probe meets the "moveably affixed" limitation because Micronics asserts that Dr. Howe is using his own claim construction, rather than how the claim was construed by the undersigned.[246] Micronics also asserts that it does not infringe claim 19 because its U-Probe does not include the "moveable element" limitation. According to Micronics, [ ] cannot move and are not a moveable mechanism.[247]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claims 1 and 18 of the '485 patent, the undersigned also finds that FormFactor has failed to show,

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[244] CIB 23 citing CFF 653-54.
[245] RIB 34-35 citing RF IV.C.3.74, 3.88, 3.71.
[246] RIB 35-36 citing RFF IV.C.3.126-3.127.
[247] RIB 36 citing RFF IV.C.3.64-65.

by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 19.

(6) Claim 29

FormFactor asserts that the additional limitation of a "space transformer" in claim 29 is practiced by Micronics' [

][248]

Micronics asserts that it does not infringe claim 29 because there is no probe card with a "compliant interconnection structure" or equivalent thereof.[249]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 1 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 29.

(7) Claim 32

FormFactor asserts that claim 32 has many limitations that overlap with claim 1 and 18 and that Micronics' U-Probe include all these elements.[250] Furthermore, FormFactor asserts that when the [ ], the orientation of the probe substrate is altered with respect to the probe card and that once [ ] the probe substrate will remain in a new fixed position until the spacers are exchanged again.[251]

Micronics asserts that it does not infringe claim 32 because there is no probe card that is

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[248] CIB 23 citing CFF 656-57.
[249] RIB 31.
[250] CIB 23-24 citing CFF 659-660, 610.
[251] CIB 24 citing CFF 661-62, 610.

"moveably affixed" or equivalents thereof.[252] Micronics also asserts that it does not infringe claim 32 because there is nothing in the U-Probe for altering orientation. Therefore, Micronics asserts that the "aligning tips" and "moving a moveable element" limitations are not met.[253]

FormFactor counters Micronics' arguments regarding the "moveably affixed" limitation. According to FormFactor, the U-Probe has exchangeable spacer that are designed to be exchanged in and out for the express purpose of changing the height between the stiffener and the MLS. Therefore, FormFactor asserts that the U-Probes satisfy the moveably affixed limitation.[254]

As the parties have not presented any new arguments as to claim 32 with regard to the claim limitations "probe card," "probe substrate," "moveably affixed," and "elongate, resilient probe elements," and the undersigned has already found that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claims 1 and 18 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 32 for the same reasons.

(8) Claim 33

FormFactor asserts that the additional limitation of "altering of orientation comprises moving a moveable element" in claim 33 is practiced by Micronics' U-Probes. Specifically, FormFactor asserts that the [ ] alter orientation of the probe substrate with respect to the probe card in Micronics' U-Probes.[255]

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[252] RIB 31.
[253] RIB 31.
[254] CRB 10-11.
[255] CIB 24 citing CFF 655-667.

Micronics asserts that it does not infringe claim 33 because there is no probe card that is "moveably affixed" or equivalents thereof.[256]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 32 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 33.

(9) Claim 41

FormFactor asserts that the additional limitation of "space transformer" in claim 41 is practiced by Micronics' U-Probes. Specifically, FormFactor asserts that [ ] contained in Micronics' U-Probes is a space transforming probe substrate with terminals disposed at a first pitch on one surface and corresponding terminals disposed at a second pitch on the opposite surface.[257]

Micronics asserts that it does not infringe claim 41 because there is no probe card that is "moveably affixed" or equivalents thereof.[258]

As the undersigned has already ruled above that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies meet each and every limitation of claim 32 of the '485 patent, the undersigned also finds that FormFactor has failed to show, by a preponderance of the evidence, that Micronics' probe card assemblies infringe claim 41.

b. Indirect Infringement

(1) Contributory Infringement

In support of its assertion of indirect infringement, FormFactor asserts that Micronics has

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[256] RIB 31.
[257] CIB 24 citing CFF 668-669.
[258] RIB 31.

had knowledge of the '485 patent since at least December 2007, when this investigation was instituted, and has continued infringement of the '485 patent by making and importing infringing products and providing services to the infringing products and sending them to the United States. FormFactor asserts that the evidence shows that Micronics is affirmatively and actively engaged with its customers in designing, building, and repairing a custom-made product that has no non-infringing use. In other words, FormFactor asserts that Micronics is aiding and abetting the practicing of the asserted claims.[259] According to FormFactor, Micronics' customers provide Micronics with the [

][260]

Micronics assert that it does not indirectly infringe the '485 patent because Micronics does not have the necessary intent. Specifically, Micronics asserts that it only intends to sell probe cards with elastic, functional pogo pins, rather than "compliant" pogo pins.[261]

Micronics asserts that there is no evidence of contributory infringement of claim 1 of the '485 patent. According to Micronics, the U-Probe, as shipped, has no plastic response from its[ ] Therefore, even under Dr. Howe's theory that[ ] become plastic over time, the U-Probe has many years of non-infringing use. Furthermore, Micronics asserts that it does not contributorily infringe claim 32 because the probe substrate is not "moveably affixed" and there is no step of "aligning tips."[262]

As the undersigned has already determined above, indirect infringement requires a showing

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[259] CIB 15 citing CFF 542-43, 545-558.
[260] CIB 15 citing CX-96C (U-Probe Order Form).
[261] RIB 29-30 citing RFF IV.C.3.05, 3.54.
[262] RIB 30 citing RFF IV.C. 2.15, 2.17.

of direct infringement. Because FormFactor has not proven direct infringement by Micronics, it cannot prove contributory infringement. Accordingly, FormFactor has failed to show that Micronics contributorily infringes the asserted claims of the '485 patent.

(2) Induced Infringement

Micronics asserts that there is no evidence of induced infringement because Micronics does not exert control over its customers to cause them to build chips or provide semiconductors, bring tips into contact with the semiconductor, or test the semiconductors. According to Micronics,[

]263

Furthermore, Micronics asserts that [

] and therefore does not have an "affirmative intent."264

As the undersigned has already determined above, indirect infringement requires a showing of direct infringement. Because FormFactor has not proven direct infringement by Micronics, it cannot prove induced infringement. Accordingly, FormFactor has failed to show that Micronics induces infringement of the asserted claims of the '485 patent.

C. Domestic Industry - Technical Prong

FormFactor asserts that it currently makes and sells probe card assemblies in the United States designed specifically for use in practicing the method for producing tested semiconductor devices claimed in the '485 patent. In addition, FormFactor asserts that its customers use the probe card assemblies to test semiconductor devices, such as DRAM and Flash according to the methods claimed in the '485 patent. Specifically, FormFactor points to its PH 50, PH75, PH100, PH150, and

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263 RIB 30 citing RFF IV.C.2.19,2.30-2.31, 2.21,2.34.

264 RIB 30-31 citing *DSU*, 471 F.3d at 1306; *Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1354 (Fed. Cir. 2008) ("*Kyocera*").

NF100 Probe Cards.[265]

As to FormFactor's PH50, PH75, PH100, and PH150 probe card assemblies, FormFactor asserts that these assemblies include all the limitations in claim 1, including:

- a printed circuit board, which is an electrical component, having a plurality of electrical contacts, thereby meeting the "probe card" limitation;[266]

- a substantially rigid ceramic substrate called a probe head, which is an electronic carrier, having a plurality of microsprings mounted to terminals on one surface of the probe substrate, thereby meeting the "probe substrate" limitation;[267]

- a plurality of microsprings that are primarily elastic, made of at least two materials for the purpose of improving mechanical characteristics, and have greater length than width, thereby meeting the "elongate, resilient probe elements" limitation;[268] and

- a microspring interposer with resilient springs that electrically connect the contacts on the probe card to the microsprings that exhibit both plastic and elastic behavior in response to an applied load or contact force, thereby meeting the "complaint interconnection structure" limitation.[269]

FormFactor asserts that an exemplary entity that practices claim 1 of the '485 patent is [ ] which uses [ ] FormFactor probe cards in its [ ] facility.[270] FormFactor also asserts that [ ] practices claims 18, 19, 23, and 24 of the '495 patent as well.[271] Specifically, FormFactor asserts that its probe card assemblies have "moveable elements" called planarization mechanisms that include screws and/or bolts that can be rotated clockwise or counterclockwise to move the probe substrate up and down at their

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[265] CIB 25 citing CFF 2; CX-650C (Kovit Dep); CX-342C (FormFactor Technology Overview); CX-376C (FormFactor Technology Overview); CX-357C (Spring Contacts).

[266] CIB 25 citing CFF 702; CX-376C (FormFactor Technology Overview).

[267] CIB 25 citing CFF 703-05; CX-376C (FormFactor Technology Overview).

[268] CIB 25 citing CFF 708-09.

[269] CIB 25 citing CFF 697, 706; CX-342C (FormFactor Technology Overview); CX-343C (PH150 Assembly Work Instruction); CX-376C (FormFactor Technology Overview).

[270] CIB 26 citing CFF 685-87.

[271] CIB 26 citing CFF 729.

respective location.[272] In addition, FormFactor probe cards require re-adjustment of planarity at some point for various reasons including wear, insertion into a new test assembly, or repair. FormFactor asserts that this altering of orientation is performed at the facilities of the semiconductor manufacturers and that FormFactor provides its customers with training on how to properly adjust the planarity.[273] For example, FormFactor asserts that [ ] has made adjustments to the probe head of FormFactor's probe cards using the planarization screws, thereby practicing claims 18 of the '485 patent.[274]

As to claim 19, FormFactor asserts that each of its probe card assemblies includes "moveable elements," or planarization mechanisms that can be rotated in order to affect an orientation of the probe substrate with respect to the probe card.[275] As to claims 23 and 24, FormFactor asserts that turning the planarization mechanism in a counter-clockwise direction causes the relevant portion of the probe substrate to move toward the probe card, while turning an adjusting bolt in a clockwise direction causes the relevant portion of the probe substrate to move away from the probe card.[276]

Respondents asserts that FormFactor has not met the technical prong of the domestic industry requirement because FormFactor has not shown that it satisfies the "compliant interconnection structure" limitation. Specifically, Respondents assert that neither FormFactor nor its expert, Dr. Howe, have identified any evidence indicating that FormFactor's products exhibit both a plastic and elastic response to an applied force. In fact, Respondents assert that Dr. Howe has testified that the interposers in FormFactor's products "exhibit a primarily elastic behavior in response to an applied

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[272] CIB 26 citing CFF 717.
[273] CIB 27 citing CFF 725-26.
[274] CIB 27 citing CFF 730.
[275] CIB 27 citing CFF 724; CX-343 (PH150 Assembly Work Instruction).
[276] CIB 27 citing CFF 728; CX-698C (PH150 Troubleshooting).

load."[277] As to Dr. Howe's reliance on CX-342C and CX-343C, Respondents asserts that these two documents do not support Dr. Howe's opinion because they are generic marketing materials that describe how to assemble and adjust the planarity of FormFactor's probe card assemblies.[278]

Staff asserts that FormFactor has not satisfied its burden of proof on the technical prong of the domestic industry requirement. Specifically, Staff asserts that FormFactor has failed to show that its probe cards satisfy the "compliant" limitation. While Staff notes that Dr. Howe testified that FormFactor's MicroSprings are "compliant interconnection structures," Staff also notes that Dr. Howe testified that this opinion was theoretical because he did not conduct any physical tests on FormFactor's interposer.[279] As to Mr. Eldridge's testimony on FormFactor's interposer, Staff asserts that his testimony is suspect because the basis of the evidence relied upon by Mr. Eldridge is insufficient.[280]

FormFactor counters Respondents' arguments that its MicroSprings are not "compliant." According to FormFactor, although Dr. How opined that the interposers in FormFactor's probe card assemblies "exhibit primarily elastic behavior in response to an applied load," Dr. Howe's definition is consistent with the claim construction of "compliant" as long as there is plastic behavior in the interposer.[281] FormFactor asserts that Mr. Eldridge provided ample testimony regarding the interposer having a degree of plasticity.[282] In further support, FormFactor cites to various exhibits.[283]

Respondents assert that FormFactor has waived any arguments for domestic industry based

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[277] RIB 37 citing RFF IV.D.07, 15, 17.
[278] RIB 37 citing RFF IV.D.03.
[279] SIB 37-38 citing CX-732C (Howe Direct) at 18; Howe, Tr. 722-24, 778-79.
[280] SIB 38-39 citing CX-728C (Eldridge Direct) at Q/A 135, Eldridge, Tr. 481-84, 493-95.
[281] CRB 11.
[282] CRB 12-13 citing Eldridge, Tr. 479-84.
[283] CRB 13-15 citing RX-664, RX-665, RX-812C, CX-342C.

on any claims other than claim 1.[284] As to claim 1, Respondents assert that the main issue is whether FormFactor has shown that its probe card assemblies include a "compliant interconnection structure." According to Respondents, FormFactor has not met its burden because the documentary evidence shows that the interposer is resilient, not compliant.[285] Furthermore, Respondents argue that FormFactor has presented no tests or other proof that establishes that the interposer has both an elastic and plastic response to a force. According to Respondents, the conclusory testimony of Mr. Eldridge that he has seen plastic behavior in FormFactor's interposer is insufficient without any supporting tests.[286] Respondents likewise criticize Dr. Howe's testimony, which is similarly unsupported by anything testing or analysis.[287]

The undersigned agrees with Respondents and Staff that FormFactor has failed to show, by a preponderance of the evidence, that its probe card assemblies meet the "compliant" limitation in claim 1, as construed by the undersigned. FormFactor has failed to show any evidence that the interposer meets the "compliant" limitation. Similar to FormFactor's arguments in the infringement section, the only evidence that FormFactor provides in support of technical prong is a theory by Dr. Howe that the interposer's are compliant. There is no evidence that they are compliant because no tests were performed on the interposer.[288] Accordingly, FormFactor has failed to show that it meets the technical prong of the domestic industry requirement.

As to Respondents' assertion that FormFactor has waived any argument that it meets the technical prong of the domestic industry argument with respect to claims 18, 19, 23, and 24 because

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[284] RRB 16, n. 8.
[285] RRB 17 citing CX-342C (FormFactor Technology Overview).
[286] RRB 17 citing Eldridge, Tr. 483-84.
[287] RRB 17 citing RFF IV.D.08-13.
[288] CX-732C (Howe Direct) at 18; Howe, Tr. 722-24, 778-79.

such issues were not preserved in FormFactor's pre-trial brief, the undersigned rejects Respondents' argument, as FormFactor specifically alleged that its customers practice claims 18, 19, 23, and 24.[289] However, since none of FormFactor's products have been shown to read on claim 1, they therefore do not read on these claims which depend from claim 1.

D. Validity

1. Ordinary Skill in the Art

As previously stated in Order No. 37, a person of ordinary skill in the art is an individual with a bachelor's degree in mechanical or electrical engineering, or the equivalent, and at least one year of experience in either probe card assemblies, semiconductor device testing, or MEMS technology at the time of effective filing date for the asserted patent.[290]

2. Prior Sale and Use

Respondents assert that, if the undersigned finds that FormFactor's probe card assemblies meet the technical prong of the domestic industry requirement by meeting the "compliant" limitation, then FormFactor's prior sales of its probe cards and uses of those probe cards by customers, more than a year before December 27, 2001, invalidates the '485 patent.[291] According to Respondents, FormFactor has admitted that the probe cards sold to its U.S. customers, including Intel, included all the features of the claims and were used by its customers to test semiconductor devices.[292]

Respondents assert that the asserted claims of the '485 patent are entitled to a filing date of

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[289] See FormFactor's pre-trial brief at 219-221.
[290] See Order No. 37, p. 11 (January 23, 2009).
[291] RIB 38; RRB 21.
[292] RIB 39 citing RFF IV.E.1.02-.08.

December 27, 2001 at best.[293] Because FormFactor sold its probe cards to its U.S. customers more than a year before that date, Respondents assert that the prior sales and use invalidate the claims of the '485 patent.[294]

FormFactor counters Respondents' arguments and asserts that the '485 patent is entitled to a November 9, 1995 priority date. According to FormFactor, the only support Respondents have to suggest that the '485 patent is not entitled to a November 9, 1995 priority date is a non-final office action in the reexamination. Therefore, FormFactor argues that this argument should be rejected.[295] Specifically, FormFactor asserts that Respondents' reliance upon the office actions in the reexamination is not dispositive because the reexamination is not final and is on-going.[296]

As the undersigned has ruled above that FormFactor's probe card assemblies do not meet the technical prong of the domestic industry requirement by failing to meet the "compliant" limitation, and Respondents' arguments rely on the contrary, the undersigned finds there is no need to address Respondents' argument as to prior sales and use. As to Respondents' assertion that the '485 patent is not entitled to a November 9, 1995 priority date, which is based on a non-final office action in the reexamination, the undersigned agrees with FormFactor that the office action in the reexamination, is not in itself dispositive. Accordingly, the undersigned finds that the Respondents have not shown, by clear and convincing evidence, that FormFactor is not entitled to a November 9, 1995 priority date.

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[293] RIB 38 citing RFF IV.E.6.03, 6.07-08.
[294] RIB 39.
[295] CRB 15.
[296] CRB 20-21.

3. Anticipation

a. The Abe '522 Patent

(1) Claim 1

Respondents assert that U.S. Patent No. 5,521,522 ("the Abe '522 patent")[297] anticipates the asserted claims of the '485 patent. According to Respondents, the Abe '522 patent shows all the elements including:

- a performance board (92) which meets the"probe card" limitation that includes a number of electrical contacts (93);

- probe card (5), which meets the "probe substrate" limitation that includes elongate conducting elements (5), which meet the "elongate, resilient electrical contacts" limitation; and

- contact ring (50), together with contact elements (57a) and (57b), which meet the "compliant interconnection structure" limitation.

According to Respondents, Dr. Howe asserts that the Abe '522 patent lacks "elongate resilient electrical contacts" because electrical contacts 72 do not have a primarily elastic response.[298] Respondents counter, however, that Dr. Adler and Mr. Taber testified that the needle-like contacts 72 must be primarily elastic because if the needles were primarily plastic, they would not function as reliable electrical contacts and the probe card would not work.[299] In addition, Respondents assert that Dr. Howe does not address structures 57a and 57b.

FormFactor asserts that the Abe '522 patent does not anticipate the '485 patent because it does not disclose an elongate, resilient probe element. While Respondents assert that contactor 52 is an elongate conducting element, FormFactor counters that the only description of contactor 52

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[297] RX-499 (the Abe '522 patent); RX-151 (the Abe '522 patent).
[298] CX-750C (Howe Rebuttal) & Q/A 49.
[299] RIB 39-40 citing RFF IV.E.2.18.

comes from a line in the specification that states "[e]ach contactor 52 is made of a gold-plated nickel material" and that one can only speculate about the physical attributes of contactor 52 from Figures 1 and 2 to show whether contactor 52 is "elongate." FormFactor asserts that just because contactor 52 is made of nickel does not necessarily mean that it has a "primarily elastic" attribute, especially because the specification states that each contactor 52 is backed up by an elastic member 52, suggesting that the contactor 52 itself is not elastic.[300]

As to Respondents' argument that probe 72 is a resilient probe element, FormFactor counters that the specification is totally devoid of any evidence to suggest that probe 72 has a primarily elastic response. FormFactor notes that the specification states the probe 72 is supported by supporting member 73, which implies that resiliency is gained from the supporting member 73, rather than from probe 72 itself.[301]

Staff asserts that Respondents have failed to show, by clear and convincing evidence, that any of the asserted claims of the '485 patent are invalid as anticipated or obvious by the Abe '522 patent, at least because the prior art did not disclose or render obvious the claimed "compliant interconnection structure," or the step of "aligning tips of said probe elements by altering an orientation."[302] Staff agrees with FormFactor that the evidence does not clearly and convincingly show that the Abe '522 patent anticipates the '485 patent because there is insufficient disclosure that the needles 72 are "resilient."[303]

Respondents counter FormFactor's arguments that the Abe '522 patent does not disclose the

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[300] CIB 28 citing CFF 751-768; 15-16.

[301] CIB 28 citing CFF 769-785; CRB 17 citing RX-499 (the Abe '522 patent) at col. 7:32-35.

[302] SIB 43 citing RX-690C (Adler Direct) at Q/A 37-72, 86,97; Adler, Tr. 2194-2205; SRB 8.

[303] SRB 8.

"elongate, resilient probe element" limitation. According to Respondents, FormFactor's argument that probe needle 72 does not have a primarily elastic response is simply wrong. Respondents assert that the Abe '522 patent discloses an elongated probe element, that the probe element must be resilient in order to function as a probe, and that the fact that there is backing material 73 is irrelevant. Respondents cite to the testimony of Dr. Adler, who testified that needle 72 itself must be resilient or else the needle would get permanently bent when contacting the wafer, which would cause alignment problems.[304] Respondents assert that Dr. Howe agrees that, in general, probe contacts must be primarily resilient or else they would not function.[305]

FormFactor asserts that Respondents did not assert that contact elements 57b are "elongate, resilient probe elements" in their pre-trial brief and therefore have waived this anticipation argument.[306] As to the substance of Respondents' argument, FormFactor asserts that the Abe '522 patent never uses the word "elongate" and that there is no basis for interpreting contactor 52 as having an elongate attribute. Furthermore, FormFactor asserts that the fact that the contactor is made of nickel does not necessarily mean that it is "primarily elastic" and reiterates that backing 53 is actually the element supplying elasticity.[307]

The undersigned agrees with FormFactor and Staff that Respondents have not shown, by clear and convincing evidence, that claim 1 of the '485 patent is invalid as anticipated by the Abe '522 patent at least because Respondents have failed to show that the reference discloses "elongate, resilient electrical contacts" because it has not been shown that either electrical contacts 72 or

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[304] RRB 17-18 citing RFF IV.E.2.17-18.
[305] RRB 18 citing RFF IV.E.2.18.
[306] CRB 16.
[307] CRB 16-17 citing CFF 756-768.

contactor 52 exhibit are "elongate" or "resilient."[308] While Respondents point to the testimony of Dr. Adler and Mr. Taber that contacts 72 must be primarily elastic or else they would not function as reliable electrical contact, this is based on speculation and not specifically disclosed in the reference.[309] Accordingly, claim 1 of the '485 patent is not anticipated by the Abe '522 patent.

As to FormFactor's waiver argument, the undersigned agrees that Respondents did not specifically allege that contact elements 57 meet the "elongate, resilient probe elements" limitation in their pre-trial brief and have therefore have waived this anticipation argument.[310]

(2) Claim 3

Respondents assert that the additional limitation in claim 3 of requiring a plurality of semiconductor devices in wafer form is also anticipated by the Abe '522 patent because the probe card of the Abe '522 patent is designed for testing multiple devices on a wafer.[311]

As the undersigned has already ruled above that Respondents have failed to show, by clear and convincing evidence, that each and every limitation of claim 1 of the '485 patent is anticipated by the Abe '522 patent, the undersigned also finds that Respondents have failed to show, by clear and convincing evidence, that the additional limitation in claim 3 is anticipated by the Abe '522 patent.

(3) Claim 4

Respondents assert that the additional limitation in claim 4 of adding the step of dicing the

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[308] CX-750C (Howe Rebuttal) & Q/A 49.

[309] Adler, Tr. 2219.

[310] See Respondents' Pre-Trial Brief at 165-66. While the undersigned notes that Respondents, in their pre-trial brief, stated that they are only presented "examples" of their invalidity arguments with respect to certain prior art references, this violates the undersigned's ground rules that all arguments must be preserved in the pre-trial brief in order to be considered.

[311] RIB 40 citing RFF IV.E.2.23; RX-499 (the Abe '522 patent), Fig. 10.

wafer is also anticipated by the Abe '522 patent because the probe card of the Abe '522 patent is designed for testing multiple devices on a wafer prior to separating them. According to Respondents, a person of ordinary skill in the art would understand that the Abe '522 patent inherently discloses that individual devices on the wafer must be diced or singulated.[312]

As the undersigned has already ruled above that Respondents have failed to show, by clear and convincing evidence, that each and every limitation of claim 1 of the '485 patent is anticipated by the Abe '522 patent, the undersigned also finds that Respondents have failed to show, by clear and convincing evidence, that the additional limitation in claim 4 is anticipated by the Abe '522 patent.

(4) Claims 18, 19 and 29

Respondents assert that the additional limitation in claim 18 of adding the step of altering orientation of the probe substrate with respect to the probe card is also anticipated by the Abe '522 patent because contact elements (57a and 57b), and bellow portions (58) permit movement of the probe substrate with respect to the probe card.[313] Furthermore, Respondents assert that if the same standard is applied for Dr. Howe's theory of infringement (*i.e.* that Micronics' U-Probes infringe the "aligning tips," "altering an orientation," and "moveable element," limitations of these claims because the U-Probe can be disassembled and rebuilt, changing the planarity) as applied toward validity, then the '485 patent is invalid.[314]

Respondents assert that the additional limitation in claim 19 of adding a moveable element to affect orientation is also anticipated by the Abe '522 patent for the same reasons as expressed

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[312] RIB 40-41 citing RFF IV.E.2.24; RX-499 (the Abe '522 patent), Fig. 5.
[313] RIB 41 citing RFF IV.E.2.29-33.
[314] RIB 42.

above for claim 18.[315]

Respondents assert that the additional limitation in claim 29 of requiring the probe substrate be a space transformer is also anticipated by the Abe '522 patent because probe substrate (54) is a space transformer (351).[316]

FormFactor asserts that Respondents have waived their right to argue that claims 18, 19, 23, 24, 43, 33, 36-38, and 41 are anticipated by the Abe '522 patent because Respondents did not provide any anticipation arguments as to these claims in their pre-trial brief.[317] As to the substance of Respondents' argument, FormFactor asserts that there is no disclosure int he Abe '522 patent that suggests movement of the probe substrate.[318]

As noted above, Staff asserts that Respondents have failed to show, by clear and convincing evidence, that any of the asserted claims of the '485 patent are invalid as anticipated or obvious by the Abe '522 patent, at least because the prior art did not disclose the claimed step of "aligning tips of said probe elements by altering an orientation."[319]

As to FormFactor's waiver argument, the undersigned agrees that Respondents did not specifically allege in their pre-trial brief that any other claims, other than claim 1, 3, 4, and 29 of the '485 patent are anticipated by the Abe '522 patent and have therefore have waived any anticipation arguments as to claims 18, 19, 23, 24, 43, 33, 36-38, and 41.[320] As noted above, while the undersigned notes that Respondents, in their pre-trial brief, stated that they are only presented

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[315] RIB 41.

[316] RIB 41 citing RFF IV.E.2.25; RX-499 (the Abe '522 patent), Fig. 10.

[317] CRB 16 citing Respondents' Pre-Trial Brief at 156, 165-66.

[318] CRB 17-18.

[319] SIB 43 citing RX-690C (Adler Direct) at Q/A 37-72, 86,97; Adler, Tr. 2194-2205; SRB 8.

[320] See Respondents' Pre-Trial Brief at 165-166.

"examples" of their invalidity arguments with respect to certain prior art references, this violates the undersigned's ground rules that all arguments must be preserved in the pre-trial brief in order to be considered. Therefore, Respondents' arguments regarding invalidity of claims 18, 19, 23, 24, 43, 33, 36-38, and 41 based on the Abe '522 patent are deemed waived and will not be considered.[321]

b. The Beaman '846 Patent

(1) Claim 1

Respondents assert that U.S. Patent No. 5,635,846 ("the Beaman '846 patent")[322] anticipates the asserted claims of the '485 patent. According to Respondents, the Beaman '846 patent shows all the elements including:

- a printed circuit board (68), which has a plurality of contact locations on its surface, meeting the "probe card" limitation;

- a space transformer (54) and probe head (4), which meet the "probe substrate" and "space transformer" limitations;

- plurality of elongate conducting members (42), which meets the "elongate, resilient probe elements" limitation; and

- elastomeric connector (76) which electrically connects contact locations (75) with conducting members (42), meeting the "compliant interconnection structure" limitation.[323]

According to Respondents, a person of ordinary skill in the art would recognize all these parts of the

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[321] Regardless of the above procedural ruling, with regard to the substance of Respondents' arguments, the undersigned agrees with FormFactor and Staff that Respondents have not shown, by clear and convincing evidence, that claim 18 of the '485 patent is invalid as anticipated by the Abe '522 patent at least because Respondents have failed to show that the reference discloses the additional limitations in claim 18, 19 or 29 in addition to not disclosing each and every limitation of claim 1.

[322] RX-150 (the Beaman '846 patent).

[323] RIB 42-43 citing RFF IV.E.2.41-42, 2.37-61.

probe card assembly recited in the asserted claims of the '485 patent.[324]

FormFactor asserts that the Beaman '846 patent does not anticipate the '485 patent because it does not disclose the "elongate, resilient probe elements," "altering of the probe substrate," "moveable element," and "moveably affixed probe substrate" limitations. According to FormFactor, conductors 42 embedded in elastomeric material 44 do not exhibit the resilient behavior of the probe elements taught in the '485 patent.[325] As for the "altering an orientation" limitation, FormFactor asserts that there is no evidence or suggestion from the specification that the clamping arrangement 80 was designed to alter the orientation of space transformer 54. Furthermore, FormFactor asserts that the Beaman '846 patent discloses that member 82 is aluminum, which makes Phicom's claim that the screws will be used to alter the orientation implausible because the screw would have to bend the aluminum wall 82. Therefore, FormFactor asserts that the screw is not the "moveable element" nor is the space transformer "moveably affixed."[326]

Respondents counter FormFactor's arguments that the Beaman '846 patent does not include the "elongate resilient probe elements," "altering and orientation," and "moveable elements" limitations. According to Respondents, multiple individuals in the probe card industry agree with Mr. Taber that the Beaman '846 patent discloses "elongate resilient probe elements," as well as a mechanism for "altering an orientation" of the space transformer with respect to the PCB.[327] Furthermore, Respondents assert that the patent examiners in the reexamination have found that the

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[324] RIB 42.
[325] CIB 33-34 citing CFF 898-920 (specifically 898, 900-907); CRB 18.
[326] CIB 34 citing CFF 908-920.
[327] RRB 19 citing RFF IV.E.2.50-56, 59.

Beaman '846 patent discloses all of the limitations of the asserted claims.[328]

The undersigned does not find Respondents' arguments to be persuasive. It is Respondents' burden to prove, by clear and convincing evidence, that all claim limitations are present in the prior art reference. Based on the evidence presented, Respondents have not met their burden. Specifically, Respondents have failed to show that the Beaman '846 patent discloses the "elongate, resilient probe elements," "altering of the probe substrate," "moveable element," and "moveably affixed probe substrate" limitations. As to Respondents' reliance on the office action in the reexamination, as the undersigned has already determined above, while relevant, it is not dispositive, especially because it is not clear that the examiners are basing their decision on claim constructions that are consistent with those made in Order No. 37. Accordingly, the undersigned finds that Respondents have not shown, by clear and convincing evidence, that claim 1 is anticipated by the Beaman '846 patent.

(2) Claims 18 and 32

Respondents assert that the additional limitation in claims 18 and 32 of "altering an orientation" is also anticipated by the Beaman '846 patent because elastomeric connector 76, which includes elastomeric material 78 and elongated electrical conductors 85 extending through elastomeric material 78, enables this limitation.[329] Furthermore, Respondents assert that the Beaman '846 patent also describes a clamping arrangement 80, which includes screws that extend through members 84 and 82 into surface 70 of the printed circuit board 68. According to Respondents, there is testimony that the rotation of a screw in clamping arrangement 80 will move the probe substrate

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[328] RRB 19 citing RX-175 (Office Action in Reexamination dated 6/12 /08); RX-248 (Office Action in Reexamination dated 6/12 /08) at 18-24.

[329] RIB 43 citing RFF IV.E.2.48-53.

either toward or away from the probe card, thereby altering the orientation of space transformer 54 with respect to printed circuit board 68.[330]

As the undersigned has already ruled above that Respondents have failed to show, by clear and convincing evidence, that each and every limitation of claim 1 of the '485 patent is anticipated by the Beaman '846 patent, the undersigned also finds that Respondents have failed to show, by clear and convincing evidence, that the additional limitation in claims 18 are anticipated by the Beaman '846 patent.

And as the parties have presented no additional arguments as to claim 32, the undersigned also finds that Respondents have failed to show, by clear and convincing evidence, that each and every limitation of claim 32 of the '485 patent is anticipated by the Beaman '846 patent.

(3) Claims 19, 23, 24, 33, 36, and 37

Respondents assert that the additional limitation in claims 19, 23, 24, 33, 36, and 37 of a "moveable element" is also anticipated by the Beaman '846 patent because elastomeric connector 76, which includes elastomeric material 78 and elongated electrical conductors 85 extending through elastomeric material 78, enables this limitation.[331]

As the undersigned has already ruled above that Respondents have failed to show, by clear and convincing evidence, that each and every limitation of claims 1, 18, and 32 of the '485 patent are anticipated by the Beaman '846 patent, the undersigned also finds that Respondents have failed to show, by clear and convincing evidence, that the additional limitations in claims 19, 23, 24, 33, 36, and 37 are anticipated by the Beaman '846 patent.

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[330] RIB 43 citing RFF IV.E.2.55-56, 2.58-59.
[331] RIB 43 citing RFF IV.E.2.48-53.

c. The Higgins '226 Patent

Respondents assert that U.S. Patent No. 5,828,226 ("the Higgins '226 patent")[332] anticipates the asserted claims of the '485 patent. First, Respondents assert that, because the '485 patent is not entitled to an earlier priority date, the Higgins '226 patent is prior art. Second, Respondents assert that the Higgins '226 patent shows all the elements including:

- printed circuit board (19), which has a plurality of leads on its surface, which meets the "probe card" limitation;

- interposer (82 and 13) with probe array (11), which meets the "probe substrate" limitation in claim 1 and the "space transformer" limitations in claims 29 and 41, which meets the "elongate, resilient probe elements" limitation; and

- slanted pins (49) of compliant interconnect (17), which meet the "compliant interconnection structure" limitation, which enables the "altering an orientation" in claims 18 and 32, and the "moveable element" in claims 19, 23, 24, 33, 36, and 37.[333]

FormFactor asserts that the Higgins '226 patent does not anticipate the '485 patent because the Higgins '226 patent is not prior art. According to FormFactor, the '485 patent is entitled to a priority date of November 9, 1995 and the Higgins '226 patent was not filed until almost a year after that date.[334]

Respondents counter FormFactor's argument that the Higgins '226 patent is not prior art. According to Respondents, Mr. Taber has provided testimony as to why the original patent application in 1995 does not meet the written description and enabling disclosure requirements.[335] Furthermore, Respondents note that the patent examiners in the reexamination have made a similar

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[332] RX-161 (the Higgins '226 patent).
[333] RIB 44 citing RFF IV.E.2.81-82, 2.85-89.
[334] CIB 35 citing CFF 921-926; CRB 18.
[335] RRB 20 citing RFF IV.E.4.02-11.

finding.[336]

As ruled upon above, the undersigned finds that Respondents have not shown, by clear and convincing evidence, that the '485 patent is not entitled to a November 9, 1995 priority date. Therefore, the Higgins '226 patent is not prior art.

d. The Evans '079 Patent

Respondents assert that U.S. Patent No. 5,355,079 ("the Evans '079 patent")[337] anticipates asserted claims 32, 33, 36, 37, and 41 of the '485 patent because the Higgins '226 patent shows all the elements including:

- printed circuit board (1), which has a plurality of leads L on its surface, which meets the "probe card" limitation;

- film membrane (13), which meets the "probe substrate" limitation in claim 32, and the "space transformer" limitation in claim 41;

- film membrane (13) includes the "elongate, resilient probe elements" in the form of cantilevered spring fingers F; and

- film membrane (1) is moveably affixed to printed circuit board (10) by screws S1 through S4 and mounting ring 11.[338]

Furthermore, Respondents assert that the "altering an orientation" and "moveable element" limitations in claims 32, 33, 36, and 37 are shown by the disclosure in the Evans '079 patent of adjusting threaded screws S1 to S4 to alter the orientation of film membrane (13) with respect to printed circuit board (10) and align tips of spring fingers F. Specifically, moving a screw in one direction causes at least a portion of film membrane 13 to move toward printed circuit board 10 and

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[336] RRB 20 citing *Poweroasis, Inc. v. T-Mobile USA, Inc.* 522 F.3d 1299, 1305-06 (Fed. Cir. 2008) ("*Poweroasis*").

[337] RX-154 (the Evans '079 patent).

[338] RIB 45 citing RFF IV.E.2-63-64.

moving a screw in the opposite direction causes at least a portion of film membrane 13 to move away from printed circuit board.10.[339]

FormFactor asserts that the Evans '079 patent does not anticipate claims 32, 33, 36, 37, and 41 of the '485 patent because it does not disclose the aligning tips of the probe elements by altering an orientation of said probe substrate with respect to said probe card. According to FormFactor, the Evans '079 patent discloses a membrane probe card in which spring contact fingers are formed from extensions of the metallic interconnects in a laminated, flexible film membrane and that the alignment mechanism does not serve to align the tips of the fingers.[340]

Respondents counter FormFactor's arguments that the Evans '079 patent does not disclose the "aligning" limitation. According to Respondents, Dr. Howe's testimony contradicts FormFactor's position because Dr. Howe testified that the Evans '079 patent describes a probe card assembly where the plane of the probe elements are made as close to parallel as possible with the plane of the wafer under test, using threaded screws S1-S4, and referred to the technology as "first order planarization."[341] In further support, Respondents cite to the Office Action in the Reexamination.[342]

The undersigned does not find Respondents' arguments to be persuasive. It is Respondents' burden to prove, by clear and convincing evidence, that all claim limitations are present in the prior art reference. Based on the evidence presented, Respondents have not met their burden. Specifically, Respondents have failed to show that the Evans '079 patent discloses the "altering an

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[339] RIB 45-46 citing RFF IV.E.2.71.

[340] CIB 32 citing CFF 856-869; CRB 18.

[341] RRB 18-19 citing RFF IV.E.2.70-73.

[342] RRB 19 citing RX-175 (Office Action in Reexamination dated 6/12/08); RX-248 (Office Action in Reexamination dated 6/12/08) at 30-31.

orientation" and "moveable element" limitations. As to Respondents' reliance on the office action in the reexamination, as the undersigned has already determined above, while relevant, it is not dispositive, especially because it is not clear that the examiners are basing their decision on claim constructions that are consistent with those made in Order No. 37. Accordingly, the undersigned finds that Respondents have not shown, by clear and convincing evidence, that claim 1 is anticipated by the Evans '846 patent.

4. Obviousness: The Abe '522 Patent in Combination with One of Ordinary Skill in the Art; the Nakajima '056 Patent; the Philips '360 Patent; the Lander '079 Patent; and/or the Hart '383 Patent

Respondents assert that if the undersigned does not find that claims 1, 3, 4, and 29 are anticipated by the Abe '522 patent, then the Abe '522 patent in combination with the knowledge of one of ordinary skill in the art renders those claims obvious.[343] Respondents also assert that if the undersigned does not find that claims 18, 19, 32, and 33 are anticipated by the Abe '522 patent, then the Abe '522 patent in combination with U.S. Patent Nos. 5,642,056 ("the Nakajima '056 patent")[344], 4,655,360 ("the Phillips '360 patent")[345], and/or 5,335,079 ("the Lander '079 patent")[346] render those claims obvious.[347] According to Respondents, it would have been obvious to one of ordinary skill in the art to modify the probe card disclosed in the Abe '522 patent to include mechanical adjustment mechanisms disclosed in the Nakajima '056 patent, the Phillips '360 patent, and/or the Lander '079 patent, as each of those patents discloses aligning tips of probe elements by altering the orientation

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[343] RIB 46.
[344] RX-505 (the Nakajima '056 patent).
[345] RX-473 (the Phillips '360 patent).
[346] RX-493 (the Lander '079 patent).
[347] RIB 46 citing RFF IV.E.3.38.

of a probe substrate with respect to a probe card.[348]

Specifically, Respondents assert that the Nakajima '056 patent discloses both the "altering an orientation" and "moveable element" limitations in claim 18, 19, and 32 in Figure 4 and teaches altering the orientation of the probe substrate with respect to the probe card using differential screws 53 at the periphery of the probe card assembly.[349]

FormFactor asserts that the Abe '522 patent, in combination with the Nakajima '056 patent, does not render claims 18, 19, 32, 33, and 41 of the '485 patent obvious because the Nakajima '056 patent fails to disclose the "altering an orientation" limitation. According to FormFactor, the Nakajima '056 patent does not even disclose a probe card assembly that includes a probe card and a probe substrate as two of its components, therefore there is no ability to alter the orientation of a probe substrate with respect to a probe card.[350]

As to the Phillips '360 patent, Respondents assert that the reference teaches altering the orientation of a probe substrate with respect to a probe card, as shown in Figure 2. Specifically, Figure 2 shows a probe card assembly, including interface probe card (26), corresponding to the probe substrate, and an interface board (70), which is the probe card. Furthermore, the Phillips '360 patent teaches spring-loaded screws (42) disposed in slots (44) and that the screws within the slots allow rotation of the substrate with respect to the probe card, thus allowing for positioning the probes with respect to the wafer.[351]

FormFactor asserts that the Abe '522 patent, in combination with the Phillips '360 patent,

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[348] RIB 46 citing RFF IV.E.3.07.
[349] RIB 46-47 citing RFF IV.E.3.12, 14-15.
[350] CIB 29 citing CFF 788-798; CRB 19.
[351] RIB 47 citing RFF IV.E.3.17-18.

does not render claims 18, 19, 32, 33, and 41 of the '485 patent obvious because the Phillips '360 patent fails to disclose the "elongate, resilient probe elements," "compliant interconnection structures," and "altering an orientation" limitations. According to FormFactor, the rotation orientation in the Phillips '360 patent is totally different from the one disclosed in the '485 patent. Specifically, FormFactor asserts that the '485 patent discloses rotation that involves tilting, while the Phillips '360 patent does not. Furthermore, FormFactor asserts that Respondents have not provided any evidence as to why the Abe '522 patent and the Phillips '360 patent should be combined.[352]

As to the Lander '079 patent, Respondents assert that the reference teaches a means for altering the orientation of a probe substrate with respect to a probe card, as shown in Figures 1 and 2. Specifically, Figures 1 and 2 illustrate a probe card assembly with four actuating screws, S1-S4, disposed along the periphery of the probe card and that actuating the screws alters the orientation of the probe substrate (13) with respect to the probe card (10).[353]

Micronics asserts that, if Dr. Howe's theory that Micronics' pogo pins are "compliant" is accepted, then the Abe '522 patent, either alone, or in combination with U.S. Patent No. 4,724,383 ("the Hart '383 patent") teaches a compliant interconnection structure. Specifically, Figures 1 and 2 from the Hart '383 patent discloses the use of pogo pins for making electrical connection in a probe card.[354]

FormFactor asserts that the Abe '522 patent, in combination with the Hart '383 patent, does not render claims 1, 3, 4, 18, 19, and 29 of the '485 patent obvious because the Hart '383 patent fails

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[352] CIB 29-30 citing CFF 802-818; CRB 19.
[353] RIB 47 citing RFF IV.E.3.20.
[354] RIB 47-48 citing RFF IV.E.3.32, 3.36.

to disclose the "compliant interconnection structure" limitation. According to FormFactor, the Hart '383 patent pertains to printed-circuit board testing, not semiconductor wafer probing and that the interconnection structure in the Hart '383 patent does not provide any room for movement, which teaches away from the compliant interconnection structure in '485 patent that allows for the altering of orientation. In addition, FormFactor asserts that the interconnection structure in the Hart '383 patent does not electrically connect electrical contacts to the elongate, resilient probe elements. Furthermore, FormFactor asserts that Respondents have not provided any evidence as to why the Abe '522 patent and the Hart '383 patent should be combined.[355]

Respondents counter FormFactor's arguments. According to Respondents, the Abe '522 patent does in fact disclose "elongate resilient probe elements." Alternatively, Respondents assert that if the undersigned finds that the Abe '522 patent does not expressly or inherently disclose the resilient nature of probe 72, then it would have been obvious to form probes from the most common probe material, which is resilient tungsten needle probes, which are known to a person of ordinary skill in the art.[356] Specifically, Respondents assert that both Dr. Howe and Dr. Adler agree that a functional probe must be primarily resilient, and that Dr. Howe testified that a probe needle should have a bend in it, and that item 72, shown in Figure 8 of the Abe '522 patent is a needle with a slight bend it is that is exactly the right shape to form a resilient, springy probe.[357]

Respondents assert that FormFactor does not contest that the Abe '522 patent discloses the "altering" and "moveable element" limitations in claims 18, 19, 23, 24, 32, 33, 36, 37, and 41, but

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[355] CIB 30-31 citing CFF 821-828.

[356] RRB 21 citing RFF IV.E.2.17.

[357] RRB 21 citing RX-499 (the Abe '522 patent) at Fig. 8; RFF IV.E.2.18-19; Howe, Tr. 573-74.

that even if the Abe '522 patent does not disclose these limitation, that the Abe '522 patent in combination with the Nakajima '056 patent, the Phillips '360 patent, and/or the Lander '079 patent, discloses these limitations.

As to FormFactor's argument that the Philips '360 patent is totally different from the claimed altering an orientation limitation, Respondents assert that the limitation must be construed by its plain meaning and the plain meaning of "align" does not preclude rotational alignment.[358]

As to FormFactor's argument that the Abe '522 patent in combination with the Nakajima '056 patent[359] does not render the '485 patent obvious, Respondents assert that the Nakajima '056 patent clearly discloses the altering step by using differential screws 53 at the periphery of the probe card assembly.[360]

As to motivation to combine, Respondents assert that Federal Circuit case law only requires a person of ordinary skill in the art to be able to implement a "predictable variation" to a prior art method for it to be obvious. According to Respondents, there is a predictable variation in prior art probe card of the Abe '522 patent, along with a mechanism for altering orientation of a probe card using screws, as shown in the Nakajima '056 patent, the Phillips '360 patent, and/or the Lander '079 patent, which any person of ordinary skill in the art would have been motivated to combine.[361]

FormFactor asserts that the Abe '522 patent lacks the "elongate, resilient probe element" limitation and that combining the Abe '522 patent with Nakajima, Phillips, and Evans for the purpose of the "aligning" step does not cure this missing element and therefore does not render the

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[358] RRB 22 citing RFF IV.E.3.18; RX-473 (the Phillips '360 patent) at Fig. 2.

[359] In a footnote, Respondents assert that the Evans '079 patent similarly discloses the use of adjusting screws to planarize a probe card assembly. RRB 22, n. 13 citing RFF IV.E.3.19-20.

[360] RRB 22 citing RFF IV.E.3.14; RX-505 (the Nakajima '056 patent).

[361] RRB 22-23 citing RFF IV.3.09.

'485 patent obvious.[362] Specifically, as to the Evans patent, FormFactor asserts that Evans does not disclose the "aligning" step.

According to Staff, the issue of whether the Abe '522 patent renders the '485 patent obvious is whether one of ordinary skill in the art would have found it obvious to have combined an elongate resilient probe element with the Abe '522 patent to achieve the claimed invention in the '485 patent and whether secondary considerations of non-obviousness support a conclusion of obviousness. Staff ultimately agrees with FormFactor that the evidence does not clearly and convincingly show that the Abe '522 patent renders the '485 patent obvious.[363]

Staff asserts that Respondents have failed to show, by clear and convincing evidence, that any of the asserted claims of the '485 patent are invalid as anticipated or obvious by the Abe '522 patent, at least because the prior art did not disclose or render obvious the claimed "compliant interconnection structure," or the step of "aligning tips of said probe elements by altering an orientation."[364]

The undersigned does not find Respondents' arguments to be persuasive. It is Respondents' burden to prove, by clear and convincing evidence, that all claim limitations are present in a combination of the prior art references and that there be some showing of a motivation to combine or a predictable variation.[365] Here, Respondents have failed to make any specific showing that a person of ordinary skill would implement a predictable variation for any of the proposed prior art

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[362] CRB 18-19.

[363] SRB 8-9.

[364] SIB 43 citing RX-690C (Adler Direct) at Q/A 37-72, 86,97; Adler, Tr. 2194-2205; SRB 8.

[365] *KSR*, 550 U.S. at 417-18 ("If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.")

combinations other than asserted generalized arguments that such variations were predictable. Accordingly, the undersigned finds that, Respondents have not shown, by clear and convincing evidence, any of the asserted claims are obvious in light of any of the asserted prior art combinations.

5. Written Description & Enablement

Respondents assert that none of the asserted claims of the '485 patent are supported by a written and enabling disclosure because the '485 patent does not describe the claimed methods for "producing a semiconductor device."[366] According to Respondents, neither the '485 patent nor any of its earlier-filed priority applications describe the claimed invention in sufficient detail to meet the written description and enablement requirements. While Respondents concede that the '485 patent discloses a structure that can be used as a component in testing, it does not describe nor enable any of the other necessary steps to produce a tested semiconductor device. Specifically, the '485 patent does not describe a tester, a prober, a test head, anything with respect to how to conduct a test, how to singulate semiconductor devices from a semiconductor wafer, or how to assemble and package semiconductor devices.[367]

Respondents note that the Patent Office, which is reexamining the '485 patent agrees.[368] Specifically, Respondents assert that Phicom filed a request for an inter partes reexamination of the '485 patent on March 14, 2008, which was granted on June 12, 2008. Respondents assert that three Examiners have agreed that the asserted claims are not patentable over the identified prior art, which includes the Abe, Beaman, Higgins, and Evans patents. Respondents contend that, even though

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[366] RIB 48 citing RFF IV.E.4.02-11.
[367] RIB 49 citing RFF IV.E.4.02-09.
[368] RIB 49-50 citing RFF IV.E.6.08.

Patent Office decisions are not dispositive, such findings are relevant.[369]

FormFactor asserts that the '485 patent satisfies the written description requirement because it expressly discloses using the described advanced probe card assembly for producing known good die from an untested semiconductor wafer made using methods well known in the art,[370] and how to use the advanced probe card assembly to solve the problem of producing tested semiconductor devices.[371] FormFactor also asserts that there is a detailed description in the specification of Figure 5 and that one of ordinary skill in the art would understand that the inventors conceived their invention to include a method of producing tested semiconductor devices using probe cards with the features set forth in the claims.[372] Finally, FormFactor asserts that Mr. Taber, Phicom's expert, applied the wrong standard for a person of ordinary skill in the art.[373]

Staff asserts that Respondents have not shown, by clear and convincing evidence, that the asserted claims are invalid under § 112. Specifically, Staff asserts that the evidence does not clearly and convincingly show that the inventors were not in possession of the invention at the time of the original filing or that one of ordinary skill in the art could not understand the bounds of the claims. As to enablement, Staff notes that while Dr. Khandros admitted that, in order to practice the claimed invention, experimentation would be required, Dr. Khandros' testimony does not clearly and convincingly demonstrate that the specification of the '485 patent would not have taught one of ordinary skill in the art how to make and use the full scope of the claimed invention without "undue"

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[369] RIB 50-51 citing RFF IV.E.5.11.
[370] CIB 35 citing JX-3 (the '485 patent) at col. 1:35-50.
[371] CIB 35 citing JX-3 (the '485 patent), col. 1:60-2:5; CRB 20.
[372] CIB 35-36 citing JX-3 (the '485 patent) at col. 30:51-67.
[373] CIB 36 citing Taber, Tr. 1461-63.

experimentations.[374]

The undersigned agrees with FormFactor and Staff that, Respondents have not shown, by clear and convincing evidence that the asserted claims are invalid under § 112 because the evidence does not show that the inventors were not in possession of the invention at the time of the original filing or that one of ordinary skill in the art could not understand the claims. As noted above, while the proceedings in the reexamination may be relevant, they are not dispositive. Accordingly, the '485 patent is not invalid based on lack of written description or enablement.

6. Related Proceedings

While Respondents devote a section of their post-hearing briefs to the invalidity findings made by the Korean courts, the undersigned does not rely on any of Respondents arguments as to the findings made by the Korean courts.

V. The '751 Patent

A. Overview

Six claims of the '751 patent are asserted against Respondents, namely 1, 12, and 24, which are independent claims, and claims 2, 3 and 25, which are dependent claims. These claims read as follows:

1. A probe card assembly comprising: a substrate having a first surface, wherein the first surface has an area that includes a central region and at least one peripheral region, wherein each peripheral region is located further from a center of said substrate than said central region; a plurality of contact elements coupled to said first surface of said substrate; and at least one planarizing element capable of transmitting a force to the central region of said substrate to modify a shape of the first surface at said central region relative to a shape of said first surface at each peripheral region, whereby, the first surface can be made planar.

2. A probe card assembly as in claim 1 wherein each of said contact elements has a contact

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[374] SIB 47.

region, and wherein said at least one planarizing element applies a force to the central region relative to each peripheral region such that said contact regions are planarized relative to one another.

3. A probe card assembly as in claim 1 wherein said plurality of contact elements comprises free-standing spring elements.

12. A probe card assembly comprising: a space transformer having a first surface, wherein the first surface has an area that includes a central region and at least one peripheral region, wherein each peripheral region is located further from a center of said space transformer than said central region; a plurality of contact elements, coupled to said first surface of said space transformer; an adjustable central control member capable of transmitting a force to the central region of said space transformer to modify a shape of the first surface at said central region relative to a shape of said first surface at each peripheral region; and at least one adjustable peripheral control member, wherein each adjustable peripheral control member is capable of transmitting a respective force to a respective peripheral region of said space transformer to modify a shape of the first surface at the respective peripheral region relative to a shape of said first surface at the central region.

24. A probe card assembly comprising: a substrate having a central region and at least one peripheral region, wherein each peripheral region is located further from a center of said substrate than said central region; a plurality of contact elements, coupled to said substrate; an adjustable central control member capable of transmitting a force to the central region of said substrate to modify a shape at said central region relative to a shape at each peripheral region; and at least one adjustable peripheral control member, wherein each adjustable peripheral control member is capable of transmitting a respective force to a respective peripheral region of said substrate to modify a shape at the respective peripheral region relative to a shape at the central region.

25. A probe card assembly of claim 24, wherein said substrate comprises a space transformer.

As noted above, the undersigned has already construed the above claims in a *Markman* order.[375] A summary of the claims construed in that order is detailed below:

Claim	Term	Construction
Claim 1	substrate	a carrier (including a flexible material as well as rigid boards) on which something can be formed or attached

[375] See Order No. 37.

Claim 1	a central region and at least one peripheral region, wherein each peripheral region is located further from a center of said substrate than said central region and to modify a shape of the first surface at said central region relative to a shape of said first surface at each peripheral region	plain meaning
Claim 1	a plurality of contact elements coupled to said first surface of said substrate	plain meaning
Claim 1	planarizing element	an apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate to achieve a desired deformation of the substrate
Claim 3	free-standing spring elements	interconnection elements which have one end attached to a structure, and which are intended to make pressure contact with terminals of an electronic component at one free[376] end thereof
Claim 12	space transformer	an interconnect assembly which makes interconnections from a one pitch to another pitch
Claim 12	a plurality of contact elements, coupled to said first surface of said space transformer	plain meaning
Claim 12	adjustable central control member	an adjustable planarizing apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate to achieve a desired deformation of the substrate in the center

[376] As noted during the hearing, there is an errata to the undersigned's claim construction where the word "free" was inadvertently omitted from the claim construction. Bullock, Tr. 2050 (March 5, 2009).

Claim 12	adjustable peripheral control member	an adjustable planarizing apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate to achieve a desired deformation of the substrate in the peripheral region
Claim 24	a plurality of contact elements, coupled to said substrate	plain meaning

B. Infringement

1. Phicom

FormFactor never contended that Phicom's Type A or Type D MEMS probe card assemblies infringe the '751 Patent and thus those assemblies are not at issue in this investigation.[377]

Phicom does not contest that its Type B and C MEMS Cards fall within the undersigned's claim construction for the asserted claims of the '751 patent.[378] Thus, it is undisputed that Phicom's Type B and C MEMS Cards infringe the asserted claims of the '751 patent.

With respect to Phicom's new, redesigned MEMS Cards, Phicom asserts that said cards do not infringe any claim of the '751 patent,[379] while FormFactor and Staff first allege that said cards are not subject to the jurisdiction of the Commission.[380] FormFactor argues that there is no jurisdiction because there is no "imminent importation" and no other evidence that "infringing acts are reasonably likely to occur."[381] However, the undersigned previously addressed this argument of

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[377] CX-732C at Q/A 134-135; CX-760C at Q/A 3, 5, 7.

[378] RRB 23; CIB 38-39. Phicom's Type B probe card assemblies are obsolete and no longer manufactured. Taber Tr. 1458:22-1459:5. Phicom's Type C probe card assemblies illustrated in RX-102C, without a fixed center bolt, are obsolete and no longer manufactured. Taber Tr. 1458:22-1459:5.

[379] RIB 51-54.

[380] CIB 39; SIB 50.

[381] CIB 39 and CRB 19, both citing *Amgen,* 519 F.3d at 1352 .

FormFactor,[382] finding that the Commission does have jurisdiction over Phicom's new probe card design assembly. Thus, the issue of whether Phicom's new probe card design assembly infringes the '751 patent shall be addressed below.

a. Claim 1: Literal Infringement

FormFactor argues that Phicom's new MEMS Cards contain 1) a substrate ("MPH"), 2) having a surface facing a semiconductor wafer, 3) said surface having central and peripheral regions, and 4) contact elements ("Micro Probes") coupled to said surface.[383] FormFactor argues that the only purported difference between Phicom's infringing Type C probe card assemblies and the new MEMS Cards is the replacement of the central planarizing and/or adjusting bolt/screw mechanism of the Type C probe card assemblies with a "Height Setting Block" and center bong combination, which FormFactor also refers to variously as a "Holding Block" and a "Center Fixing Module."[384] According to FormFactor, Mr. Jun Tae Hwang, a Phicom engineer in charge of the design of the new center device,[385] testified that the only change in the new probe card is the replacement of the center

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[382] See Section II.A., *supra*.

[383] CIB 40; CFF 944-959, 963-967, 994. Specifically, FormFactor asserts:

> The newly designed MEMS Cards contains [sic] 1) probe cards in the form of PCBs having a plurality of contact areas disposed on a surface; 2) space transformers called Microprobe Heads ("MPH") that make interconnections from one pitch to another pitch; 3) elongate, resilient probe elements called Microprobes that exhibit primarily elastic behavior in response to an applied load or contact force; 4) a compliant interconnection structure in the form of NIPs and guide films that electrically connect ones of the electrical contacts with the Microprobes, and 5) planarizing elements in the form of bolts and screws that can planarize respective local areas of the MPH for a first and second order planarization.

CFF 959.

[384] CIB 40 citing CX-758C, CX-647C, and RX-221C.

[385] It is undisputed that Phicom's witness Mr. Hwang was responsible for the design of (continued...)

control bolt by the "Height Setting Block/Center Fixing Module."[386] FormFactor argues that Mr. Hwang established that the new center device allows for adjustment of the separation of the MPH substrate and the printed circuit board ("PCB").[387]

FormFactor argues that the new "Height Setting Block/Center Fixing Module" aspect of Phicom's new card design is an adjustable planarizing apparatus capable of applying and holding a controlled force at the center of the MPH substrate to achieve a desired deformation of the MPH substrate.[388] FormFactor asserts that the position, *i.e.*, height or length, of the Height Setting Block/Center Fixing Module can be controlled or adjusted via the threaded center screw (or "bong") by rotating the Height Setting Block/Center Fixing Module around the screw/bong.[389] In particular, FormFactor relies on CX-758C, a document which FormFactor alleges illustrates that height adjustment is performed by operation of a screw, "just like the screws used on the older central and current peripheral planarization mechanism which Phicom does not contest as adjusting planarity."[390] FormFactor asserts that rotation of the screw leads to an adjustment of the distance between the MPH substrate and the PCB.[391] FormFactor also asserts that "even when screwed in all the way, the arrangement produces the applied force to achieve the desired formation."[392]

FormFactor further argues that, in addition to manually adjusting the separation between the

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[385](...continued)
Phicom's new probe card assembly design. CFF 973 citing CX-752C at 92:18-21; CFF 974 citing CX-752C at 93:8-19 and Hwang Tr. 1332:6-12; ROCFF 973; ROCFF 974.

[386] CFF 964 citing CX-752C at 33:15-20, 34:11-13, and 34:15-16.

[387] CIB 41.

[388] CIB 40; CFF 990-1022.

[389] CIB 41.

[390] CRB 19-20.

[391] CIB 41 citing CX-755C at PHI54755; CRB 20.

[392] CIB 41.

MPH substrate and the PCB by rotating the Height Setting Block/Center Fixing Module around the screw/bong, the height or length of the Height Setting Block/Center Fixing Module itself can be changed independently of the use of the "screwing adjustment process."[393] FormFactor argues that "Mr. Hwang confirmed that the different heights of center bolts can be selected when a new MEMS Card is assembled."[394] FormFactor argues that changing the length of the Height Setting Block/Center Fixing Module "establishes that the 'new' design MEMS Cards include an adjustable central planarizing element."[395]

FormFactor argues that, even if the final position of the components is fixed, "the fixed position is adjusted by operation of the screw or by swapping different height setting blocks" and this satisfies claim 1's requirement of a planarizing element because, according to the undersigned's claim construction, the apparatus need only be *capable* of applying a pushing or pulling force on the substrate to achieve a desired deformation of the substrate.[396]

Phicom asserts that its redesigned MEMS Cards have a "fixed center bolt that keeps the Phicom PCB and MPH at a fixed relative position, so that the distance between the PCB and the MPH cannot be modified at the location of the bolt."[397] Phicom also asserts that all Phicom Type C MEMS Cards manufactured since December 2008 use a fixed center bolt,[398] and does not dispute that, other than the fixed center bolt, Phicom's redesigned MEMS Cards sold since December 2008

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[393] CIB 41.

[394] CIB 41 citing Hwang Tr. 1398:1-5.

[395] CIB 41-42.

[396] CRB 20.

[397] RIB 51; RRB 24; RRCFF 992E (stating, "The purpose of the fixed center bolt in Phicom's [new] Type C probe card assemblies is to fix the distance between the micro probe head (MPH) and the printed circuit board in the center, and to prevent any adjustment of that distance.") citing Hwang Tr. 1387:1-1388:9; RX-418C at Q/A 9, 35-38, 48, 54, 57, 85.

[398] RX-0381C at Q/A 161-162.

are the same as Phicom's previous Type C probe card assemblies.[399]

Phicom argues that the "fixed center bolt" at issue is locked in place between the MPH substrate and the PCB and that it has a "single designed length," which cannot be moved or adjusted to change length or to "transmit a force to modify a surface shape" of the MPH substrate.[400] Phicom further argues that the fixed center bolt "prevents deformation at the center of the MPH."[401]

Phicom adds that customers cannot access the fixed center bolt because the new MEMS Card, as shipped, includes a cover that is secured over the fixed center bolt by specialty bolts and Loctite.[402] Phicom argues that "with its cover plates in place, all of the assembled components of the fixed center bolt are inaccessible and fixed in place."[403] Phicom further argues that its fixed center bolt falls within the scope of the prior art.[404]

Staff argues that, with respect to the function and operation of the new fixed center bolt, the testimony of FormFactor's expert, Dr. Howe, is at odds with the testimony of Phicom's engineer, Mr. Hwang, and that Dr. Howe's testimony is not sufficient to carry FormFactor's burden of proving infringement because it "is not based on the actual use and operation of the new center bolt."[405]

The undersigned finds the arguments of Phicom to be persuasive and that FormFactor has failed to prove, by a preponderance of the evidence, that Phicom's MEMS Cards meet each and every

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[399] RFF V.B.1.04 and RRCFF 992C, both citing RX-418C at Q/A 49-51; RX-0381C at Q/A 162; Hwang Tr. 1328:6-14; RRB 24 (stating, "On the merits, the only difference between the obsolete and the current Type C designs is that the adjustable center assembly in the obsolete design has been replaced with a new fixed center assembly.").

[400] RIB 52, 53; RRB 24.

[401] RIB 52.

[402] RIB 52 citing RFF V.B.1.20.

[403] RIB 53.

[404] RIB 53-54.

[405] SIB 50-52 comparing CX-760C at Q/A 8 and Q/A 9 with Hwang Tr. 1388-90 (stating that it would not be possible to change the height of the bolt in the actual assembly) and 1390-93.

limitation of claim 1 of the '751 patent. Specifically, FormFactor has failed to show that the fixed center bolt in Phicom's MEMS Cards meets the "planarizing element" limitation of claim 1 because there is no evidence that the bolt is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the MPH substrate.[406]

The undersigned construed the claim limitation, "planarizing element," as "an apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate *to achieve a desired deformation of the substrate*." With respect to deformation of the MPH substrate, the undersigned finds that FormFactor makes only unsupported conclusory assertions such as, "the arrangement produces the applied force to achieve the desired formation."[407] The undersigned finds that FormFactor has failed to present any evidence that Phicom's new MEMS Cards include an element that achieves, or is capable of achieving, a desired deformation of the MPH substrate.

The evidence that FormFactor provides is focused on the new fixed center bolt's effect on the separation distance between the MPH substrate and the PCB, which FormFactor alleges may be adjusted by rotating a screw or by swapping different height setting blocks. Even if such is evidence that the fixed center bolt is *capable of applying a pushing or pulling force*, the undersigned finds that FormFactor still has not presented any evidence that the alleged force on the MPH substrate achieves, or is capable of achieving, a desired deformation of the substrate. Conversely, Mr. Taber testified that the fixed center bolt in Phicom's new probe card design assemblies is not used for

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[406] One argument among the parties centers around whether the new fixed center bolt design should be referred to as a "height setting block" based on CX-758C or a "holding block" based on CX-647C. *See, e.g.*, CRB 20, fn. 4; Hwang Tr. 1399:16-1400:25. However, the undersigned finds that the name given to the design has no real significance here in determining whether or not the design infringes the '751 patent.

[407] CIB 41.

planarization and is not capable of applying a force to, *or changing the shape of*, the MPH substrate.[408]

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Phicom's new MEMS Cards literally infringe each and every limitation of independent claim 1 of the '751 patent.

b. Claim 1: Literal Infringement Under the Doctrine of Equivalents

FormFactor argues that even if the position, *i.e.*, height or length, of the Height Setting Block/Center Fixing Module, which sets the distance between the MPH substrate and the PCB, is fixed, the new MEMS Cards infringe independent claim 1 of the '751 patent under the doctrine of equivalents because the height is "selected to ensure that the force applied results in the desired deformation" of the MPH substrate.[409] More specifically, FormFactor states that "the desired relative deformation of the MPH is achieved as the fixed central planarizing element will be applying a force depending on the relative forces of the peripheral planarizing elements."[410] Thus, according to FormFactor:

> [T]he alleged 'new' design MEMS Cards include a center device that performs the same function (*i.e.*, desired deformation of the central region of the substrate) in substantially the same way (via an adjustable mechanism for exerting a controlled force to the central region of the substrate) in order to achieve the same result (*i.e.*, planarizing the tips of the probe elements mounted to the substrate) as the central planarizing element and the adjustable central control member. [411]

FormFactor argues that "there is no difference between the functional capabilities between the center planarization mechanism contained in the older Type B and C MEMS Cards and the 'new' center

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[408] RX-418C at Q/A 9, 57, 81, 85-91; RX-415C at Q/A 172-74.
[409] CIB 42.
[410] CIB 42.
[411] CIB 42 citing CFF 1011-12, 1018-21, 1029, 1039-41.

bolt design."[412]

Phicom argues that the doctrine of equivalents is not available to FormFactor because of prosecution history estoppel.[413] As evidence, Phicom points to FormFactor's narrowing amendments during prosecution of the application leading to the '751 patent for the "planarization element" of claim 1.[414] Phicom also argues that FormFactor waived its right to argue that Phicom infringes the '751 Patent under the doctrine of equivalents by presenting no such argument in its PreHearing Brief.[415]

Staff argues that Dr. Howe's opinion that the peripheral screws of the new fixed center bolt assembly adjust the force applied on the central area of the assembly ignores that there are claim limitations directed to both the peripheral region and the central region of the assembly.[416] Staff argues that Dr. Howe's analysis omits a limitation of the asserted claims and thus does not establish that Phicom's new MEMS Cards infringe the asserted claims of '751 patent under the doctrine of equivalents.[417]

Again, the undersigned finds that FormFactor has failed to prove, by a preponderance of the evidence, that Phicom's new MEMS Cards meet each and every limitation of claim 1 of the '751 patent. Specifically, FormFactor has failed to show that the fixed center bolt in Phicom's new MEMS Cards meets the "planarizing element" limitation because there is no evidence that the bolt

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[412] CRB 20-21.

[413] RIB 54 and RRB 25, both citing *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 727 (2002) ("*Festo*").

[414] RIB 54; RRB 25.

[415] ROCFF 1040.

[416] SIB 52.

[417] SIB 52 citing *Carnegie Mellon Univ. v. Hoffmann-LaRoche, Inc.*, 541 F.3d 1115, 1129 (Fed. Cir. 2008) ("*Carnegie Mellon*").

is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the MPH substrate - literally or by equivalents. FormFactor provides no support for its conclusory assertions in its brief that 1) the height of the fixed center bolt is selected to ensure that the force applied results in the desired deformation of the MPH substrate and 2) the desired relative deformation of the MPH is achieved as the fixed central planarizing element will be applying a force depending on the relative forces of the peripheral planarizing elements.

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Phicom's new MEMS Cards infringe each and every limitation of independent claim 1 of the '751 patent under the doctrine of equivalents. Since the undersigned finds that Phicom's new MEMS Cards do not read on the claim term *planarizing element* in independent claim 1, either literally or under the doctrine of equivalents, there is no need to address other claim terms in claim 1 or in the claims that depend from claim 1, *i.e.*, claims 2 and 3.

c. Claim 2

FormFactor asserts that Phicom's new MEMS Cards infringe dependent claim 2 of the '751 patent because they include Micro Probes that allegedly have contact regions "that are designed to make pressure contacts with the electrical pads on the wafer."[418]

As the undersigned has already ruled above that independent claim 1 is not infringed, none of the claims that depend from it infringe as well.

d. Claim 3

FormFactor asserts that Phicom's new MEMS Cards infringe dependent claim 3 of the '751 patent because the Micro Probes, which FormFactor argues are "contact elements," allegedly have

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[418] CIB 42 citing CFF 403, 405-08, 946 and CX-0653C at FFITC0116912.

one end attached to a structure, the terminal of the MPH substrate, and an opposing end that is not attached to the MPH substrate.[419] FormFactor also asserts that the Micro Probes of Phicom's new MEMS Cards "are elastic structures that make pressure connections or contacts with a semiconductor device under test."[420]

As the undersigned has already ruled above that independent claim 1 is not infringed, none of the claims that depend from it infringe as well.

e. Claim 12: Literal Infringement

FormFactor argues that independent claim 12 adds that the substrate is a space transformer and that there are adjustable control members in the central and peripheral regions of the MPH substrate.[421] FormFactor further asserts that the MPH substrate is a space transformer and that Dr. Howe's uncontested testimony regarding Phicom's previous Type C probe card assemblies establishes that, in the new MEMS Cards, there are "peripheral planarizing mechanisms including adjusting screws/bolts."[422] Finally, FormFactor asserts that the "'new' design also includes an adjustable center device as called for by Claim 12 and as discussed above."[423]

Phicom argues that the fixed center bolt of its new MEMS Cards does not meet the requirement of a "planarizing element capable of transmitting a force to the central region of said substrate to modify a shape of the first surface at said central region" as it is recited in independent claim 1 and that, because independent claim 12 has the same limitation, it is also not infringed.[424]

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[419] CIB 42-43 citing CFF 948-49.
[420] CIB 43 citing CFF 948-49.
[421] CIB 43.
[422] CIB 43-44 citing CFF 954, 968, 1039.
[423] CIB 44.
[424] RIB 52-53.

The undersigned finds that claim 12 is similar to claim 1, the differences being that claim 12 claims a "space transformer," an "adjustable central control member," and "at least one adjustable peripheral control member," rather than a "substrate" and a "planarizing element." The "having" clause which follows "space transformer" in claim 12 and "substrate" in claim 1 is identical and it is undisputed that, other than the fixed center bolt, Phicom's new MEMS Cards are the same as Phicom's previous Type C probe card assemblies.[425] It is also undisputed that Phicom's previous Type C probe card assemblies infringe the '751 patent and that Phicom's new MEMS Cards have planarization mechanisms in the *peripheral* regions of the MPH substrate.[426] Thus, the undersigned further finds that the only element at issue with respect to claim 12 is the "adjustable central control member."

The undersigned finds that FormFactor has failed to prove, by a preponderance of the evidence, that Phicom's MEMS Cards meet each and every limitation of claim 12 of the '751 patent. Specifically, FormFactor has failed to show that the fixed center bolt in Phicom's new MEMS Cards meets the "adjustable central control member" limitation because there is no evidence that the bolt is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the MPH substrate in the center. The undersigned construed the claim limitation, "adjustable central control member," as "an adjustable planarizing apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate *to achieve a desired deformation of the substrate in the center*." The undersigned finds that FormFactor has failed to present any evidence that Phicom's new MEMS Cards include an element that achieves, or is capable of achieving, a

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[425] CX-758C, CX-647C, and RX-221C; RX-418C at Q/A 49-51; RX-0381C at Q/A 162; Hwang Tr. 1328:6-14.

[426] CX-752C at 83:18-20; CFF 1039; ROCFF 968; ROCFF 1039.

desired deformation of the MPH substrate in the center. Conversely, Mr. Taber testified that the fixed center bolt in Phicom's new probe card design assemblies is not used for planarization and is not capable of applying a force to, *or changing the shape of*, the MPH substrate.[427]

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Phicom's new MEMS Cards literally infringe each and every limitation of independent claim 12 of the '751 patent.

f. Claim 12: Literal Infringement Under the Doctrine of Equivalents

Similar to its doctrine of equivalents argument for claim 1, FormFactor argues that "[e]ven if the 'new device' is considered to have a fixed height, it is selected to ensure that the force applied results in the desired formation."[428] Thus, according to FormFactor:

> [T]he alleged 'new' design MEMS Cards include a center device that performs the same function (*i.e.*, desired deformation of the central region of the substrate) in substantially the same way (via an adjustable mechanism for exerting a controlled force to the central region of the substrate) in order to achieve the same result (*i.e.*, planarizing the tips of the probe elements mounted to the substrate) as the central planarizing element and the adjustable central control member.[429]

Phicom argues that the doctrine of equivalents is not available to FormFactor because of prosecution history estoppel.[430] As evidence, Phicom points to FormFactor's narrowing amendments during prosecution of the application leading to the '751 patent for the "adjustable central control member" element of claim 12.[431] Phicom also argues that FormFactor waived its right to argue that Phicom infringes the '751 Patent under the doctrine of equivalents by presenting no such argument

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[427] RX-418C at Q/A 9, 57, 81, 85-91; RX-415C at Q/A 172-74.
[428] CIB 44 citing CFF 1041.
[429] CIB 42 citing CFF 1011-12, 1018-21, 1024, 1039-41.
[430] RIB 54 and RRB 25, both citing *Festo,* 535 U.S. at 727.
[431] RIB 54; RRB 25.

in it PreHearing Brief.[432]

Staff argues that Dr. Howe's opinion that the peripheral screws of the new fixed center bolt assembly adjust the force applied on the central area of the assembly ignores that there are claim limitations directed to both the peripheral region and the central region of the assembly.[433] Staff argues that Dr. Howe's analysis omits, a limitation of the asserted claims and thus does not establish that Phicom's new MEMS Cards infringe the asserted claims of '751 patent under the doctrine of equivalents.[434]

Again, the undersigned finds that FormFactor has failed to prove, by a preponderance of the evidence, that Phicom's MEMS Cards meet each and every limitation of claim 12 of the '751 patent. Specifically, FormFactor has failed to show that the fixed center bolt in Phicom's new MEMS Cards meets the "adjustable central control member" limitation because there is no evidence that the bolt is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the MPH substrate in the center - literally or by equivalents.

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Phicom's new MEMS Cards infringe each and every limitation of independent claim 12 of the '751 patent under the doctrine of equivalents. Since the undersigned finds that Phicom's new MEMS Cards do not read on the claim term *adjustable central control member* in independent claim 12, either literally or under the doctrine of equivalents, there is no need to address other claim terms in claim 12.

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[432] ROCFF 1040.
[433] CIB 52.
[434] SIB 52 citing *Carnegie Mellon*, 541 F.3d at 1129.

g. Claim 24

FormFactor argues that independent claim 24 is similar to claim 12 with respect to adjustable control members in the central and peripheral regions and that "[f]or the same reasons, it is satisfied literally and under the doctrine of equivalents" by Phicom's new MEMS Cards.[435]

Phicom argues that the fixed center bolt of its new MEMS Cards does not meet the requirement of a "planarizing element capable of transmitting a force to the central region of said substrate to modify a shape of the first surface at said central region" as it is recited in independent claim 1 and that, because independent claim 24 has the same limitation, it is also not infringed.[436]

The undersigned finds that claim 24 is similar to claim 12, the differences being that claim 24 claims a "substrate" rather than a "space transformer;" claims 12 and 24 both claim an "adjustable central control member" and "at least one adjustable peripheral control member." Again, it is undisputed that, other than the fixed center bolt, Phicom's new MEMS Cards are the same as Phicom's previous Type C probe card assemblies.[437] It is also undisputed that Phicom's previous Type C probe card assemblies infringe the '751 patent and that Phicom's new MEMS Cards have planarization mechanisms in the *peripheral* regions of the MPH substrate.[438] Thus, the undersigned further finds that, as with claim 12, the only element at issue with respect to claim 24 is the "adjustable central control member."

For the reasons articulated by the undersigned above regarding claim 12, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, either

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[435] CIB 45.

[436] RIB 52-53.

[437] CX-758C, CX-647C, and RX-221C; RX-418C at Q/A 49-51; RX-0381C at Q/A 162; Hwang Tr. 1328:6-14.

[438] CX-760C at 13; CX-759C; CX-752C at 83:18-20.

literally or under the doctrine of equivalents, that Phicom's new MEMS Cards infringe each and every limitation of independent claim 24 of the '751 patent. Since the undersigned finds that Phicom's new MEMS Cards do not read on the claim term *adjustable central control member* in independent claim 24, either literally or under the doctrine of equivalents, there is no need to address other claim terms in claim 24 or in the claims that depend from claim 24, *i.e.*, claim 25.

h. Claim 25

FormFactor asserts that Phicom's new MEMS Cards infringe dependent claim 25 of the '751 patent because claim 25 adds that the substrate be a space transformer and "[a]s discussed above, the MPH is a space transformer."[439]

As the undersigned has already ruled above that independent claim 24 is not infringed, none of the claims that depend from it infringe as well.

2. Micronics

It is undisputed that Micronics' accused Center Lock U-Probes include [

][440] Thus, the dispute regarding infringement by Micronics centers mainly around whether the accused Micronics [ ] U-Probes contain the "planarizing element" and "adjustable control member" limitations of the asserted claims.

a. Claim 1: Literal Infringement

FormFactor asserts that Micronics' accused Center Lock U-Probes meet the "planarizing

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[439] CIB 45.
[440] CFF 1049 (undisputed) citing CX-732C at 124.

element" limitation of claim 1 because "[a] desired deformation of the[ ] [substrate] is achieved [ ][441] FormFactor argues that each accused U-Probe [ ] that is capable of transmitting a force to the central region of the [ ] substrate to achieve a desired deformation of the first surface of the substrate.[442]

FormFactor argues that the [ ][443] FormFactor further argues that Micronics' witnesses testified that, [ ][444] FormFactor asserts that Micronics' witness Mr. Inoue testified that[ ][445] Thus, according to FormFactor, [ ][446]

FormFactor also argues that MJC has [ ] which FormFactor also calls [ ] in the middle of certain U-Probe cards to improve or repair their planarity.[447]

To start, Micronics argues that FormFactor's arguments wrongly focus on process steps

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[441] CIB 47; CRB 22.

[442] CFF 1052 and CFF 1055, both citing CX-732C at 125, CX-120C at MJC01308115, JX-062C at 111:5-16, 111:23, and CX-340C at MJC01975372.

[443] CFF 1056 citing Inoue Tr. 1984:1-19, Adler Tr. 2073:8-10, 2073:16-2074:14; CFF 1057 citing Inoue Tr. 1986:1-8.

[444] CIB 47 citing CFF 1056 and 1061.

[445] CFF 1071 citing Inoue Tr. 2019:8-2020:10.

[446] CIB 47.

[447] CFF 1063 citing CX-732C 127; CX-656C at MTI021764, MTI021779.

rather than on "the actual product imported and sold in the U.S."[448] Specifically, Micronics argues that:

> U-Probes are shipped [ ] preventing any adjustment or exchange of these components in the United States.[449]

Micronics then argues that the accused U-Probes do not infringe claims 1-3 of the '751 patent because they do not have a "planarizing element."[450] According to Micronics, "U-Probes are not capable of planarity adjustments."[451] Micronics argues that [ ][452]

Micronics further argues that [ ][453]

Thus, Micronics asserts that [ ] does not meet the "whereby" limitation of claim 1, which states, "whereby the first surface [of the substrate] can be made planar."[454]

Micronics also argues that [ ] and that

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[448] RIB 55 citing RFF IV.E.3.04-06; RRB 25.

[449] RIB 55 (emphasis added) citing RFF V.C.23-25; RRCFF 1052D citing RFF V.C.23; Howe Tr. 661:10-13, 662:3-7; RX-807C; RX-857C at Q/A 210, 253-254, 281; RX-861C at Q/A 22; RRCFF 1052E citing RFF V.C.24-V.C.25; Howe Tr. 662:8-17, 684:7-17; RDX-153C; RX-857C at Q/A 258; JX-63C, Miur Depo Tr. 172:20-173:10.

In response, FormFactor argues that it is not important that the accused U-Probes are shipped to prevent adjustment. CRB 22. FormFactor asserts that the accused U-Probes apply the required forces "even after the mechanism is closed and sealed" and thus shipping the product after it has been configured does not avoid infringement. CRB 22-23.

[450] RIB 55-57.

[451] RRB 25.

[452] RIB 55 citing RFF V.C.1.01; RRB 25; RRCFF 1053A citing RFF V.C.30, V.C.1.01, V.C.1.08; Inoue Tr. 1015:21-25; RX-830C at 2; RX-831C at 3; RX-861C at Q/A 19; JX-63C, Miura Depo Tr. at 170:14-172:11.

[453] RIB 56 citing RFF V.C.14-22, 1.01-1.09; RRCFF 1055B and 1055C, both citing RFF V.C.1.01-V.C.1.08; Inoue Tr. 1015:21-25; RX-830C at 2; RX-831C at 3; RX-857C at Q/A 99, 232, 281; RX-861C at Q/A 19-22; JX-63C, Miura Depo Tr. at 170:14-172:1.

[454] RIB 56, 57; RRB 29.

[ ][455]

Micronics argues that [

][456] In addition, Micronics asserts that[

][457] Micronics further asserts

that [.

][458]

Micronics argues that the accused U-Probes do not infringe the asserted claims of the '751 patent because "they lack any mechanism for providing a desired amount of deformation to the substrate, or for adjusting the planarity of the substrate," which is required by the undersigned's constructions of the "planarizing element" and "adjustable control member" limitations.[459] Micronics further argues that [

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[455] RIB 57.

[456] RIB 56 citing RFF.C.04-06, 14-18.

[457] RIB 55; RRCFF 1052A citing RX-861C at Q20, 22; RX-857C at Q/A 99, 281; RRCFF 1052B citing RX-861C at Q20, 22; RX-857C at Q/A 99, 281; RRCFF 1052C citing RX-861C at Q20, 22; RX-857C at Q/A 99, 281.

[458] RRCFF 1052G citing Inoue Tr. 2045:7-8, 2045:16-2046:4; RRCFF 1052F citing RX-857C at Q/A 99, 250-252, 273, 281, RX-861C at Q/A 57.

[459] RIB 54 citing RFF V.C.01-03.

[460] RIB 55; RRB 26 (stating, [

]

(continued...)

Micronics also argues that [

]461

Staff argues that the dispute regarding whether Micronics' accused [ ] U-Probes infringe claims 1-3 of the '751 patent centers on whether the [ ] U-Probes contain the "planarizing element" limitation of claim 1.462 Staff further argues that Micronics' witnesses, including its expert, testified that [

] thus, Micronics' [ ] U-Probes infringe all of the asserted claims of the '751 patent.463 Specifically, Staff argues that:

[

]464

Staff argues that, because the undersigned's claim construction does not require more than one amount of deformation, [ ] is sufficient to satisfy the claim limitation.465

The undersigned finds the arguments of Micronics to be persuasive and that FormFactor has failed to prove, by a preponderance of the evidence, that Micronics' accused [ ] U-Probes

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460(...continued)
(emphasis added)).

461 RRCFF 1063A and 1063B citing RFF IV.C.1.16; RX-857C at Q/A 242.

462 SIB 53.

463 SIB 54-55.

464 SIB 54.

465 SIB 54; SRB 9.

meet each and every limitation of claim 1 of the '751 patent. Specifically, FormFactor has failed to show that [ ] mechanism in Micronics' accused U-Probe card assemblies meets the "planarizing element" limitation because there is no evidence that the mechanism is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the [ ] substrate.

The undersigned construed the claim limitation, "planarizing element," as "an apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate *to achieve a desired deformation of the substrate*."

With respect to deformation of the MLS substrate, FormFactor argues that the [ ][466] Thus, FormFactor concludes that [ ][467] Even if the evidence relied on by FormFactor, *e.g.*, the cited testimony of Inoue and Adler, is evidence that [ ] is *capable of applying a pushing or pulling force*, the undersigned finds that FormFactor still has *not presented any evidence* that the alleged force on the [ ] substrate achieves, or is capable of achieving, a *desired deformation of the substrate*. Conversely, Mr. Inoue testified that [ ] Mr. Inoue stated:

[ ]

[466] CFF 1056 citing Inoue Tr. 1984:1-19, Adler Tr. 2073:8-10, 2073:16-2074:14.
[467] CIB 47.

[ ][468]

Thus, the undersigned finds that FormFactor has not provided sufficient evidence to support its conclusion that a desired deformation of the [ ] is achieved, which is required to meet the "planarizing element" limitation of claim 1 of the '751 patent.

With respect to Staff's argument that by testifying that MJC's [ ][469] Dr. Adler recognized that deformation occurs, which Staff alleges is sufficient to satisfy the claim limitation,[470] the undersigned finds that Dr. Adler's testimony is confusing. Dr. Adler also testified that [ ][471]

At the very least, even if Dr. Adler's testimony were enough to establish that Micronics' accused U-Probes meet the "planarizing element" limitation of claim 1, Staff (and FormFactor) have failed to present any evidence demonstrating that Micronics' accused [ ] U-Probe card assembly meets the "whereby" limitation of claim 1, which states, "whereby the first surface [of the substrate] can be made planar," and requires that a planarizing element within the card assembly planarize the first surface of the substrate. Mr. Inoue's testimony and the undisputed facts provide evidence to the contrary. For example, Mr. Inoue testified:

[ ]

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[468] Inoue Tr. 1997:12-21 (emphasis added).
[469] SIB 54 citing RX-861C at Q/A 78.
[470] SIB 54, SRB 9.
[471] [ ]

[

]472

Further, it is undisputed that the Micro-cantilevers are coupled to a first surface of the [ ] substrate.[473] Thus, the undersigned finds that [

] As a result, the card assembly does not meet the whereby clause limitation of claim 1. In addition, the undersigned finds that RX-830C shows that [

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Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Micronics' accused U-Probes literally infringe each and every

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472 Inoue Tr. 2014:11-2015:25 (emphasis added).
473 CFF 1049 (undisputed) citing CX-732C at 124.
474 RX-830C at MJC 02133475.

limitation of independent claim 1 of the '751 patent.

b. Claim 1: Literal Infringement Under the Doctrine of Equivalents

FormFactor argues that Micronics uses a [ ] to apply a force that results in a "desired deformation" of the MLS substrate.[475] Thus, according to FormFactor:

> The accused MJC U-Probes thus all include a [ ] mechanism that performs the same function (*i.e.*, desired deformation of the central region of the substrate) in substantially the same way (via an adjustable mechanism for exerting a controlled force to the central region of the substrate) in order to achieve the same result (*i.e.*, planarizing the tips of the probe elements mounted to the substrate) as the central planarizing element and the adjustable central control member.[476]

Micronics argues that claims 1-3 are not infringed under the doctrine of equivalents because [ ] do not perform the same function in the same way to achieve the same result as the planarizing element.[477]

Again, the undersigned finds that FormFactor has failed to prove, by a preponderance of the evidence, that Micronics' accused [ ] U-Probes meet each and every limitation of claim 1 of the '751 patent. Specifically, FormFactor has failed to show that [ ] in Micronics' accused U-Probe card assemblies meets the "planarizing element" limitation because there is no evidence that it is capable of applying a force that achieves (or is capable of achieving) a desired deformation of the [ ] substrate - literally or by equivalents. In addition, Mr. Inoue testified that Micronics [ ]

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[475] CIB 47.
[476] CIB 47 citing CFF 1105-08.
[477] RIB 57.

[ ][478]

The undersigned also finds that FormFactor failed to present any evidence demonstrating that Micronics' accused Center Lock U-Probe card assembly meets the "whereby" clause limitation of claim 1.

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Micronics' accused U-Probes infringe each and every limitation of independent claim 1 of the '751 patent under the doctrine of equivalents. Since the undersigned finds that Micronics' accused U-Probes do not read on the claim term *planarizing element* in independent claim 1, either literally or under the doctrine of equivalents, there is no need to address other claim terms in claim 1 or in the claims that depend from claim 1, *i.e.*, claims 2 and 3.

c. Claim 2

FormFactor asserts that Micronics' accused [ ] U-Probes infringe dependent claim 2 of the '751 patent because claim 2 depends from claim 1 and it adds the "contact region" recitation.[479] It is undisputed that all of Micronics' [ ] U-Probes include Micro-cantilevers with contact regions, or tips.[480] It is also undisputed that CX-718C shows the tips of Micro-cantilevers touching the wafer.[481] FormFactor argues that such tips are "designed to make pressure contacts with the electrical pads on the wafer."[482]

As the undersigned has already ruled above that independent claim 1 is not infringed, none

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[478] RX-857C at Q/A 242.

[479] CIB 47 citing CFF 1073-75.

[480] CFF 1073 (undisputed) citing CX-732C at 130; CX-717C at MJC02072808; CX-719C at MJC02067768.

[481] CFF 1075 (undisputed) citing CX-718C at MJC02067787.

[482] CIB 47 citing CFF 575 and 1073-75, CX-0719C.

of the claims that depend from it infringe as well.

d. Claim 3

FormFactor asserts that Micronics' accused [ ] U-Probes infringe dependent claim 3 of the '751 patent because [

]483 FormFactor also asserts that [

]484 It is undisputed that [

]485

As the undersigned has already ruled above that independent claim 1 is not infringed, none of the claims that depend from it infringe as well.

e. Claim 12: Literal Infringement

FormFactor argues that the [ ] substrate is a space transformer and that the [ ] of Micronics' accused [ ] U-Probes is an adjustable planarizing element capable of transmitting a force to the central region of the [ ] substrate to achieve a desired deformation of said substrate at the central region because the mechanism has the ability to turn on

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483 CIB 48-49.

484 CIB 49 citing JX-64C at 113:20-115:2.

485 CFF 1086 (undisputed) citing CX-732C at 132; CX-329C; CX-114C; CX-115C; CX-120C; CX-340C; JX-062C; JX-063C; CX-653C; CX-717C; CX-718C; CX-656C; CX-639C.

and off.[486]

FormFactor also argues that Micronics' [ ] U-Probes include [ ] which FormFactor calls adjustable peripheral planarization mechanisms, that are capable of transmitting a force to the peripheral region of the [ ] substrate to achieve a desired deformation of said substrate at the respective peripheral region.[487]

Micronics argues that the accused [ ] U-Probes do not infringe claims 12 and 24-25 of the '751 patent because they do not have an "adjustable central control member."[488] Micronics argues that the [ ] is not adjustable and that its purpose is to "[ ][489] Micronics that the [ ][490]

Micronics also argues that the accused U-Probes do not infringe claims 12 and 24-25 of the '751 patent because they do not have "adjustable peripheral control members."[491] According to Micronics, [ ] are not adjustable peripheral planarization mechanisms.[492] Micronics argues that the accused [ ] are not adjustable and that their purpose is to "[ ][493] Micronics argues that the [ ] like the [ ][494]

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[486] CIB 49 citing CFF 1088, 1090-1101, 1104.

[487] CIB 50 citing CFF 1090-91, 1096-99, CX-116, and CX-120 at MJC 01308114.

[488] RIB 57-58.

[489] RIB 58; RRB 29.

[490] RIB 57-58 citing RFF V.C.14-19, 36-37; RRCFF 1063D citing RFF IV.C.1.17, V.C.14-V.C.22; RX-857C at Q/A 243; RX-691C at Q/A 20; Inoue Tr. at 1987:17-22, 2012:15-17, 2045:13-15, 2047:1-6, 2048:6-11.

[491] RIB 58-59.

[492] RRCFF 1090A citing RFF V.C.38; Howe Tr. 660:12-17, 694:1-25.

[493] RIB 58; RRB 29.

[494] RIB 58 citing RFF V.C.3.02; RRCFF 1090B citing RFF V.C.3.02; Howe Tr. 660:12-17; RX-857C at Q/A 227.

Micronics further argues that the [ ] in an assembled U-Probe are incapable of transmitting a force to modify the shape of the [ ][495]

Staff argues that the dispute regarding whether Micronics' accused [ ] U-Probes infringe claim 12 of the '751 patent centers on whether the [ ] U-Probes contain the "adjustable central [and peripheral] control member" limitation of claim 12.[496] Specifically, Staff argues that:

> Dr. Adler testified that [ ] RX-861C at Q.78.[497]

Staff argues that, because the undersigned's claim construction does not require more than one amount of deformation, Dr. Adler's recognition that [ ] is sufficient to satisfy the claim limitations.[498]

The undersigned finds that claim 12 is similar to claim 1, the differences being that claim 12 claims a "space transformer," an "adjustable central control member," and "at least one adjustable peripheral control member," rather than a "substrate" and a "planarizing element." The "having" clause which follows "space transformer" in claim 12 and "substrate" in claim 1 is identical.

The undersigned finds the arguments of Micronics to be persuasive and that FormFactor has failed to prove, by a preponderance of the evidence, that Micronics' accused [ ] U-Probes meet each and every limitation of claim 12 of the '751 patent. Specifically, FormFactor has failed to show that the [ ] mechanism in Micronics' accused U-Probe card assemblies meets the

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[495] RRCFF 1057A citing RX-857C at Q/A 227-227, 233, 273, 279; RX-861C at Q/A 19, 21-22.

[496] SIB 53.

[497] SIB 54.

[498] SIB 54; SRB 9.

"adjustable central control member" and "adjustable peripheral control member" limitations because there is no evidence of a mechanism that is capable of applying any force that achieves (or is capable of achieving) a desired deformation of the [ ] substrate in the center and in a peripheral region.

The undersigned construed the claim limitation, "adjustable central control member," as "an adjustable planarizing apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate *to achieve a desired deformation of the substrate in the center*," and the claim limitation, "adjustable peripheral control member," as "an adjustable planarizing apparatus that when applied to a substrate is capable of applying a pushing or pulling force on the substrate *to achieve a desired deformation of the substrate in the peripheral region*." With respect to deformation of the [ ] substrate, FormFactor argues that the [ ] mechanism applies a force to pull up the [ ] substrate.[499]

Even if the evidence relied on by FormFactor, *e.g.*, the cited testimony of Inoue and Adler, is evidence that [ ] the undersigned finds that FormFactor still has *not presented any evidence* that the alleged force on the [ ] substrate achieves, or is capable of achieving, *a desired deformation of the substrate* in the center or in a peripheral region. Conversely, Mr. Inoue testified that no deformation of the [ ] substrate occurs. Mr. Inoue stated:

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[499] CFF 1056 citing Inoue Tr. 1984:1-19, Adler Tr. 2073:8-10, 2073:16-2074:14.
[500] Inoue Tr. 1997:12-21 (emphasis added).

In addition, with respect to the peripheral region, FormFactor argues that [ ] are capable of transmitting a force to the peripheral region of the [ ] substrate to achieve a desired deformation of said substrate at the respective peripheral region.[501] However, the undersigned finds that FormFactor has not presented evidence to indicate that such is the case. To the contrary, there is testimony to indicate that the function and purpose of [ ] in Micronics' accused U-Probe card assemblies are similar to that of the [ ] mechanism.[502] Thus, the undersigned finds that FormFactor has not presented sufficient evidence to support a conclusion that a desired deformation of the [ ] substrate is achieved, which is required to meet both "adjustable control member" limitations of claim 12 of the '751 patent.

With respect to Staff's argument that by testifying that Micronics' [ ] "[ ] and that because [ ][503] Dr. Adler recognized that deformation occurs, which Staff alleges is sufficient to satisfy the claim limitations,[504] the undersigned finds that Staff fails to address where such alleged deformation may occur. Claim 12 requires a desired deformation of the [ ] substrate both at the center and in a peripheral region and, at the least, Staff has not presented evidence to demonstrate the presence of both.

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Micronics' accused U-Probes literally infringe each and every

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[501] CIB 50.
[502] RX-860 at Q/A 21 (stating, [ ]
[503] SIB 54 citing RX-861C at Q/A 78.
[504] SIB 54; SRB 9.

limitation of independent claim 12 of the '751 patent.

f. Claim 12: Literal Infringement Under the Doctrine of Equivalents

Similar to its doctrine of equivalents argument for claim 1, FormFactor argues that Micronics' accused [ ] U-Probes "infringe the planarizing element and 'adjustable central control member element' of claim 12."[505] FormFactor argues that the [ ] mechanism can be turned on or off to produce the "desired deformation at the center" and that the "peripheral spacers" are selected to "modify shape (*i.e.*, deform) at each peripheral region relative to the central region."[506] Thus, according to FormFactor:

> [T]he arrangement achieves the same function (desired deformation of regions of the substrate), in substantially the same way [ ] and the same result [ ][507]

Micronics argues that claims 12 and 24-25 are not infringed under the doctrine of equivalents because the [ ] do not perform the same function in the same way to achieve the same result as the adjustable central/peripheral control members.[508]

Again, the undersigned finds that FormFactor has failed to prove, by a preponderance of the evidence, that Micronics' accused [ ] U-Probes meet each and every limitation of claim 12 of the '751 patent. Specifically, FormFactor has failed to show that the [ ] in Micronics' accused [ ] U-Probes meet the "adjustable control member" limitations because there is no evidence that they are capable of applying a force that achieves a

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[505] CIB 50.
[506] CIB 50-51 citing CFF 1052-53, 1055-57, 1061, 1083-84, and 1095.
[507] CIB 51 citing CFF 1105-08.
[508] RIB 58-59.

desired deformation of the [ ] substrate in the center and in a peripheral region - literally or by equivalents. The undersigned fails to see any distinction between FormFactor's arguments with respect to literal infringement and infringement under the doctrine of equivalents for claim 12.

Therefore, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, that Micronics' accused U-Probes infringe each and every limitation of independent claim 12 of the '751 patent under the doctrine of equivalents. Since the undersigned finds that Phicom's new MEMS Cards do not read on the claim terms *adjustable central control member* and *adjustable peripheral control member* in independent claim 12, either literally or under the doctrine of equivalents, there is no need to address other claim terms in claim 12.

g. Claim 24

FormFactor argues that the [ ] mechanism of Micronics' accused [ ] U-Probes is an adjustable planarizing element capable of transmitting a force to the central region of the [ ] substrate to achieve a desired deformation of said substrate at the central region because the mechanism has the ability to turn on and off.[509] FormFactor also argues that Micronics' [ ] U-Probes include [ ] which FormFactor calls adjustable peripheral planarization mechanisms, that are capable of transmitting a force to the peripheral region of the [ ] substrate to achieve a desired deformation of said substrate at the respective peripheral region.[510] It is undisputed that each accused Micronics [ ] U-Probe includes [ ]

[509] CIB 49 citing CFF 1088, 1090-1101, 1104.
[510] CIB 50 citing CFF 1090-91, 1096-99, CX-116, and CX-120 at MJC 01308114.

[ ][511]

Staff argues that the dispute regarding whether Micronics' accused [ ] U-Probes infringe claims 24 and 25 of the '751 patent centers on whether the [ ] U-Probes contain the "adjustable central [and peripheral] control member" limitations of claim 24.[512] Specifically, Staff argues that:

[

][513]

Staff argues that, because the undersigned's claim construction does not require more than one amount of deformation, Dr. Adler's recognition that [ ] is sufficient to satisfy the claim limitations.[514]

The undersigned finds that claim 24 is similar to claim 12, the differences being that claim 24 claims a "substrate" rather than a "space transformer;" claims 12 and 24 both claim an "adjustable central control member" and "at least one adjustable peripheral control member."

For the reasons articulated by the undersigned above regarding claim 12, the undersigned finds that FormFactor has not met its burden of proving, by a preponderance of the evidence, either literally or under the doctrine of equivalents, that Micronics' accused U-Probes infringe each and every limitation of independent claim 24 of the '751 patent. Since the undersigned finds that Micronics' accused U-Probes do not read on the claim terms *adjustable central control member* and *adjustable peripheral control member* in independent claim 24, either literally or under the doctrine

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[511] CFF 1102 (undisputed) citing CX-732C at 137-38.
[512] SIB 53.
[513] SIB 54.
[514] SIB 54; SRB 9.

of equivalents, there is no need to address other claim terms in claim 24 or in the claims that depend from claim 24, *i.e.*, claim 25.

h. Claim 25

FormFactor argues that the [ ] substrate is a space transformer.[515]

As the undersigned has already ruled above that independent claim 24 is not infringed, none of the claims that depend from it infringe as well.

C. Domestic Industry - Technical Prong

FormFactor asserts that it currently makes and sells probe card assemblies that practice claims 1 and 3 of the '751 patent.[516]

The following findings of fact are undisputed:

> Each FormFactor PH75 and larger probe card assembly includes a ceramic substrate with contact elements or MicroSprings that are mounted to a first surface with central and peripheral regions. CX-732C at 21; CX-342C; CX-343C; RX-930C.
>
> FormFactor probe card assemblies using a PH75 or larger probe head all have components that allow for adjustment of the probe heads at both the central regions and peripheral regions so that the probe heads are planar and the tips of the probe elements are in a flat plane parallel to the wafer, causing all the tips to touch at the wafer surface uniformly. CX-728C at 50; CX-732C at 22; CX-698C; CX-342C; CX-343C; CDX-12C; RX-930C.
>
> FormFactor's probe card assemblies containing larger probe substrates, or probe heads, all have at least one planarizing element near the edge of the surface of the probe substrate, capable of transmitting a force to the central region in order to achieve a desired deformation of the probe substrate. CX-728C at 49; CX-732C at 22; CX698C.
>
> CX-343C shows the step-by-step process for assembling a PH150 probe card assembly. The PH150 is representative of FormFactor probe card assemblies that practice the '751 Patent. CX-728C at 49; CX-343C.

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[515] CIB 49 citing CFF 1088, 1104.
[516] CIB 51 citing CFF 1109-19.

Users of FormFactor probe card assemblies with PH75 or PH100 probe heads can adjust the planarity using a planarization mechanism comprised of [ ] to apply a pulling or pushing force to the central or peripheral region of the probe head to adjust the planarity of the probe head. CX-728C at 50; CX-699 at FFITC0047255, FFITC0047241 - FFITC047242.

Adjusting the [ ] causes the probe head to move up and down as desired by the user. CX-728C at 51.

The PH150 probe head has the additional [ ] of the probe card assemblies. CX-728C at 51; CX-698 at FFITC0047187.

All FormFactor probe card assemblies have probe substrates (or probe heads) and a plurality of probe elements called MicroSprings that are mounted or coupled to the probe heads. The planarization mechanisms are capable of applying a pushing or pulling force to the central region of the probe head to achieve a desired deformation of the substrate, so that the wafer side surface of the probe head is made planar. CX-728C at 51; CX-342C; CX-343C; CX-347C; CX-348C; CX-349C; CX-357C; CX-376C; JX-060C; CX-698C; CX-699C; RX-930C.

Each of FormFactor's MicroSprings has a contact region or "tip" that are designed to make contact with the contact pads on the semiconductor devices under test. The planarizing elements of FormFactor's probe card assemblies are capable of modifying the shape of the probe substrate so that the respective regions are planar relative to other regions of the substrate, as well as to make planar the virtual plane formed by the tips of the MicroSprings structures. CX-728C at 51; CX-699C at FFITC0047225, FFITC0047247; CX-357 at FFITC0040994, FFITC0040995.

The MicroSprings produced by FormFactor are "small tipped springs that contact pads on the device under test." CX-728C at 52; CX-698C at FFITC0047194.

The MicroSprings are elastic structures with one end bonded to the terminals of the probe head and an opposing end spaced from and not bonded to the terminal of the probe substrate the free end having a tip designed to make pressure contact with terminals of electronic components such as semiconductor devices. CX-728C at 52; CX-732C at 23 - 24; CX342C; CX-343C; CX-347C; CX-348C; CX-349C: CX-375C; CX-376C; JX-060C; CX-698C; CX-699C.

The probe heads on FormFactor's PH75 or larger probe card assemblies are space transformers. CX-728C at 53-54; CX-699C at FFITC0047241-FFITC0047242.

> All FormFactor probe card assemblies containing PH75 or larger probe heads have planarizing elements that are adjustable, whether located in the central or peripheral regions, using [ ] CX-728C at 53-54; CX-699C at FFITC0047241-FFITC0047242.[517]

Respondents do not address the issue of the technical prong of the domestic industry requirement as to the '751 patent in their initial or reply briefs.

Staff argues that neither Phicom nor Micronics dispute that FormFactor satisfies the technical prong of the domestic industry requirement as to the '751 patent, and further asserts that the preponderance of the evidence demonstrates that FormFactor practices, at the least, claim 1, which is sufficient to satisfy the technical prong requirement.[518]

The undersigned finds that, based on the evidence presented by FormFactor, and there being no opposition, FormFactor has shown, by a preponderance of the evidence, that it meets the technical prong of the domestic industry requirement by practicing at least claim 1 of the '751 patent.

D. Validity

Respondents allege that the only possible novel feature of the '751 patent is "a planarizing element capable of transmitting a force to the central region of a substrate to modify its shape in the central region," as a result of amendments made during the prosecution of the application that led to the '751 patent.[519] Respondents argue that the Examiner originally rejected the claims of the '751 patent as anticipated or obvious in light of U.S. Patent No. 5,974,662 ("the '662 patent" or RX-165), which is the great-grandparent to the '485 patent. RIB 59-60. Respondents assert that the Examiner did so because the '662 patent allegedly discloses:

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[517] CFF 1109-21 (all undisputed).
[518] SIB 55 citing CX-732C at Q/A 67-74.
[519] RIB 60.

(1) a substrate;

(2) a space transformer;

(3) a plurality of contact elements coupled to . . . the substrate; and

(4) a plurality of contact elements coupled to . . . the space transformer.[520]

Respondents argue that FormFactor distinguished the invention of the '751 patent on (1) a planarizing element capable of transmitting a force to the central region to modify a shape of the central region and (2) a hole in the center of the interposer.[521]

1. Ordinary Skill in the Art

As previously stated in Order No. 37, a person of ordinary skill in the art is an individual with a bachelor's degree in mechanical or electrical engineering, or the equivalent, and at least one year of experience in either probe card assemblies, semiconductor device testing, or MEMS technology at the time of effective filing date for the asserted patent.[522]

2. Anticipation

a. The JP '034 to Amamiya

Respondents assert that Japanese Patent Application Publication H10-31034 to Amamiya et al. ("Amamiya" or RX-166) anticipates the '751 patent under 35 U.S.C. § 102.[523] Respondents argue that Figures 1 and 2 of Amamiya show:

(1) a probe substrate;

(2) a plurality of contact elements; and

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[520] RIB 59 citing JX-2 at 1:30-54.
[521] RIB 60 citing RX-690C at Q/A 117; JX-7 at FFITC0016259-61.
[522] See Order No. 37, p. 11 (January 23, 2009).
[523] RIB 59, 60-63; RRB 30-32.

(3) four screws on the periphery and one screw in the center of the probe substrate to planarize the probe card.[524]

Respondents argue that the screws each transmit a force to the probe substrate that modifies the shape of the substrate at each of the screw locations.[525]

Respondents argue that, contrary to what FormFactor asserts, Amamiya does disclose modification of the shape of the substrate, which is accomplished by the five screws in the probe substrate.[526] Respondents state that three points define a plane,[527] and thus only three screws would be used in Amamiya if "tilt was the only objective."[528] Respondents assert that, by using five screws, Amamiya teaches altering the shape of the substrate or virtual surface defined by the test pin tip portions, *i.e.*, "the shape of the substrate can be altered out of plane."[529] Respondents further argue that the center screw is on a different side of the substrate from the peripheral screws and thus "applies an opposite force to the center of the substrate, thereby bending it."[530] According to Respondents, the only way that Amamiya can achieve the level of planarity it discloses is through deformation of the probe substrate.[531]

With respect to claim 2, Respondents argue that Amamiya teaches that the five screws apply a force to the substrate, with the center screw changing the shape of the central region of the

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[524] RIB 61 citing RX-166 at 9, 10, 13, Figs. 1 and 2.

[525] RIB 61 citing RX-166 at ¶¶ 9, 10, 13, Figs. 1 and 2; RX-690C at Q/A 125-27; Howe Tr. 588:5-12, 626:20-23, 629:19-630:2; Adler Tr. 2209:8-20, 2215:8-2217:22.

[526] RIB 61-62.

[527] RX-690C at Q/A 127, Howe Tr. 588:5-12, 626:20-23.

[528] RIB 62.

[529] RIB 62 citing RX-690C at Q/A 127; RX-166 at ¶¶ 9, 13; RRB 30-31.

[530] RIB 62 citing RX-690C at Q/A 125-27; RX-166 at ¶¶ 9, 13; Howe Tr. 629:19-630:2; RRB 31.

[531] RRB 31 citing Adler Tr. 2217:20-22.

substrate relative to the periphery.[532] With respect to claim 3, Respondents argue that the contacts disclosed in Amamiya are free-standing spring elements.[533] With respect to claims 12 and 25, Respondents argue that the substrate in Amamiya is a space transformer.[534] With respect to claim 24, Respondents argue that Amamiya discloses a peripheral control member.[535]

Staff agrees with Respondents that Amamiya discloses a planarizing element, rather than merely a tilting probe substrate as argued by FormFactor, and thus argues that claims 1-2, 12, 24, and 25 of the '751 patent are invalid as anticipated by Amamiya.[536] Staff asserts that Amamiya discloses:

> [A] probe card with test pins 1, substrate/space transformer 2, threaded peripheral adjustment screws 3, threaded central screw 4, and probe card board 5. The four peripheral threaded screws 3 are screwed into the top of the probe card, while the threaded central screw 4 is screwed in from the underside of the board 5.[537]

Staff argues that Amamiya also discloses that the peripheral screws can be independently operated and thus:

> [A]ccording to the laws of elementary physics, rotation of a single screw 3, or the varying rotation of more than one of the screws 3, would enable the planarization of the probe card and allow it to do more than merely tilt.[538]

Staff further argues that FormFactor's contention that Amamiya discloses only tilting is not supported by the evidence because Amamiya teaches that the peripheral and central screws can push or pull in opposite directions.[539]

FormFactor argues that Respondents have not shown by clear and convincing evidence that

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[532] RIB 62 citing RX-690C at Q/A 125-27; RX-166 at ¶¶ 9, 13; Howe Tr. 629:19-630:2.
[533] RIB 62 citing RX-690C at Q/A 129; RX-166 at ¶¶ 7, 10, and Fig. 1.
[534] RIB 62 citing RX-690C at Q/A 130; RX-166 at Figs. 1 and 2.
[535] RIB 62 citing RX-690C at Q/A 125-27; RX-166 at ¶¶ 9, 13; Howe Tr. 629:19-630:2.
[536] SIB 56-57.
[537] SIB 56 citing RX-166 at ¶ 11.
[538] SIB 56 citing RX-166 at ¶ 13; Adler Tr. 2209-10, 2216-17.
[539] SIB 56-57 citing RX-690C at Q/A 26.

Amamiya anticipates any claim of the '751 patent because the reference "does not teach the combination, let alone the required planarizing element which calls for the desired deformation of the probe substrate."[540] FormFactor asserts that Amamiya describes a "parallelism regulator" that addresses the problem of "tilt" of the virtual plane created by the test pins, not modification of the shape of the substrate.[541] FormFactor further argues that "more than just a tilting of the substrate" is required to anticipate the '751 patent because it is clear that the invention of the '751 patent "entails a bending or deforming of the probe substrate."[542]

According to FormFactor, Amamiya does not ever mention or suggest that there is any modification of the shape of the substrate.[543] FormFactor argues that, even if there is deformation in Amamiya, such deformation would be of the probe card board 5, not the probe substrate 2.[544] FormFactor argues that the probe substrate 2 has, among other things, a thickness of 5 mm, while the probe card 5 has a thickness of 3 mm, and thus:

> Given that the probe substrate and the circuit [probe card] board are both made of the same material, the probe substrate (2), being much thicker and with much smaller lateral dimensions, will not significantly alter its shape in the presence of a deflecting force. Rather, if fixing screw (4), as Respondents assert, were to apply a force to the central region, the larger and thinner probe card board [5], not the probe card [substrate 2], would sustain the deflection (and would also defeat the parallelism regulation).[545]

In addition, FormFactor argues that Amamiya teaches that the planarity of the virtual plane formed by the test pins 1 is achieved by grinding, while the parallelness of the virtual plane of those

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[540] CIB 52-57; CRB 23-25.

[541] CIB 52 citing CX-750C at 30; RX-166 at Abstract.

[542] CIB 52 citing Eldridge Tr. 492:11-20, 522:6-15.

[543] CIB 53 citing CX-750C at 30-31; RX-166 at ¶¶ 11-13; Howe Tr. 763:24-764:10.

[544] CIB 53 and 56, both citing CX-750C at 31; RX-166 at ¶¶ 10-11.

[545] CIB 53 citing CX-750C at 31; RX-166 at ¶¶ 10-11; Howe Tr. 770:25-771:10, 771:14-17, 771:18-22.

pins relative to the object to be tested is achieved by adjustment of the adjustment screws 3 that are located at the four corners of the probe substrate 2.[546] FormFactor further argues that the adjustment screws 3 do not bore into the probe card board 5 and thus cannot apply a pulling force at the periphery of the probe substrate 2.[547] FormFactor asserts that:

> The sole purpose of the regulating screws (3) is to provide tilt . . . so the virtual plane, already planarized by the grinding process, can be made parallel to the surface of the wafer under test.[548]

The undersigned finds that Respondents have failed to prove, clearly and convincingly, that Amamiya anticipates each and every limitation of independent claims 1, 12, and 24 of the '751 patent. Specifically, Respondents have failed to show that a pushing or pulling force applied by affixing screw 4 of Amamiya, or any other apparatus in the probe card device of Amamiya, achieves (or is capable of achieving) a "desired deformation" of probe substrate (or "test pin attachment board") 2, which is required by the undersigned's construction of the claim limitations "planarizing element," "adjustable central control member," and "adjustable central [and peripheral] control member."

In support of the assertion that Amamiya discloses that the adjustment screws 3 and affixing screw 4 each transmit a force to the probe substrate 2 that modifies the shape of the substrate at each of the screw locations, Respondents cite to various references.[549] However, the undersigned finds evidence in Amamiya that the "parallelness adjustment device," which is "achieved by using a

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[546] CIB 53-54 and CRB 24, both citing CX-750C at 30-31; RX-166 at 10-13; Adler Tr. 2208:4-13.

[547] CIB 55.

[548] CIB 55 and CRB 24-25, both citing Howe Tr. 763:6-15.

[549] RX-166 at ¶¶ 9, 10, 13, Figs. 1 and 2, Howe Tr. 588:5-12, 626:20-23, 629:19-630:2, and Adler Tr. 2209:8-20, 2215:8-2217:22.

plurality of screws," is not a planarizing element, but rather is simply a device for adjusting position and slope of the probe substrate.[550] The undersigned finds nothing in Amamiya that discusses any modification or desired deformation of the shape of the probe substrate.[551] Further, the undersigned does not find persuasive Dr. Adler's testimony that he "does not believe" that the probe substrate could be parallel to one micron without changing the bend of the substrate,[552] because he offers no support for such a belief.

The undersigned finds that Respondents' assertion that, because three points define a plane, only three screws would be used in Amamiya if "tilt was the only objective," is not supported by the cited testimony of Dr. Howe.[553] Dr. Howe testified that three screws on a substrate would provide first order planarization, but also that, if you have, *e.g.*, four screws on a substrate, you do not necessarily have a higher order planarization.[554] The undersigned also finds no support in Amamiya for Respondents' assertion that, by using five screws, Amamiya teaches that the shape of the substrate can be altered out of plane. While Staff cites to Dr. Adler[555] in support of its argument that rotation of a single adjustment screw 3, or the varying rotation of more than one of the adjustment screws 3, would enable the planarization of the probe substrate 2 and allow it to do more than merely tilt, the undersigned finds no support for the proposition that raising or lowering an adjustment screw 3 to lift or depress a corner of probe substrate 2 meets the limitation of the '751 patent that the planarizing element be "capable of transmitting a force to the central region of said substrate" to

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[550] RX-166 at ¶¶ 8-9.
[551] RX-166 at ¶¶ 11-13.
[552] Adler Tr. 2217:12-22.
[553] Howe Tr. 588:5-12, 626:20-23.
[554] Howe Tr. 626:20-627:4, 631:6-632:1, 639:7-14, 639:21-640:21.
[555] Adler Tr. 2209-10, 2216-17.

modify a shape at the central region that, *e.g.*, leads to planarity of the substrate.

In addition, while not limiting Amamiya to its single embodiment, the undersigned finds that the embodiment discussed in Amamiya consists of a probe substrate (or "test pin attachment board") 2 with a thickness of 5 mm into which adjustment screws 3 that are 3 mm long are disposed at the four corners, as well as a probe card board 5 with a thickness of 3 mm into which an affixing screw 4 that is 8 mm long is disposed in the center.[556] As a result, the undersigned finds persuasive Dr. Howe's testimony that, if deformation were to occur as a result of any force applied by the adjustment and/or affixing screws, such deformation would occur in probe card board 5.[557] Further, it is unclear to the undersigned how, in said embodiment, the adjustment screws 3 apply a pulling force at the periphery of the probe substrate 2 because said screws do not bore into the probe card board 5.[558]

Therefore, the undersigned finds that Respondents have not met their burden of proving, by clear and convincing evidence, that Amamiya anticipates each and every limitation of independent claims 1, 12, and 24 of the '751 patent. As the undersigned has ruled that said independent claims are not anticipated, none of the claims that depend from them are anticipated as well.

b. The Hagihara '192 Patent

Respondents assert that U.S. Patent No. 5,825,192 to Hagihara ("Hagihara" or RX-167) anticipates the '751 patent under 35 U.S.C. § 102.[559] Respondents argue that the "Hagihara pushers achieve the desired deformation by a pushing force, and thus anticipate" the "planarizing element"

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[556] RX-166 at ¶¶ 10-11 and Fig. 1.
[557] Howe Tr. 636:22-637:14, 763:24-764:10, 770:10-771:22.
[558] RX-166 at ¶¶ 10-11 and Fig. 1.
[559] RIB 59, 63-64.

claim limitation of the '751 patent.[560]

Specifically, Respondents assert that Hagihara discloses pushing members 39a, which are divided into sixteen alleged planarizing elements, including four in the center and twelve in the periphery, that are independently capable of transmitting a force to the probe card 32.[561] With respect to claim 2, Respondents argue that Hagihara teaches relative planarization of contact regions.[562] With respect to claim 3, Respondents argue that Hagihara teaches using traditional needles and bumps as contact elements.[563] With respect to claims 12 and 25, Respondents argue that the probe substrate 32 of Hagihara performs space transformation.[564] With respect to claim 24, Respondents argue that Hagihara discloses a peripheral control member.[565]

Respondents argue that FormFactor's expert, Dr. Howe, has only one argument in support of patentability, which is that Hagihara lacks a planarizing element because the planarizing elements of the '751 patent alter a shape of the probe substrate prior to and independent of contact with the semiconductor wafer.[566] Respondents further argue that, based on the undersigned's claim construction, there is no "prior to and independent of" limitation in the claims.[567] Respondents argue that FormFactor's alleged attempt to add such language to the claims conflicts with the undersigned's construction of "substrate," "which allows flexibility and deformation after

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[560] RIB 64.
[561] RIB 63 citing RX-167 at 11:52-57 and Figs. 2, 3, 4, and 6; RX-690C at Q/A 145, 152-57.
[562] RIB 63 citing RX-167 at 11:52-57, and Figs. 2, 3, 4, and 6.
[563] RIB 63 citing RX-167 at 7:4-8, 7:29-30, and Fig. 2.
[564] RIB 63 citing RX-167 at 2:48-60, 12:21-23.
[565] RIB 63 citing RX-167 at Figs. 2 and 3.
[566] RIB 64 citing Howe Tr. 714:3-17; CX-750 at Q/A 121.
[567] RIB 64; RRB 32.

contact."[568] According to Respondents, "[t]he ALJ's construction does not require that planarizing occurs prior to contact with the semiconductor wafer, or that such contact cannot play a role in the planarizing process."[569]

FormFactor argues that Hagihara does not teach the "planarizing element" required by all claims of the '751 patent.[570] FormFactor asserts that:

> The aim of the membrane-type probe card assembly disclosed in Hagihara '192 is to ensure that the flexible probe substrate 32 conforms to the non-planar surface of the semiconductor wafer, so that there is a uniform pressure on the contact bumps 37 formed on the bottom surface of the probe substrate.
>
> The mechanism to accommodate variations in the height of the semiconductor wafer (12) is to segment the conventional 'contact block' used in membrane-type probe cards into a plurality of independently spring-loaded contact blocks arranged in a lattice (39a).[571]

FormFactor points out that Hagihara states that "[i]n the present invention . . . the pushing member 39 serving to push the pushing region 33a is divided into a plurality of blocks 39a, as shown in FIG. 2."[572] FormFactor then asserts that the force on each block 39a includes a compressive force from the semiconductor wafer 12, which is applied when the table 13 on which the semiconductor wafer sits is moved upward against the probe card.[573] FormFactor argues that the flexible probe substrate 32 is "forced by the lattice of contact blocks to conform more closely to the non-planar surface of the semiconductor wafer than in prior-art, single-contact block probe cards."[574]

Thus, according to FormFactor, the invention of the '751 patent is "fundamentally different"

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[568] RRB 32 citing Order No. 37 at 71.
[569] RRB 32-33.
[570] CIB 57-60.
[571] CX-750C at 32.
[572] CIB citing RX-167 at 8:1-8.
[573] CIB 59 citing CX-750C at 33.
[574] CIB 59 citing CX-750C at 33.

because, in the asserted claims of the '751 patent, the "planarizing element" produces the desired deformation of the substrate, while the invention of Hagihara requires the probe card assembly to make contact with the semiconductor wafer to achieve the desired deformation.[575] FormFactor argues that the invention of the '751 patent is a "stand-alone probe card assembly itself, not a method of using the probe card assembly," and thus the claim limitation "planarizing element" may only be met by elements within the assembly itself.[576] Therefore, according to FormFactor, an external pushing force from the semiconductor wafer does not meet the claim limitation.[577] FormFactor concludes that:

> By claiming the planarizing element of the '751 Patent as internal to the stand-alone probe card assembly, the patentee has established that the *planarizing element is what provides pushing or pulling force on its own, i.e., prior to and independent of contact with the semiconductor wafer*, in order to achieve a desired deformation of the substrate.[578]

FormFactor further argues that Respondents' assertion that the '751 patent does not require a planarizing element that alters a shape of the probe substrate "prior to and independent of" contact with the semiconductor wafer is an "implicit recognition that Hagihara's planarizing element does not function before a contact is made with the semiconductor wafer."[579]

In response, Respondents argue that there is no limitation in the claims to narrow the adjustment to one that is independent of external forces.[580] Respondents assert that "the ALJ's construction and the '751 Patent are broad enough to permit both internal and external forces" to

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[575] CIB 59 citing CX-750C at 33.
[576] CRB 26.
[577] CIB 60; CRB 26.
[578] CRB 26 (emphasis added).
[579] CRB 25-26.
[580] RRB 33.

"alter orientation," or planarize the substrate.[581] Respondents argue that limiting the claims of the '751 patent to exclude an application of external force excludes the preferred embodiments of the patent, which demonstrate arrangements in which internal force and external force are used to alter orientation.[582]

Staff agrees with FormFactor and argues that Hagihara does not disclose the "planarizing element" of claim 1 or the "adjustable central [and peripheral] control member" limitations of claims 12 and 24 and thus asserts that the '751 patent is not invalid as anticipated by Hagihara.[583] Staff argues that the movement of the center bolt 53 in Hagihara does not result in the probe card 32 achieving the "desired deformation of the substrate," which is required by the undersigned's claim construction of the terms "planarizing element" and "adjustable central [and peripheral] control member."[584]

Rather, Staff argues that it is the movement of, and force exerted by, a semiconductor wafer 12 on the probe card 32 that results in the probe card 32 achieving the desired deformation, and that the center bolt 53 is adjusted to alter the tension of the membrane-type probe card 32 to allow the probe card 32 to be sufficiently flat.[585] Specifically, Staff asserts that semiconductor 12 is raised so that it contacts the bump electrodes 37 on the surface of probe card 32.[586] Staff further asserts that the bump electrodes 37 on probe card 32 conform to the surface of the semiconductor wafer 12 via

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[581] RRB 33 citing RX-167 at 7:10-20, 7:60-8:17 and Figs. 5A, 5B, 5C and 7B.
[582] RRB 33 citing RX-167 at 7:10-20, 7:60-8:17 and Figs. 5A, 5B, 5C and 7B.
[583] SIB 57-58.
[584] SIB 57.
[585] SIB 57 citing RX-167 at 7:48-50.
[586] SIB 57 citing RX-167 at 7:50-59 and Fig. 2.

independently operable spring-loaded blocks 39a.[587]

The undersigned finds that Respondents have failed to prove, clearly and convincingly, that Hagihara anticipates each and every limitation of independent claims 1, 12, and 24 of the '751 patent. Specifically, Respondents have failed to show that a pushing or pulling force applied by center bolt 53 or pushing mechanism 38 of Hagihara, or any other apparatus in the probe card device of Hagihara, achieves (or is capable of achieving) a "desired deformation" of probe card 32, which is required by the undersigned's construction of the claim limitations "planarizing element," "adjustable central control member," and "adjustable central [and peripheral] control member."

While the undersigned agrees with Respondents that there is no "prior to and independent of" limitation in the claims, the undersigned finds that claim 1 of the '751 patent explicitly claims a probe card assembly *comprising* 1) a substrate, 2) a plurality of contact elements, and 3) a *planarizing element*.[588] The word "comprising" is a "term of art used in claim language which means that the named elements are essential . . .."[589] The plain language of the asserted claims, in conjunction with the undersigned's claim construction order, thus makes it clear that, to anticipate the asserted claims of the '751 patent, the *probe card device* of Hagihara *must comprise*, among other elements, an *apparatus* capable of applying a force on the "substrate" *to achieve a desired deformation* of the substrate, *i.e.*, it is essential that the probe card device itself contain a planarizing element.

In support of the assertion that Hagihara discloses pushing members 39a, which are divided

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[587] SIB 57 citing RX-167 at 8:8-22.

[588] Claims 12 and 24 are similar in that they explicitly claim a probe card assembly comprising 1) a space transformer or substrate, respectively, 2) a plurality of contact elements, 3) an adjustable central control member, and 4) at least one adjustable peripheral control member.

[589] *Genentech, Inc. v. Chiron Corp.*, 112 F.3d 495, 501 (Fed. Cir. 1997).

into planarizing elements that are capable of transmitting a force to probe card 32, Respondents cite RX-167.[590] However, the undersigned finds evidence in Hagihara that the pushing mechanism 38 described in the patent, which comprises a tension imparting block 51 and a pushing member 39 divided into a plurality of blocks 39a, is adjusted to *alter the tension* of the membrane-type probe card 32 to allow the probe card 32 to be sufficiently flat.[591] The undersigned finds that such evidence is not sufficient to support a conclusion that the pushing members 39a are capable of applying a force to achieve a desired deformation of probe card 32. Respondents did not present evidence that altering the tension of probe card 32 meets the claim limitation of desired deformation, *e.g.*, a planar relationship between the contact elements on the probe card and the semiconductor device under test.[592] To the contrary, the undersigned finds that evidence within Hagihara suggests that it is the movement of, and force exerted by, semiconductor wafer 12 on the probe card 32 that results in probe card 32 achieving the desired deformation. For example:

> A table 13 on which a semiconductor wafer 12 is disposed is mounted on the main stage 11. The table 13 can be moved in x-, y-, z- directions and can be rotated by a moving mechanism 14 arranged below the table 13.[593]

Further:

> [T]he table 13 is moved upward so as to bring the electrode pad 12a of the semiconductor chip into contact with the bump electrode 37 acting as a contact element of the probe card 32, thereby aligning the probe card 32 and the semiconductor wafer 12 in a horizontal direction.[594]

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[590] RX-167 at 11:52-57 and Figs. 2, 3, 4, and 6.

[591] RX-167 at 5:66-6:11, 6:28-59, 7:11-13, 7:48-50, 8:41-44, 11:51-56.

[592] JX-2 at 1:7-10.

[593] RX-167 at 4:48-51.

[594] RX-167 at 7:54-59, 10:53-58, 1:22-34 (stating, "the position of the table is adjusted so as to bring the probing needles of the probe card into contact with the electrode pads of the semiconductor wafer").

In addition, there is evidence that semiconductor wafer 12, table 13, and moving mechanism 14 are not elements of the probe card device of Hagihara.[595]

Therefore, the undersigned finds that Respondents have not met their burden of proving, by clear and convincing evidence, that Hagihara anticipates each and every limitation of independent claims 1, 12, and 24 of the '751 patent. As the undersigned has ruled that said independent claims are not anticipated, none of the claims that depend from them are anticipated as well.

3. Obviousness - WO96/15458 alone or in Combination with JP '034 and/or the Hagihara '192 Patent

Respondents assert that FormFactor's PCT Patent Application Publication WO96/15458 ("the PCT application" or RX-169) renders the '751 patent obvious in light of either Amamiya or Hagihara under 35 U.S.C. § 103.[596] Respondents argue that the PCT application "expressly teaches all elements of the asserted claims of the '751 Patent except for a control element capable of transmitting a force to the central region of the substrate to modify the shape of the central region."[597] It is undisputed that the PCT application discloses:

(1) a probe card assembly;

(2) a probe substrate;

(3) a plurality of contact elements; and

(4) a plurality of control elements 536 and 538 at the periphery of the probe card for

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[595] RX-167 at 1:6-8 and 1:22-34 (indicating that the probe card device and the table on which the semiconductor is placed are part of a "probe card apparatus;" the claimed "probe card device" is used in a "probing apparatus"), 4:52-57 (stating that the probe card device is mounted *to face* the semiconductor wafer and that the probe card device is used *to probe* the semiconductor wafer), 5:42-48, and Fig. 2.

[596] RIB 59, 64-66; RX-690C at Q/A 159-60.

[597] RIB 64-65.

adjusting the orientation of the probe substrate.[598]

Respondents argue that, because the PCT application teaches control elements at the periphery of the probe card, "it would have been a matter of routine engineering, with predictable results" to add a control element at the central region of the card to exert a force on the central region by which the substrate can be made planar.[599] In support, Respondents allege that "standard planarization equipment indicated that as the size of the probe cards increased, there was more deflection at the center" and that "[a] person of ordinary skill in the art would have been motivated to add such a central control element to achieve planarity [in the central region] as for other [peripheral] regions."[600] Respondents further argue that Amamiya and Hagihara disclose central control elements, as well as a motivation to combine such elements with the teachings of the PCT application, and that the addition of a control element at the center to achieve planarity would have had predictable results.[601]

FormFactor argues that neither Amamiya nor Hagihara disclose a planarizing element and that the PCT application also does not disclose a planarizing element.[602] Therefore, according to FormFactor, none of the references, individually or in combination, disclose or teach the "planarizing elements" of the '751 patent claims, and thus Respondents have failed to carry their burden to show

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[598] RX-169 at Abstract, 8:1-3, 8:17, 8:24-25, 49:2-4, 50:29-51:4, 53:12-14, 55:18-56:7, and Fig. 5.

[599] RIB 65 citing RX-690C at Q/A 160-62; RX-0382 at Q/A 75, 529, 532 and 533.

[600] RIB 65 citing RX-690C at Q/A 117; JX-7; Eldridge Tr. 499:1-5, 507:14-21, 512:17-513:2, 513:10-514:2 and 514:12-21.

[601] RIB 65-66 citing RX-690C at Q/A 117; JX-7; Eldridge Tr. 499:1-5, 507:14-21, 512:17-513:2, 513:10-514:2 and 514:12-21.

[602] CIB 60-61 citing CX-750C at 35.

invalidity by clear and convincing evidence.[603]

Staff asserts that the evidence does not clearly and convincingly demonstrate that one of ordinary skill in the art would have found it obvious to modify the PCT application to add a central control element to achieve planarity.[604] Staff argues that Dr. Adler's testimony that the PCT application discloses all of the limitations of the claims except for the "central adjustment mechanism" and that one of ordinary skill in the art would have found it obvious to combine the central adjustment mechanism of Amamiya or Hagihara with the PCT application,[605] is not clear and convincing evidence that the '751 patent is invalid based on obviousness.[606]

The undersigned finds that Respondents have failed to prove, clearly and convincingly, that the PCT application in combination with either the Amamiya reference or the Hagihara reference renders obvious each and every limitation of independent claims 1, 12, and 24 of the '751 patent. Specifically, Respondents have failed to show that the "planarizing element" limitation of independent claims 1 and the "adjustable central control member" limitation of independent claims 12 and 24 are taught by the PCT application in combination with either Amamiya or Hagihara. The undersigned finds that Respondents' arguments, which rely on conclusory statements by Dr. Adler,[607] and testimony of Mr. Eldridge that does not demonstrate invalidity of the '751 patent,[608] are not persuasive.

Therefore, the undersigned finds that Respondents have not met their burden of proving, by

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[603] CIB 61; CRB 26.
[604] SIB 58.
[605] RX-690C at Q/A 159-62.
[606] SIB 58.
[607] RX-690C at Q/A 159-62.
[608] Eldridge Tr. 499:1-520:24.

clear and convincing evidence, that the PCT application, in combination with either Amamiya or Hagihara, renders obvious each and every limitation of independent claims 1, 12, and 24 of the '751 patent. As the undersigned has ruled that said independent claims are not obvious, none of the claims that depend from them are obvious as well.

VI. The '538 Patent

A. Overview

Originally, thirteen claims of the '538 patent were asserted against Respondents, namely independent claims 1 and 19, along with dependent claims 2-7 and 14-18. These claims read as follows:

1. A method of forming a contact assembly comprising: fabricating a plurality of contact structures; providing a substrate comprising an array of electrical connections on a surface of said substrate; and after said fabricating step and said providing step, attaching ones of said plurality of contact structures to ones of said array of electrical connections, wherein said fabricating comprises: forming said contact structures on a sacrificial substrate, and removing said contact structures from said sacrificial substrate.

2. The method of claim 1, wherein said electrical connections comprise metallic pads.

3. The method of claim 1, wherein said contact structures are resilient.

4. The method of claim 1, wherein said forming comprises sequentially applying a plurality of materials to said sacrificial substrate.

5. The method of claim 4, wherein at least one of said materials comprises a patterned layer of material.

6. The method of claim 5, wherein said at least one of said materials comprises photo resist.

7. The method of claim 4, wherein at least one of said materials composes said contact structures.

14. The method of claim 1, wherein said attaching comprises: bringing ends of said contact structures into contact said array of electrical connections on said substrate; and securing said ends of said contacts structures to said array.

15. The method of claim 1, wherein said attaching comprises permanently attaching ones of said plurality of contact structures to ones of said array of electrical connections.

16. The method of claim 1, wherein said attaching comprises metallurgically bonding ones of said plurality of contact structures to ones of said array of electrical connections.

17. The method of claim 1, wherein said fabricating step comprises fabricating said plurality of contact structures separate and apart from said substrate and said electrical connections.

18. The method of claim 17, wherein following said fabricating step and prior to said attaching step said plurality of contact structures are not attached to said electrical connections.

19. A method of forming a contact assembly comprising: fabricating a plurality of contact structures; providing a substrate comprising an array of electrical connections on a surface of said substrate; and after said fabricating step and said providing step, attaching ones of said plurality of contact structures to ones of said array of electrical connections, wherein said fabricating comprises applying a patterned layer of material to a sacrificial substrate, said patterned layer comprising openings corresponding to said contact structures.

As noted above, the undersigned has already construed the above claims in a *Markman* order.[609] A summary of the claims construed in that order is detailed below:

Claim	Term	Construction
Claim 1	attaching	affixing to make a relatively permanent connection without external means
Claim 1	ones	more than one
Claim 1	forming	bringing into being
Claim 1	sacrificial substrate	a supporting material, excluding any applied layers, which is destructible, such as by etching

While at this time only claim 19 is asserted, the constructions of the above terms govern those terms as they appear in claim 19.

[609] See Order No. 37 (January 23, 2009).

B. Infringement of Claim 19 by Micronics

1. Direct Infringement

a. Position of the Parties

FormFactor alleges that MJC's products infringe this claim element. FormFactor notes that Order No. 37 defines a "sacrificial substrate" as "a supporting material, excluding any applied layers, which is destructible, such as by etching."[610] FormFactor states that the definition of the term "destructible" has now became an issue among the parties. FormFactor states that neither actual destruction nor intent to destroy is required by the claim construction. FormFactor states that MJC's employee Mr. Inoue testified that[

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In any event, it is argued that MJC destroys its silicon substrate at least in part through its cleaning process. FormFactor asserts that MJC [

] [7] FormFactor argues that Mr. Leckie did not even consider whether [ ] would etch the silicon wafer, and could not say one way or the other whether [ ] would etch the silicon wafer. FormFactor also states that Mr. Leckie's position that "destructible" means "destroyed or intended to be destroyed" should also be rejected. The argument that it is necessary to distinguish a "substrate comprising an array of electrical connections" from a "sacrificial substrate" is said to be wrong. FormFactor argues that "the substrate comprising an array of electrical connections" of claim 19 becomes part of the final product

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[610] *Id.*

whereas the destructible sacrificial substrate does not. FormFactor argues that a "sacrificial substrate" as used in the '538 patent is thus one capable of being destroyed without destroying the thing that is fabricated on its substrate.

FormFactor, citing *Intel Corp. v. U.S.I.T.C.*,[611] asserts that MJC's and Mr. Leckie's position that "destructible" carries with it some notion of "intended to be destroyed" is also not persuasive. The above-cited case is said to stand for the proposition that there is no "intent" element to direct infringement.

FormFactor states that MJC's argument that a "sacrificial substrate" must enable the positional placement of the contact structure is without merit because it ignores and fails to take into account the Figure 11 examples and corresponding disclosure in the '538 specification. It is stated that in those examples, the "sacrificial substrate" would not, and indeed could not, be used in positioning the contact structures during the "attaching" step.

Finally, FormFactor argues that Order No. 37 already rejected MJC's argument that the term "destructible" means destroyed when it stated in Order No. 37 that "[f]urthermore, 'destructible' rather than 'destroyed' reflects the more reasonable construction of the overall claim."[612] Furthermore, FormFactor alleges that Staff and MJC misrepresent FormFactor's position in the *Markman* proceeding.

MJC states that its products do not infringe claim 19 because [

] and is therefore not a sacrificial substrate. It asserts that the '538 patent defines a "sacrificial substrate" as being a supporting substrate that is destructible in the

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[611] *Intel Corp. v. U.S.I.T.C.*, 914 F.2d 821, 832 (Fed. Cir. 1991) ("*Intel*").
[612] Citing Order No. 37 at 93.

sense that it is intended to be destroyed. MJC argues that the '538 patent teaches that sacrificial substrates are substrates that are "intended to be destroyed" for two reasons. First, it is argued, the actual destruction of a sacrificial substrate enables the positional placement of probes on the sacrificial substrates to be maintained even after the probes have been attached to a space transformer. Second, the destruction of the sacrificial substrate allows for customization of the shape of probe tips, by etching away a portion of the sacrificial substrate, building the probe tip within the etched away portion, and then destroying the sacrificial substrate to release the probe tip. MJC states that if the sacrificial substrate were not actually destroyed, these two critical steps, positional placement of the probes and formation of the probe tips, could not be accomplished. MJC states that these two characteristics of a sacrificial substrate are depicted in evidence as RDX-294.

MJC argues that if "destructible" means "capable of destruction," then there is no distinction between a "sacrificial substrate" and a "substrate." MJC states that the '538 specification distinguishes between a "sacrificial substrate" and a "substrate." Furthermore, it is alleged, claim 19 itself explicitly distinguishes between a "substrate" and a "sacrificial substrate" by including the limitations of both claim terms. More specifically, claim 19 is said to explicitly distinguish between a "substrate" and a "sacrificial substrate" by including the limitations of both a "substrate" and a "sacrificial substrate." MJC asserts that in claim 19, the "substrate" forms an integral component of the finished contact assembly, whereas the "sacrificial substrate" is used solely for the fabrication of contact structures that are subsequently connected to the substrate. This distinction is said to be made because a "sacrificial substrate" is a substrate that is "intended to be destroyed" and a "substrate" is intended to be preserved and indeed become part of the finished contact assembly.

MJC asserts that an interpretation of "destructible" as meaning "capable of destruction"

renders meaningless the '538 patent's distinction between a "substrate" and a "sacrificial substrate." MJC alleges that all substrates, not just "sacrificial substrates," are "capable of destruction." Therefore, MJC states that to properly distinguish a "substrate" from "a sacrificial substrate," the term "destructible" must mean "intended to be destroyed."[613]

MJC alleges that it does not literally infringe claim 19 because [ ] MJC states that the Micronics' [ ] Instead, it is argued, [ ] MJC states that, [ ] For these reasons, it is argued, MJC's [ ] is not a sacrificial substrate. MJC argues that one of the inventors of the '538 patent, even recognized that a sacrificial substrate is a substrate that is not reused in the manufacturing process. MJC also cites the testimony of Dr. Khandros to the effect that the sacrificial substrate "is partially destroyed" during the manufacturing process.

MJC asserts that there are two key reasons why MJC's [ ] is neither destroyed nor intended to be destroyed. First, it is stated, [ ]

[613] MJC also makes several arguments concerning the alleged similarity between its position in the *Markman* proceeding and that of FormFactor in that proceeding.

[ ]

Second, MJC argues, [

]

MJC also argues that in some instances [

] Therefore, MJC argues that its silicon wafer is not "destructible" and is not a "sacrificial substrate."

MJC argues that FormFactor's allegedly new "final contact assembly" argument impermissibly broadens the scope of the undersigned's construction of a "sacrificial substrate." It is asserted that while Order No. 37 included the term "destructible" in its construction, the undersigned is said not to have found that a "sacrificial substrate" is a substrate that is "not part of the final contact assembly."

MJC rejects FormFactor's argument that MJC's silicon wafer is actually destroyed [

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[ ] MJC states that none of FormFactor's witnesses, experts, or analyses were directed to this assertion, and the argument is said to be completely absent from FormFactor's prehearing brief. MJC states that FormFactor's witness, Dr. Frazier, and FormFactor's prehearing brief argue that [ ] It is argued that FormFactor's argument is late and violates the undersigned's Ground Rule 8.2, and therefore should not be considered.

MJC states that not surprisingly, then, FormFactor cites no evidence for the proposition that [ ] Instead, it is argued, FormFactor points to a reference cited by MJC, U.S. Patent No. 4,916,002 (the Carver '002 patent) in MJC's invalidity arguments. MJC states that in the Carver '002 patent, one single paragraph of the specification states that potassium or KOH can be used to etch silicon and silicon dioxide. The Carver '002 patent is said to provide no information about the central characteristics of the KOH, including the pH value. MJC asserts that [

] MJC argues, among other things, that there is no evidentiary support for FormFactor's argument. In fact, MJC notes that Mr. Leckie testified at the hearing that the pH of a solution is not dispositive of that solution's ability to etch silicon.

MJC also argues that there is no evidence in this investigation that MJC's [ ] is destroyed by any means. In fact, MJC asserts, all of the evidence shows that the [ ] is not destroyed.

MJC also opposes FormFactor's argument that, because [

] each of these wafers is "destructible" and therefore is a "sacrificial substrate." It is argued that the evidence shows that [

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Finally, MJC asserts that FormFactor's interpretation of *Intel* is erroneous. It argues that the case stands for the proposition that a direct infringer need not intend to infringe the claims of a patent. In the instant proceeding, MJC's assertion that "destructible" means "intent to destroy" is not the same as "intent to infringe." MJC concludes by stating that one can intend to destroy a substrate without ever intending to infringe a patent.

Staff argues that "destructible" must mean "intended to be destroyed." Staff believes that using this interpretation, the preponderance of the evidence shows that the substrate that MJC uses to fabricate its [ ] is not a "sacrificial substrate" that is "intended to be destroyed." For this reason, Staff submits that the preponderance of the evidence does not show that MJC infringes claim 19 of the '538 patent. Staff also agrees with MJC's interpretation of the *Intel* case.

b. Discussion and Conclusion

FormFactor's arguments are not persuasive. In the first instance, as noted above, there is extensive discussion among the parties as to the meaning of "destructible" in the undersigned's construction of the claim term "sacrificial substrate" as "a supporting material, excluding any applied layers, which is *destructible*, such as by etching."[614] The question is, not whether the substrate in MJC's accused products is destructible by any means, because all [ ] are destructible in

[614] Order No. 37, *supra.*

the sense that they can be destroyed by some means or other.[615] The issue is, whether in the fabrication of MJC's products, the substrate used is a "sacrificial substrate" by virtue of its being "destructible, *such as by etching.*"[616] Therefore, the issue to be resolved is whether FormFactor has shown that the substrate used in the manufacture of MJC's Micro Cantilevers is "destructible, such as by etching."

FormFactor's argument, which is that [ ] meets this claim term, is not persuasive. FormFactor cites to no persuasive evidence to support this proposition. The fact that the Carver '002 patent allegedly supports the proposition that a different compound, *potassium hydroxide* (KOH), with a pH of 12[7], can be used to etch silicon and silicon dioxide, does not show that ammonia water at a pH of 11.7±0.2 would make MJC's substrate [ ] "destructible, such as by etching." Nor does FormFactor cite any other persuasive evidence to support its argument. Therefore, based upon the preponderance of evidence standard, FormFactor has not shown that there is a sacrificial substrate in the fabrication of MJC's [ ] because the substrate used in the fabrication process has not been shown to be "destructible, such as by etching." Accordingly, MJC's [ ] do not infringe claim 19 of the '538 patent by virtue of using a "sacrificial substrate" in the fabrication process.

2. Doctrine of Equivalents

FormFactor has not made a case for infringement under the doctrine of equivalents concerning this claim term. Accordingly, no finding of infringement under the doctrine of

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[615] Frazier, Tr. 1134.
[616] Order No. 37 (emphasis added).

equivalents is made.

3. Conclusion on Infringement

In light of the above, there is no infringement of claim 19 of the '538 patent by MJC's Micro Cantilevers. In light of the finding above with regard to "sacrificial substrate," there is no need to determine whether MJC's products read on other claim elements of claim 19.

C. Domestic Industry - Technical Prong

1. "a patterned layer of material"

MJC argues that claim 19 requires a *single* layer of patterned material to be used in fabricating the complete contact structures. As support for its argument, MJC cites the testimony of Mr. Leckie.[617] It asserts that FormFactor's T5 and T8 MicroSprings are not built using a single patterned layer of material that corresponds to a complete MicroSpring. Instead, MJC asserts, multiple patterned layers are used in fabricating the MicroSprings, where each layer of materials only corresponds to a complete MicroSpring. MJC states that Dr. Frazier testified that [ ] patterned layers are used in building both the T5 and T8 MicroSprings.

FormFactor states that with respect to the T5 MicroSprings, it applies a patterned layer of material that is [ ] In the case of the T8 MicroSprings, FormFactor applies a patterned layer that is [ ] FormFactor argues that claim 19 does not require that a single patterned layer of material be used in fabricating the complete contact structures. It argues that nothing in the claim language, the '538 patent specification, or the undersigned's claim construction supports MJC's position. Staff supports FormFactor's position.

For the reasons set forth below, FormFactor's position is found to be persuasive. Claim 19

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[617] RX-860, Q/A 219.

uses the language "a patterned layer" and its use of the article "a" indicates that the scope of claim 19 can include *one or more* patterned layers. With respect to the T5 MicroSprings, FormFactor applies a patterned layer of material that is [ ][618] In the case of the T8 MicroSprings, FormFactor applies a patterned layer that is [ ] on the [ ] wafer.[619] All parties agree, or do not oppose, the fact that the respective patterned layers in the T5 and T8 products, in turn, are composed of multiple layers.[620]

Claim 19 uses the language "a patterned layer." The claim's use of the article "a" in the context of the entire claim 19 indicates that claim 19 can include one or more patterned layers. In the *Abtox*[621] case, the Federal Circuit noted that "patent claim parlance also recognizes that an article [i.e. 'a'] can carry the meaning of 'one or more,' for example in a claim using the transitional phrase 'comprising.'" Claim 19 uses the open-ended term "*comprises*" in the claim term "wherein said fabricating *comprises* applying a patterned layer of material." That open-ended claim term supports the conclusion of a multilayered patterned layer. MJC relies on its witness Mr. Leckie's testimony that "*[i]t is my understanding that* this limitation requires the application of a *single* patterned layer of material. The claim does not include a limitation of multiple pattered layers."[622] That testimony, standing alone, is not persuasive. Accordingly, it is determined that FormFactor's T5 and T8 MicroSprings products read on the claim term "a patterned layer."

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[618] Dr. Frazier, CX-731C, Q/A 261.
[619] *Id.*, Q/A 279.
[620] See the parties' sections on the technical prong issue in their respective briefs.
[621] *AbTox, Inc. v. Exitron Corp.*, 122 F.3d 1019, 1023 (Fed. Cir. 1997) ("*AbTox*").
[622] RX-860, Q/A 219 (italics added).

2. "said patterned layers comprising openings corresponding to said contact structures"

MJC asserts that the openings in any one of the T5 and T8 MicroSprings' patterned layers only correspond to a portion of a MicroSpring, not a complete MicroSpring. For example, MJC argues that the T5 MicroSprings are built from [ ] MJC asserts that, as illustrated in RX-789C, an opening in a patterned layer of [ ] builds the tip and the beam of the T5 MicroSprings. Therefore, it is argued, this opening corresponds to the [ ] but not the [ ]

FormFactor states that MJC's position is erroneous. With respect to the T5 MicroSprings, FormFactor asserts that it patterns the [ ] to create multiple openings that correspond to multiple T5 MicroSprings. It is asserted that a layer of [ ] are deposited in the openings by an [ ]

FormFactor argues that a layer of [ ] is applied and the [ ] is patterned to create openings that expose sections of the layer of [ ] FormFactor states that it [ ] in the opening and [ ] FormFactor states that the [ ] is then removed. Subsequently, FormFactor asserts that it [ ] The [ ] is also said to destroy the wafer.

In the case of T8 MicroSprings, FormFactor argues that it applies separate layers of [ ] on the silicon wafer and in the [ ] Next, it is asserted, a patterned layer of material that is [ ] is applied on the silicon wafer. Then, it is argued, FormFactor patterns the [ ] to create openings that correspond to a portion of the T8 MicroSprings. FormFactor states that [ ]

[ ] in the openings by an [ ] FormFactor states that the openings correspond to the complete T8 MicroSprings [ ] Therefore, FormFactor argues that, contrary to the positions taken by Mr. Leckie and MJC, FormFactor does create a complete contact structure (T8 MicroSpring) in a single opening, even thought it is not a requirement of claim 19.

Next, FormFactor states that it applies a layer of [ ] on the silicon wafer and [ ] to create an opening at the end of the T8 MicroSpring that corresponds to the location of a [ ] After that, it is argued, [ ] in the opening to create [ ] After that, it is asserted, [ ] After that, it is argued, FormFactor [ ] the wafer to [ ] step.

FormFactor's position is not persuasive. Claim 19 states that "said patterned layer comprising *openings corresponding to said contact structures*."[623] FormFactor has the burden to show by a preponderance of the evidence that its position is correct. This FormFactor has not done. With respect to the T5 MicroSprings, FormFactor patterns the [ ] to create openings which are the [ ] of the MicroSprings.[624] However, the [ ] of the T5 Micro Springs are not a complete T5 MicroSpring and thus not a complete contact structure. There is also the [ ] which is not included in this opening.[625] The language of claim 19 clearly requires that each opening correspond to a complete contact structure. Therefore, the T5 MicroSpring does not practice the portion of claim 19 cited above.

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[623] JX-5 (the '538 patent) at col. 135 (italics added).
[624] CX-731C at 261.
[625] RX-799C.

Similarly, the T8 Micro Spring does not practice claim 19 of the '538 patent. In the third cross section in CX-348C at FFITC0041087, [ ] in the openings that correspond to the [ ] portion of the T8 MicroSpring.[626] Thereafter, FormFactor applies a [ ] on the silicon wafer and patterns the [ ] to create an opening at the [ ] of the T8 MicroSpring that corresponds to the location of [ ] which is *another portion* of the T8 MicroSpring.[627] The language of claim 19 clearly requires that each opening correspond to a contact structure. Therefore, the T8 MicroSpring does not practice the portion of claim 19 cited above.

Since neither the T5 nor the T8 MicroSpring practice the portion of claim 19 that requires "said patterned layer comprising *openings corresponding to said contact structures*," FormFactor does not satisfy the technical prong of the domestic industry requirement. Since FormFactor does not practice this claim term of claim 19, there is no need to discuss the other claim terms that comprise claim 19.

D. Validity

1. Ordinary Skill in the Art

As previously stated in Order No. 37, a person of ordinary skill in the art is an individual with a bachelor's degree in mechanical or electrical engineering, or the equivalent, and at least one year of experience in either probe card assemblies, semiconductor device testing, or MEMS technology at the time of effective filing date for the asserted patent.[628]

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[626] RX-254, 255.
[627] *Id.*
[628] See Order No. 37, p. 11 (January 23, 2009).

2. Anticipation

a. The Beaman '846 Patent

MJC argues that the Beaman '846 patent anticipates claim 19 of the '538 patent in that it inherently teaches the limitation of "wherein said fabricating comprises applying a patterned layer of material to a sacrificial substrate, said patterned layer of material comprising openings corresponding to said contact structures," because a single layer of photoresist is applied to a sacrificial substrate. This single layer of photoresist is said to comprise a "patterned layer comprising openings corresponding to said contact structures," because the areas where the photoresist has been removed through the development are "openings" in the layer of photoresist and thus produce a pattern. These openings are said to correspond to the Beaman '846 patent's probes (i.e. contact structures) because a complete probe is fabricated by positioning wire within the opening in this single layer of photoresist and then wire bonding the wire to the sacrificial substrate. None of the other claim terms of claim 19 are discussed in MJC's brief.

Both FormFactor and Staff oppose MJC's position.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is anticipated by the Beaman '846 patent. Accordingly, it is determined that the Beaman '846 patent does not anticipate claim 19 of the '538 patent.

b. The Beaman '654 Patent

MJC argues that the Beaman '654 patent anticipates claim 19 of the '538 patent in that it inherently teaches the limitation of "wherein said fabricating comprises applying a patterned layer of material to a sacrificial substrate, said patterned layer of material comprising openings corresponding to said contact structures," because a single layer of photoresist is applied to a

sacrificial substrate. This single layer of photoresist is said to comprise a "patterned layer comprising openings corresponding to said contact structures," because the areas where the photoresist has been removed through the development are "openings" in the layer of photoresist and thus produce a pattern. These openings are said to correspond to the Beaman '654 patent's probes (i.e. contact structures) because a complete probe is fabricated by positioning wire within the opening in this single layer of photoresist and then wire bonding the wire to the sacrificial substrate. None of the other claim terms of claim 19 are discussed in MJC's brief.

Both FormFactor and Staff oppose MJC's position.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is anticipated by the Beaman '654 patent. Accordingly, it is determined that the Beaman '654 patent does not anticipate claim 19 of the '538 patent.

c. The Laakso '545 Patent

MJC argues that the Laakso patent is prior art to the '538 patent and that it teaches (1) the limitation of "affixing to make a relatively permanent connection without external means" and (2) the limitation of "applying a patterned layer of material to a sacrificial substrate, said patterned layer comprising openings corresponding to said contact structures." None of the other claim terms of claim 19 are discussed in MJC's briefs.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is anticipated by the Laaskso '545 patent. Accordingly, it is determined that the Laakso '545 patent does not anticipate claim 19 of the '538 patent.

3. Obviousness

a. The Beaman '846 Patent in Combination with the References Disclosed in the Direct Witness Statement of Ronald Leckie

MJC argues that the Beaman '846 patent in combination with any of the references disclosed in the Direct Witness Statement of Ronald Leckie render claim 19 obvious. Specifically, MJC states that, due to the need in the semiconductor wafer probing industry to custom shape probe tips, it would have been obvious to use a sacrificial substrate and apply a patterned layer, such as photoresist, to the sacrificial substrate to do so. None of the other claim terms of claim 19 are discussed in MJC's briefs.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is taught by the Beaman '846 patent in combination with the references in Mr. Leckie's referenced testimony so as to render claim 19 obvious. Accordingly, it is determined that the above-mentioned references do not render claim 19 of the '538 patent obvious.

b. The Beaman '654 Patent in Combination with the References Disclosed in the Direct Witness Statement of Ronald Leckie

MJC argues that the Beaman '654 patent in combination with any of the references disclosed in the Direct Witness Statement of Ronald Leckie render claim 19 obvious. Specifically, MJC states that, due to the need in the semiconductor wafer probing industry to custom shape probe tips, it would have been obvious to use a sacrificial substrate and apply a patterned layer, such as photoresist, to the sacrificial substrate to do so. None of the other claim terms of claim 19 are discussed in MJC's briefs.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is taught by the Beaman '654 patent in combination with the references in Mr. Leckie's referenced testimony so as to render claim 19 obvious. Accordingly, it is determined that the above-mentioned references do not render claim 19 of the '538 patent obvious.

c. The Kwon '297 Patent in Combination with the JPA H06-84455 Patent

MJC argues that the Kwon '297 patent and the JPA H06-84455 (JPA '455) patent render claim 19 of the '538 patent obvious. MJC states that both of these references are prior art to the '538 patent under 35 U.S.C. § 103(a), and that they both disclose the use of a sacrificial layer instead of a sacrificial substrate. However, it is argued, based on the disclosure in these patents, one of ordinary skill in the art would have been motivated to use a sacrificial substrate instead of a sacrificial layer, given the industry need to customize the shape of probe tips. None of the other claim terms of claim 19 are discussed in MJC's briefs.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is taught by the Kwon '297 patent in combination with the JPA '455 patent so as to render claim 19 obvious. Accordingly, it is determined that the above-mentioned references do not render claim 19 of the '538 patent obvious.

d. The Carver '002 Patent in Combination with the Albrecht '415 Patent

MJC asserts that the Carver '002 patent and the Albrecht '415 patent are prior art under 35 U.S.C. § 103, and also that they render claim 19 obvious. MJC states that both patents pertain to atomic force microscopy (AFM). MJC argues that, due to AFM's custom shaping of contact

structure tips, as disclosed in these patents, it would have been obvious to a person of ordinary skill in the art to use any of the references addressed in the Direct Witness Statement of Ronald Leckie, such as the Beaman '846 patent, and applied patterned layers of material to a sacrificial substrate in building the contact structures. Moreover, it is argued, the sacrificial substrate would have to be destroyed, such as by etching, in order to free the contact structures.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is taught by the Carver '002 patent in combination with Albrecht '415 patent and any of the references addressed in the Direct Witness Statement of Ronald Leckie so as to render claim 19 obvious. Accordingly, it is determined that the above-mentioned references do not render claim 19 of the '538 patent obvious.

e. The Tada '052 Patent in Combination with the Luttmer '037 Patent

MJC asserts that the Tada '052 patent and the Luttmer '037 patent are prior art under 35 U.S.C. § 103, and also that they render claim 19 obvious. MJC states that, based on the disclosure in these patents, it would have been obvious to a person of ordinary skill in the art to combine these two patents with the references addressed in the Direct Witness Statement of Ronald Leckie, such as the Beaman '846 patent or the Beaman '654 patent, for the purposes of customizing the shape of the probe tips or achieving a fine pitch.

FormFactor and Staff oppose MJC's arguments.

MJC's position is not persuasive. MJC has not shown *in its briefs* that each and every element of claim 19 is taught by the Tada '052 patent in combination with the Albrecht '415 patent and any of the references addressed in the Direct Witness Statement of Ronald Leckie so as to render

claim 19 obvious. Accordingly, it is determined that the above-mentioned references do not render claim 19 of the '538 patent obvious.

4. Written Description & Enablement

MJC argues that the '538 patent fails to enable the fine pitch attachment of individual contact structures. MJC states that the '538 patent describes the attachment of individual contact structures only in the context of "package" attachment, where a fine pitch is not necessary, and fails to do so in the context of "probe" attachment, where a fine pitch is necessary. MJC asserts that because the fine pitch attachment contact structures was not enabled by the '538 patent, the '538 patent describes gang-transfer as the ideal method of probe attachment.

MJC argues that the same FormFactor applicants that are on FormFactor's '538 patent are also on FormFactor's '254 patent. MJC asserts that a fine pitch can not be achieved using mechanical techniques. Instead, it is argued, "lithographic" techniques would be needed to be employed to achieve a fine pitch.

FormFactor argues that claim 19 does not require inclusion of a "fine pitch," "coarse pitch," or "pitch." FormFactor states that the plain language of claim 19 does not even use the words "fine pitch," "coarse pitch," or "pitch," and that nothing in the '538 patent or its prosecution history provides any basis for importing such an extraneous limitation into claim 19.

FormFactor argues that the '538 patent discloses attaching contact structures one-by-one on an individual basis and attaching in multiplies using a gang-transfer method. In addition, it is asserted, the '538 patent discloses that individual contact structures can be attached using automated

parts equipment such as MJC's laser soldering system, citing to '538 patent.[629] FormFactor states that this attachment could be at any pitch for which the automated equipment is programmed, but attaching at a "pitch," "fine pitch," or "coarse pitch," is not a limitation of claim 19. FormFactor concludes by arguing that neither FormFactor nor the inventors of the '254 patent stated in the '254 patent (a patent said not to be related to the '538 patent) that it was not possible to achieve a fine pitch by attaching contact structures using mechanical means such as automated parts equipment.

Staff supports FormFactor's position on this issue.

MJC's arguments are not persuasive. While the language of the specification cited by MJC does mention the terms "coarse pitch" and "fine pitch,"[630] it does not support MJC's allegation as set forth above. In addition, there is nothing in the language of claim 19 to support MJC's argument. The argument regarding the '254 patent is similarly not supported. Accordingly, MJC's argument regarding lack of enablement is rejected.

E. Enforceability

MJC's argument concerning this issue in its brief consists of the following:

(1) FormFactor committed inequitable conduct by withholding the '654 Patent, the '846 Patent and the '052 Patent during the prosecution of FormFactor's '538 Patent. (RCOL 106 - 108.)

(2) FormFactor knew of and intentionally failed to disclose these Patents during the prosecution of the application that led to FormFactor's '538 Patent. (RFF VI.E.1.01 - .03.)

FormFactor and Staff oppose MJC's position.

To make a showing of inequitable conduct, MJC must show that references not disclosed

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[629] JX-005 (the '538 patent) at col. 133:23 - 27.
[630] JX-005 (the '538 patent) at col. 70:35 - 71:15.

by the patentee to the PTO were material and that the patentee intended to deceive the PTO.[631] As is clear from the above-cited language from MJC's briefs, MJC has not shown in its briefs evidence sufficient to meet its burden of presenting clear and convincing evidence of inequitable conduct. Accordingly, MJC's allegation of inequitable conduct is rejected.

VII. The '152 Patent

A. Overview

Originally, nineteen claims of the '152 patent are asserted against Respondents, namely independent claims 1 and 21 and dependent claims 2, 7-12, 15, 22-23, 27-30, and 33-35. These claims read as follows:

1. A method of an fabricating interconnection element, comprising:
   fabricating an interconnection component, including a connection region,
   fabricating a cantilever structure on a sacrificial substrate;
   mounting the cantilever structure to the connection region of the interconnection component; and
   releasing the cantilever structure from the sacrificial substrate by removing at least a portion of the sacrificial substrate.

2. The method, according to claim 1, characterized in that:
   the interconnection component is elongate.

7. The method, according to claim 1, characterized in that:
   the cantilever structure is brazed or soldered to the interconnection component.

8. The method, according to claim 1, characterized in that:
   a plurality of cantilever structures are lithographically defined on the sacrificial substrate.

9. The method, according to claim 1, characterized in that:
   the interconnection component is an element on a second substrate.

10. The method, according to claim 1, characterized in that:
    the cantilever structure is formed by providing a masking layer on the sacrificial substrate,

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[631] *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1365. (Fed. Cir. 2008) ("*Star Scientific*").

forming an opening in the masking layer, and depositing spring material in the opening.

11. The method, according to claim 1, characterized in that:
the cantilever structure is tapered from a one end to an opposite end thereof.

12. The method, according to claim 1, characterized in that:
the interconnection component is resident on an electronic component.

15. The method, according to claim 1, wherein:
the sacrificial substrate comprises a silicon wafer.

21. A method of forming a cantilever element, comprising:
providing a support substrate,
applying a release material on a first side of the support substrate, the release material suitable for destructive removal,
applying a masking material on the first side of the support substrate and masking at least a portion of the release material,
patterning the masking material to expose a selected portion through the masking layer, and depositing spring material in the selected portion to form a cantilever element.

22. The method of claim 21 further comprising releasing the cantilever element by removing at least a portion of the release material.

23. The method of claim 21 wherein the support substrate is silicon.

27. The method of claim 21 wherein the release material is copper.

28. The method of claim 21 wherein the release material is removed by etching.

29. The method of claim 21 wherein the release material covers the first surface of the support substrate.

30. The method of claim 21 wherein the masking material is photoresist.

33. The method of claim 21 wherein the spring material comprises one or more materials with final material properties and dimensions sufficient to form a resilient member after being released from the support substrate.

34. The method of claim 21 wherein the spring material is deposited by electroplating.

35. The method of claim 21 wherein the spring material is deposited by a method selected from the group consisting of plating, electroless plating, chemical vapor deposition, physical vapor deposition, and sputtering.

Subsequently, claims 1, 2 , 7 -12, and 15 were withdrawn by FormFactor.[632] However, some of the claim construction in the withdrawn claims applies to the remaining claims. As noted above, the undersigned has already construed the above claims in a *Markman* order.[633] A summary of the claims construed in that order is detailed below:

Claim	Term	Construction
Claim 1	interconnection element and interconnection component	indefinite
Claim 1	cantilever	an elongate structure that is mounted (fixed) at one end, and the other end is free to move, typically in response to a force acting generally transverse to the longitudinal axis of the elongate element
Claim 1	cantilever structure and cantilever element	an elongate element (or structure) that is mounted (fixed) at one end, and either is or can become free to move at the other end, typically in response to a force acting generally transverse to the longitudinal axis of the elongate element (or structure), provided that whether movement is allowed depends on which step of the fabrication process one is in."
Claim 1	sacrificial substrate and substrate	a carrier (including a flexible material as well as rigid boards) on which something can be formed or attached (excluding applied layers), and that is destructible or removable
Claim 1	mounting the cantilever structure to the connection region	no construction
Claim 2	elongate	having a greater length than width
Claim 7	brazed or soldered	no construction
Claim 10	spring material	resilient material
Claim 11	tapered from one end to an opposite end thereof	no construction
Claim 21	support substrate	a substrate that supports

[632] Order No. 39 (January 29, 2009).
[633] See Order No. 37 (January 23, 2009).

Claim 21	a release material and release material suitable for destructive removal	a release material: a material that enables the complete release of structures release material suitable for destructive removal: a release material that is appropriate for removal[634] by destruction of that release material
Claim 21	patterning the masking material to expose a selected portion through the masking layer	masking layer is the same as masking material

B. Infringement of Claim 21 by Phicom: "release material"

FormFactor alleges that during the fabrication of Phicom's Micro Probes, Phicom uses lithographic and wet etching processes to etch the silicon wafer to form depressions that complement the tip of Phicom's Micro Probes. Thereafter, it is alleged, Phicom sputters a layer of copper that is a release material suitable for destructive removal on a first side of the silicon wafer (front side), including in the etched areas. It is argued that a previously sputtered layer of titanium serves to adhere the layer of copper. FormFactor states that the copper acts as a seed layer for fabricating Phicom's Micro Probes. It is asserted that the Micro Probes are therefore attached to the copper layer and to each other via the copper layer. Thus, FormFactor argues that the copper seed layer is also a release material because it is suitable for destructive removal such as through a chemical etching process, and its removal enables the complete release of structures (Phicom's Micro Probes) from the silicon wafer. FormFactor states that its infringement argument is based upon the undersigned's claim construction that: (1) *release material* is a material that enables the complete release of structures, and (2) *release material suitable for destructive removal* is a release material

[634] During the hearing, a change was made to the undersigned's claim construction to include the words "for removal," which were inadvertently omitted from the claim construction in Order No. 37. Bullock, Tr. 1880 - 1881 (March 4, 2009).

that is appropriate for removal by destruction of that release material.

Phicom asserts that its products do not meet the "release material" limitation of claim 21 and therefore do not infringe any of the asserted claims. More specifically, Phicom states that it destroys a sacrificial substrate in a wet etching bath of KOH to release the fabricated beam. Phicom states that it uses the copper layer to permit the beam to be electroplated and then remain fixed in place until the sacrificial substrate is completely etched away. Phicom argues that the KOH bath that etches the Phicom sacrificial substrate to free the beam from the substrate does not remove the copper layer. Instead, it is asserted, after the beam is completely released, Phicom applies a separate etching solution and step to remove the copper layer that remains on the fabricated beam. Therefore, Phicom concludes that the copper layer is in fact a copper seed layer and is not the "release material" of the '152 patent.

Phicom states that its process does not practice the invention of the '152 patent. Phicom asserts that its process sputters a layer of titanium over a silicon substrate, followed by a layer of copper over the titanium layer. It asserts that the copper layer serves as a seed layer that allows the beam to be electroplated. Phicom states that the beam is formed by electroplating metal material directly onto the copper layer. The copper layer is said to keep the fabricated beam attached and fixed to the substrate until the substrate is destroyed. It is further argued that after the end of the beam is mounted to the MicroProbe Head, the beam is freed from the silicon layer by etching the silicon away in a wet KOH bath, until the silicon sacrificial substrate is fully destroyed. Phicom states that it then removes the copper layer that remains adhered to the beam, through a separate etching step directed to the copper. Phicom asserts that this position is supported by Mr. McAlexander's testimony.

Phicom argues that its position is also supported by the '152 patent itself. It notes that in the single instance in the '152 patent where FormFactor refers to a "release layer," the patent discloses an aluminum layer as the release layer to release a tip that is fabricated on a copper seed layer. The tip is said to be released by etching away the aluminum layer. Phicom states that after the tip is released, the copper layer remains and is subsequently etched. Phicom argues that FormFactor, in its own T-2 process, uses a layer of aluminum as a release layer, while using an adhesion layer and a copper seed layer for plating. Again, it is argued, FormFactor releases the fabricated tip by etching away the aluminum release layer, followed by a separate step of etching off the residual copper seed layer. Thus, Phicom argues that FormFactor itself recognizes that a copper seed layer is not a release layer.

Phicom asserts that there is no infringement under the doctrine of equivalents. It is argued that the expansion of the claim scope to cover a copper seed layer would read the "release material" limitation out of the claim, in violation of the all elements rule and the law of prosecution history estoppel.

Staff agrees with FormFactor that Phicom infringes claim 21 of the '152 patent. It argues that its position is based in part on the correct definition of the claim term "release material," which requires the release material to "*enable* the complete release of *structures*," rather than Phicom's position which is based on a definition that release material requires the "complete release of the [release] material."

For the reasons set forth below, Phicom's position shall be adopted. Phicom's process begins with a layer of titanium being sputtered over a silicon substrate, followed by a layer of copper over

the titanium over the titanium layer.[635] The copper layer serves as a seed layer that allows the beam to be electroplated.[636] The copper layer keeps the fabricated beam attached and fixed to the substrate until the substrate is completely destroyed.[637] After the end of the beam is mounted to the Microprobe head, the beam is freed from the silicon wafer by etching the silicon away in a wet KOH bath until the sacrificial substrate is fully destroyed.

In Mr. McAlexander's testimony at trial, he stated that the way you get to the silicon is to first remove the copper that is outside of the beam when the beam is still attached to the copper. He stated further that the reason that you remove the copper outside of the beam is to give you access to the titanium. Then he asserts that you have to etch off the titanium to get access to the SIO-2 oxide. In turn, the SIO-2 oxide must be etched off to get to the silicon.[638] At this point in time, the beam is still 100% fully attached to the substrate, so he concludes that the removal of a portion of the copper layer has nothing to do with the release.[639] Dr. Frazier disagrees with Mr. McAlexander's conclusion.[640]

In Order No. 37, the term "release material" was construed to mean *a material that enables the complete release of structures.*[641] While removal of a portion of the copper seed layer is a necessary step to proceed to the destruction of the silicon substrate that completely releases one end of the MicroProbe Heads, it cannot be said to rise to the level of a release material that *enables the complete release* of the MicroProbe Heads made by Phicom. The connection is too tenuous.

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[635] RX-381 at Q/A 39 - 41; Tr. 1845 - 1846.
[636] *Id.*
[637] Tr. 1877 - 1878.
[638] Tr. 1845 - 1846.
[639] Tr. 1846.
[640] CX-731C at p. 30.
[641] Order No. 37 at 109.

Accordingly, Phicom's products do not read on the claim term *release material* of claim 21. Therefore, Phicom's products do not directly infringe claim 21 of the '152 patent. For the same reasons, Phicom's products do not infringe claim 21 of the '152 patent under the doctrine of equivalents.

Since Phicom's products do not read on the claim term *release material* in claim 21, there is no need to address other claim terms in claim 21 or in the claims that depend from claim 21; *i.e.* claim 22, claim 23, claim 27, claim 28, claim 29, claim 30, claim 33, claim 34, and claim 35.

C. Domestic Industry - Technical Prong

1. FormFactor's T-2 Products

The main dispute between the parties with regard to FormFactor's T-2 products is whether FormFactor practices the step of claim 21 of "depositing spring material in the selected portion to form a cantilever element." FormFactor argues that it deposits [ ] in the selected portion to produce the [ ] of the cantilever element, which is part and parcel of what FormFactor does "to form a cantilever element." FormFactor states that the fact that more is done does not matter in determining that claim 21, a "comprising" claim, is satisfied. In that regard, FormFactor applies a [ ] on top of the [ ] and patterns that [ ] to expose a selected portion that will correspond to the [ ]

Thereafter, it is asserted, the [ ] of the cantilever element is formed by [ ] material into the opening. The material deposited is said to complete the cantilever element.

FormFactor argues that Phicom takes the position that the [ ]

[ ] defines an opening for only [ ] of the cantilever element, which is not an elongated structure that Order No. 37 requires for it to be considered a "cantilever element." In fact, FormFactor asserts, Phicom argues that the [ ] portion of FormFactor's cantilever is formed using the [ ] FormFactor states that Phicom asserts that the [ ]is not on the substrate, and that [ ]

In response to that argument, FormFactor states that nothing in claim 21 requires that a complete cantilever element be deposited in the opening in the [ ] layer. Indeed, it is asserted, the '152 specification itself discloses in the Figure 6 examples a process of forming [ ] structure and releasing that [ ] through an aluminum release layer. FormFactor asserts that the Figure 6 examples of the '152 patent show that the [ ] is subsequently attached to the [ ] portion to form a cantilever element.

In response to Staff's argument that the [ ] applied by FormFactor does not [ ] at least a portion of the release material, FormFactor states that it [ ] across the first side of the support substrate (silicon wafer) and into the [ ] in fabricating its T-2 MicroSprings. Therefore, FormFactor argues that any [ ] material that is applied on the first surface of the silicon wafer will necessarily [ ] at least a portion of the [ ] layer that is a release material. FormFactor states that while the [ ] layers are [ ] layer, it is plain that claim 21 does not require that the [ ] be applied directly on the release and there is nothing in the '152 specification or prosecution history requiring claim 21 to be so limited. This is said to be supported by the Figure 6 examples and disclosure of the '152 patent. FormFactor concludes by asserting that

even "if it were literally so limited, the difference is insubstantial."[642]

Phicom does not appear to disagree with FormFactor about the details of the process used. However, Phicom states that the only "release material" that FormFactor alleges is the [ ] release material. It argues that the [ ] which (1) is on the support substrate and (2) [ ] this [ ] release layer, defines an opening for only [ ] which is not an "elongate element" as required by Order No. 37's construction of the claim term "cantilever element." Instead, Phicom asserts the [ ] portion of FormFactor's cantilever is formed using the [ ] that is [ ] formed on the [ ] Phicom states that the [ ] is not on the substrate and does not [ ] release layer. Instead, it is argued, the [ ] [ ] layer. Therefore, Phicom concludes that FormFactor is not practicing the combined steps of "applying a masking material on the first side of the support substrate and masking at least a portion of the release material, patterning the masking material to expose a selected portion through the masking material, and depositing spring material in the selected portion to form a cantilever beam," as required by claim 21. Phicom states that its expert, Mr. McAlexander, explained all of this through testimony.

Staff also asserts that FormFactor's T-2 MicroSpring does not practice claim 21 of the '152 patent. Staff notes that FormFactor applies masking material in which a "selected portion" is exposed to receive the deposit of the spring material, which forms a cantilever element. But, it is asserted, that masking material does not mask at least a portion of the release material. Alternatively, it is argued, exposure of masking material that masks at least a portion of the release material that masks at least a portion of the release material in which a selected portion is exposed to receive a deposit of spring

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[642] CRB 30.

material does not satisfy the claim because the deposit forms [ ] which is not "elongate," as called for by the definition of "cantilever element" in Order No. 37.

In response to an argument made by FormFactor in its initial brief, Staff states that FormFactor misapprehends Staff's argument. More specifically, Staff states that FormFactor asserts that Staff's argument is "based on the incorrect contention that Claim 21 requires deposit of a *complete cantilever element* into an opening and directly onto the [ ][643] In response, Staff states that claim 21 of the '152 patent requires "depositing spring material in the selected portion to form a cantilever element." This term was construed by Order No. 37 to be an elongate element. Thus Staff states that this claim language requires that the deposit of spring material in the selected portion be *elongate*, not complete. Because the material that FormFactor deposits in the selected portion forms [ ] and because the evidence does not show that [ ] is elongate, Staff asserts that FormFactor has not shown that its T-2 MicroSpring practices claim 21 of the '152 patent.

Staff also argues that FormFactor, in its initial brief, argues for the first time that it practices the '152 patent under the doctrine of equivalents. Staff submits that FormFactor has already waived this argument by not having raised it in its pre-trial brief. Even if the undersigned finds that the argument was not waived, Staff asserts that the argument must fail because it is not supported by any evidence and is merely conclusory attorney argument.

For the reasons set forth below, FormFactor's T-2 MicroSpring has not been shown to practice claim 21 of the '152 patent. Claim 21 of the '152 patent requires "depositing spring material in the selected portion to form a cantilever element." The term "cantilever element" was construed

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[643] Staff cites to CIB 68 and states that it added the italics to the quoted language. SRB 3.

by Order No. 37 to be an elongate element.[644] This claim language requires that the deposit of spring material in the selected portion must result in the object formed to be *elongate*. Because the material that FormFactor deposits in the selected portion forms [ ] and because the evidence does not show that [ ] is elongate, FormFactor's T-2 MicroSpring does not practice claim 21 of the '152 patent." [645]

FormFactor's argument, which is that the Figure 6 series in the '152 specification disclose that the [ ] is eventually attached to [ ] portion to form a cantilever, is not persuasive. The [ ] portion of FormFactor's cantilever is formed using an [ ] that is deposited on the metal layers formed on the first mask. The [ ] and does not [ ] layer. Instead, [ ] Therefore, FormFactor is not practicing the combined steps of "applying a masking material on the first side of the support substrate and masking at least a portion of the release material, patterning the masking material to expose a selected portion through the masking material, and depositing spring material in the selected portion to form a cantilever beam," as required by claim 21.[646]

With regard to FormFactor's doctrine of equivalents argument, FormFactor has presented no persuasive evidence to support this contention.

For the reasons set forth above, FormFactor's T-2 products do not practice claim 21 of the '152 patent.

2. FormFactor's T-8 Products

Staff and Phicom argue that FormFactor has waived the argument that its T-8 products

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[644] Order No. 37 at 105.
[645] CX-0414C, Q/A 69 - 70.
[646] *Id.*

practice claim 21 of the '152 patent because that argument was not raised in FormFactor's pre-trial brief. FormFactor disagrees, citing pages 342 - 347 of its pre-trial brief.

A review of pages 342 through 347 of FormFactor's pre-trial brief cited by FormFactor, indicates quite clearly that FormFactor was discussing its T-8 products in the context of claim 19 of the '538 patent, not claim 21 of the '152 patent. Therefore, since FormFactor did not raise the issue of its T-8 products practicing claim 21 of the '152 patent in its pre-trial brief, that issue is deemed waived in accordance with the undersigned's Ground Rule 8.2.

3. Conclusion

For the reasons set forth above, FormFactor has not met the technical prong of the domestic industry requirement.

D. Validity

1. Ordinary Skill in the Art

As previously stated in Order No. 37, a person of ordinary skill in the art is an individual with a bachelor's degree in mechanical or electrical engineering, or the equivalent, and at least one year of experience in either probe card assemblies, semiconductor device testing, or MEMS technology at the time of effective filing date for the asserted patent.[647]

2. Anticipation - The Kubena '194 Patent

Phicom argues that the Kubena patent, U.S. Patent No. 5,596,194 (RX-202), [Kubena], anticipates claim 21 of the '152 patent. Phicom asserts that Kubena discloses a method of forming a cantilever element. It is stated that Figures 7A - 7D of Kubena show the fabrication of a cantilever element, as recited by claim 21 of the '152 patent. The fabrication process of the Figure 7 series is

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[647] See Order No. 37, p. 11 (January 23, 2009).

said to start with an initial substrate 114 shown in Fig. 7A, and then a sacrificial layer 122 is formed. (Fig. 7C.) A metal layer 124 is said to be formed over the sacrificial layer. As shown in Fig. 7D, the metal layer is then masked, and a beam 128 is formed. Phicom then argues that sacrificial layer 122 in 7D is removed to provide a complete release of the cantilever beam. Phicom asserts that Kubena discloses every limitation of the asserted claim. Phicom states that its conclusions are supported by Mr. McAlexander's evidence as well as the content and teachings of the prior art references themselves. Phicom rejects FormFactor's argument that Kubena does not disclose depositing a spring material to form a cantilever element because the cantilever is made of gold. Phicom argues that the '152 patent expressly teaches that gold can be used as a resilient or spring material.

Finally, Phicom opposes FormFactor's argument that, because one end of the cantilever, when freed, remains attached to the substrate on which it was formed, there is no release layer that enables a complete release. Phicom argues that claim 21 requires depositing spring material onto a selected portion of the release material, construed to be "a material that enables the complete release of structures." The claim is said to require depositing spring material onto a selected portion of the release material to form a "cantilever element." The claimed combination is said to cover fabricating a beam over a release layer on a substrate and complete, as Kubena is said to disclose.

Phicom argues that a similar process is shown in the figure 1 series of Kubena. It states that Fig. 1f of Kubena shows that a sacrificial layer 30 is provided over a first side of support substrate 14, which corresponds to "the applying release layer ..." step of claim 21. It is stated that sacrificial release layer 30 is destructively removed later to completely release cantilever 36. Fig. 1h is said to show that resist 34, which is a masking material, is applied on support substrate 14 and masks both metal seed layer 32 and release layer 30, thus corresponding to the "applying a masking material..."

step. Mask material 34 is said to be patterned to expose a selected opening through mask material 34, thus corresponding to the "patterning the masking material..." step.

Phicom argues that Fig. 1i of Kubena shows that the selected opening is deposited with gold, a spring material, which corresponds to the "depositing spring material..." step. Phicom asserts that the '152 patent itself states that gold is a spring material that has resilient characteristics.

Therefore, Phicom argues that that Kubena anticipates each and every element of claim 21.

Staff asserts that Kubena does not anticipate claim 21 because Kubena does not disclose the claimed "release material" that enables the complete release of the structures from the substrate.

FormFactor asserts that Kubena does not anticipate claim 21 of the '152 patent because Kubena does not disclose a "release material." FormFactor states that "the substrate 14 is a part of the final structure (tunneling sensor) and cantilever arm 38 remains attached to it."[648] In addition, FormFactor states that Kubena does not disclose "depositing a spring material in the selected portion to form a cantilever element." It is argued that the cantilever arm is made from gold and one of ordinary skill in the art would not conclude that gold is a spring material.

FormFactor asserts that Phicom is improperly trying to rely on certain RDX (demonstrative) exhibits, which are claim charts, which have no intrinsic evidentiary value since they are demonstrative exhibits. FormFactor argues that its witness, Mr. McAlexander's, opinions are based on a definition of one of ordinary skill in the art that is different than the one established in Order No. 37, and that his opinions are not based upon the claim construction set forth in Order No. 37. FormFactor states that Mr. McAlexander did not provide an element-by-element analysis of Kubena or any other prior art with regard to claim 21. FormFactor argues that the evidence he did present is

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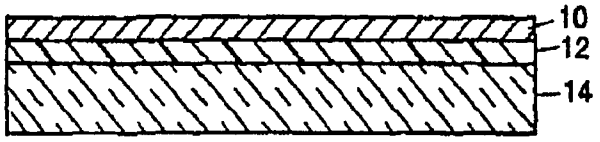
[648] CIB 75.

insufficient to demonstrate that Kubena anticipates claim 21.

For the reasons set forth below, Phicom's position shall be adopted. Figure 1a of Kubena shows substrate 14 that supports other structures. Support substrate 14 corresponds to the "support substrate" recited by claim 21 of the '152 patent.[649]

FIG. 1a.



Kubena shows in figure 1f that a sacrificial layer 30 is provided over a first side of support substrate 14, which corresponds to the "applying a release layer" step of claim 21. Sacrificial release layer 30 is destructively removed later to completely release the cantilever 36.[650]

FIG. 1f.

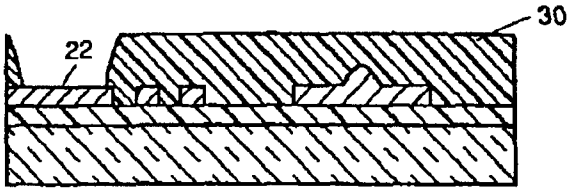


Figure 1h shows that the resist layer 34, which is a masking material, is applied on support substrate 14 and masks both metal seed layer 32 and release layer 30, thus corresponding to the "applying a masking material" step of claim 21. Mask material 34 is patterned to expose a selected opening through mask material 34, thus corresponding to the "patterning the masking material" step of claim

[649] RX-0202 (Kubena) at Fig. 1a and col. 3:65 - 4:2.
[650] *Id.* at Fig. 1f and 4:17 - 19 and 4:37 - 45.

21.[651]

FIG. 1h.

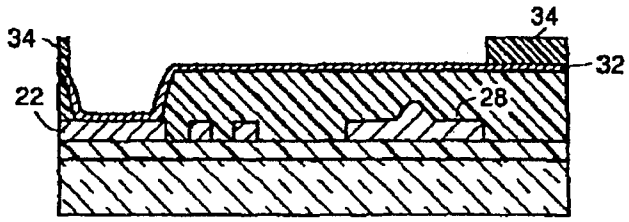
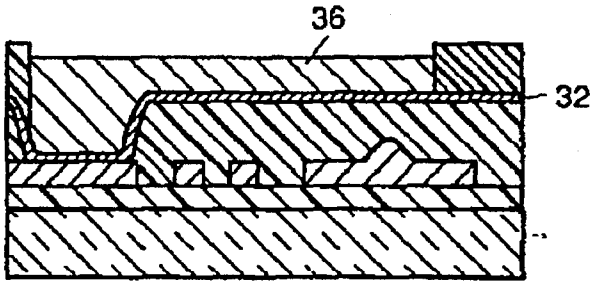


Fig. 1i of Kubena shows that the selected opening is deposited with gold, a spring material, which corresponds to the "depositing spring material" step recited by claim 21 of the '152 patent.[652] The '152 patent indicates that gold is a spring material that shows resilient characteristics.[653]

FIG. 1i.



For all of the above-stated reasons, it is determined that the Kubena '194 patent anticipates claim 21 of the '152 patent in all respects. Accordingly, claim 21 of the '152 is determined to be invalid due to anticipation by the Kubena '194 patent.

As noted above, it has been determined that Phicom's products do not infringe independent claim 21, that FormFactor does not meet the technical prong with respect to independent claim 21,

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[651] *Id.* at Fig. 1h and 4:28 - 31.
[652] *Id.* at Fig. 1i and 4:33 - 38 and 4:36 –45.
[653] JX-001 at 10:26 - 30; 11:45 - 50; 12:20 -25; and 15:48 -52.

and that Kubena anticipates independent claim 21. In light of these findings, the undersigned will not address the other prior art invalidity arguments regarding anticipation and obviousness with respect to independent claim 21. Since three bases for no violation of claim 21 have been determined, no analysis of the invalidity arguments related to anticipation and obviousness of the dependent claims will be made.

3. Written Description and Enablement

Phicom argues that Figures 7A - F and 7G - H are the only drawings in the '152 patent that illustrate steps of fabricating elongated cantilevered elements. Phicom asserts that, as shown, an elongated cantilever beam is formed on what is disclosed to be "sacrificial substrate" 702, a claimed element of "terminated" independent claim 1 but not a claimed element of remaining asserted independent claim 21, which claims a "support substrate" and a "release material suitable for destructive removal."

Phicom argues that in the first embodiment encompassed by Figures 7A through F and 7G - H, trenches 704 are etched into a surface of "sacrificial substrate" 702. It states that, as shown in Figure 7B, a hard field layer 706 is deposited on the surface of the substrate, followed by an optional layer 708 of plateable material. Phicom argues that the patent does not describe either of those layers - layer 706 or 708 - as a "release" layer that in some manner allows the fabricated cantilever element to be released from the underlying substrate. Instead, it is asserted, layer 706 is described to be a "hard field layer," and the only materials expressly identified for this layer are tungsten-silicide, tungsten, or diamond materials that are described as "not amenable to plating." Phicom argues that the second layer 708 is described to be a plateable material.

Phicom states that a masking material, such as a photoresist, is applied over layer 708.

Phicom asserts that then the cantilever element is formed by depositing a spring layer 712 by any suitable means such as plating. It is stated that the masking material and the portions of layers 706 and 708 below the masking layer are stripped, leaving a plurality of cantilever elements remaining fixed on the sacrificial substrate. Figures 7C through 7E are said to illustrate the fabricated cantilever beams on the "sacrificial substrate" 702, while in Fig. 7F the cantilever beam is shown with the sacrificial substrate removed. Phicom states that while the patent does not explain how the beam is removed, even after it is removed, the field layer and the plating layer remain, as shown in Fig. 7F.

Phicom asserts that Figures 7G and H similarly show that the fabricated cantilever is formed and then removed from the sacrificial substrate. Phicom argues that the Figure 7 embodiments do not disclose the use of a release layer to enable a complete release, or any release. It is asserted that instead they disclose plating a cantilever element over field and plating layers that are applied and used to adhere materials to the substrate, not to release any material whatsoever.

Phicom rejects what it says are FormFactor's attempts to use the Figure 6 and 7 series together to support its contention that claim 21 is not invalid because of a lack of a written description and lack of enablement.

FormFactor argues that there is no legal requirement that there must be a single embodiment in the patent specification that discloses every thing required by the claim. FormFactor states that one of ordinary skill in the art would realize that the combination of the Figure 6 and Figure 7 examples of the '152 patent disclose use of a "release material" to form a cantilever element as required by claim 21.

For the reasons set forth below, FormFactor's arguments have been found to be persuasive. Phicom has the burden of showing lack of enablement or inadequate written description. A review

of the language of claim 21, the specification with the Figure 7 series of drawings and the language associated with those figures, shows that one of ordinary skill in the art could discern how to replicate the alleged invention without undue experimentation. Accordingly, Phicom's lack of written description and enablement arguments are rejected.

VIII. Patent Misuse and Unclean Hands

Respondents argues that FormFactor has engaged in misconduct that warrants a determination that FormFactor has violated the equitable doctrines of patent misuse, unclean hands, and abuse of process, rendering each of the asserted patents unenforceable.

Respondents assert that when the undersigned construed the claims and issued Order No. 37, FormFactor should have accepted the dispositive consequences of the claim constructions in that order and not pursued the trial further. Instead, it is alleged, FormFactor made erroneous and misleading arguments on several issues. FormFactor is also said to have failed to absorb the lessons of certain Korean patent rulings that it had no viable claims, improperly pressured Phicom to take a license, improperly communicated with Respondents' customers, and acted improperly in the instant proceeding.

FormFactor and Staff oppose these allegations.

Respondents' position is not persuasive. Respondents have not shown *in their briefs* clear and convincing evidence that FormFactor has engaged in patent misuse, unclean hands or abuse of process with respect to any or all of the asserted patents in this proceeding. Accordingly, the asserted patents are not unenforceable due to patent misuse, unclean hands, or abuse of process.

IX. Domestic Industry - Economic Prong

FormFactor asserts that it meets the economic prong of the domestic industry requirement

under prongs (A), (B), and (C).[654] Staff agrees with FormFactor that it has satisfied the economic prong of the domestic industry requirement for each of the asserted patents.[655]

Respondents assert that FormFactor does not meet the economic prong with respect to the '485 patent because FormFactor has not shown that any of its U.S. facilities are used to produce or test semiconductor devices. As to the remaining patents, Respondents assert that FormFactor has not tied its U.S. investments in research and development activities to a specific product that is covered by each of the asserted patents.[656]

FormFactor counters Respondents' arguments. As to the '485 patent, FormFactor asserts that there only needs to be a nexus between the asserted patent and domestic activities, which is satisfied by showing <u>some</u> connection.[657] And as to Respondents' argument that FormFactor has not demonstrated with sufficient particularity the allocation of investment attributable to the asserted patents, FormFactor asserts that there is no requirement that a complainant allocate the breakdown of its investment in the articles protected by the intellectual property at issue in excruciating detail where a complainant's entire business is devoted to the design and manufacture of the intellectual property at issue.[658] Furthermore, FormFactor asserts that the threshold by which a complainant may satisfy the economic prong is relatively low.[659] The undersigned agrees with FormFactor that, based

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[654] CIB 95-98; CRB 40-42.

[655] SIB 71-72 citing Freeman, Tr. 348-49, CX-729C (Freeman Direct) at Q/A 4, 25-27, 36-40, 59, 101, CX-730C (Khandros Direct) at Q/A 56-63, CX-59C.

[656] RIB 97; RRB 48.

[657] CRB 40 (emphasis in original) citing *Certain Microlithgraphic Machines and Components Thereof*, Inv. No. 337-TA-468, Initial Determination (January 29, 2003) ("*Certain Microlithgraphic Machines*").

[658] CRB 41.

[659] CRB 41 citing *Certain SDRAMs, DRAMs, ASICs, RAM-on-Logic Chips, Microprocessors, Microcontrollers, Processes for Manufacturing Same and Products Containing Same*, Inv. No. 337-

(continued...)

on Commission precedent, the threshold by which a complainant may satisfy the economic prong is relatively low.

A. Significant Investment in Plant and Equipment

FormFactor asserts that its headquarters in Livermore, California consists of a campus of six buildings totaling approximately 220,000 square feet, including the largest manufacturing MEMS Class 100 clean room in California.[660] FormFactor asserts that it has invested heavily in its U.S. operations for the past three years. Specifically, FormFactor asserts that it has invested [ ] in 2005,[661] [ ] in 2006,[662] and [ ] for the first half of 2007,[663] all of which is related to the asserted patents. Based on a review of the evidence, the undersigned agrees with FormFactor that it has shown that it satisfies the economic prong of the domestic industry requirement for each of the asserted patents based on its significant investment in plant and equipment.

B. Significant Employment of Labor or Capital

FormFactor asserts that it employs approximately 986 employees in North America.[664] As of June 2008, FormFactor employed nearly [ ] department, the majority of whom are located in the U.S.[665] Based on a review of the evidence, the undersigned agrees with FormFactor that it has shown that it satisfies the economic prong of the domestic

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[659](...continued)
TA-404, Order No. 14 (March 31, 1998) ("*Certain SDRAMs*").

[660] CIB 97 citing CFF 2061-2065.

[661] CIB 97 citing CFF 2112-2113, 2119-2122.

[662] CIB 97 citing CFF 2115, 2123- 2127.

[663] CIB 97 citing CFF 2096, 2116, 2128-2132.

[664] CIB 97 citing CFF 2083.

[665] CIB 97 citing CFF 2084, 2090-2091.

industry requirement for each of the asserted patents based on its significant investment employment of labor and capital.

C. Substantial Investment in Exploitation, Including Engineering, Research and Development, or Licensing

FormFactor asserts that it has invested [ ] of its revenues on research and development, which breaks down to [ ] for fiscal year 2007, [ ] for fiscal year 2006, and [ ] for fiscal year 2005.[666] FormFactor asserts that, while it has operations in other countries, all of FormFactor's manufacturing operations and the great majority of FormFactor's research and development into its probe card assemblies are conducted in California.[667]

The undersigned agrees with Respondents that FormFactor has not made a sufficient showing of nexus between its research and development activities to any of the asserted patents. Accordingly, the undersigned finds that FormFactor has not shown that it satisfies the economic prong of the domestic industry requirement for each of the asserted patents based on a substantial investment in exploitation, including engineering, or research and development.

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[666] CIB 96 citing CFF 2117-2118.
[667] CIB 96 citing CFF 2061, 2065, 2070, 2086.

CONCLUSIONS OF LAW

1. The Commission has subject matter jurisdiction in this investigation.

2. The Commission has personal jurisdiction over Respondents Micronics Japan Co., Ltd., MJC Electronics Corp.; Phicom Corp.; and Phiam Corp.

3. Respondents Micronics' and Phicom's accused products do not infringe claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485 in violation of 35 U.S.C. § 271(a).

4. Respondents Micronics' and Phicom's accused products do not infringe claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 in violation of 35 U.S.C. § 271(a).

5. Respondents Micronics' accused products do not infringe claim 19 of U.S. Patent No. 7,225,538 in violation of 35 U.S.C. § 271(a).

6. Respondents Phicom's accused products do not infringe claims 21-23, 27-30, and 33-35 of U.S. Patent No. 5,994,152 patent in violation of 35 U.S.C. § 271(a).

7. An industry in the United States does not exist with respect to FormFactor's products that is protected by U.S. Patent Nos. 6,615,485; 7,225,538; and 5,994,152 as required by 19 U.S.C. § 1337(a)(2) and (3).

8. An industry in the United States exists with respect to FormFactor's products that is protected by U.S. Patent Nos.6,509,751 as required by 19 U.S.C. § 1337(a)(2) and (3).

9. Claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485 are not invalid under 35 U.S.C. § 102 for anticipation based on the asserted prior art references.

10. Claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485 are not invalid under 35 U.S.C. § 103 for obviousness based on the asserted combination of prior

art references.

11. Claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485 are not invalid under 35 U.S.C. § 112 for lack of written description and/or enablement.

12. Claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 are not invalid under 35 U.S.C. § 102 for anticipation based on the JP -034 to Amamiya or Hagihara '192 patent prior art references.

13. Claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751 are not invalid under 35 U.S.C. § 103 for obviousness based on WO96/15458 alone or in combination with the JP -034 to Amamiya or Hagihara '192 patent.

14. Claim 19 of U.S. Patent No. 7,225,538 is not invalid under 35 U.S.C. § 102 for anticipation based on the Beaman '846 patent; the Beaman '654 patent; or the Laakso '545 patent prior art references.

15. Claim 19 of U.S. Patent No. 7,225,538 is not invalid under 35 U.S.C. § 103 for obviousness based on any of Respondent Micronics prior art combinations.

16. Claim 19 of U.S. Patent No. 7,225,538 is not invalid under 35 U.S.C. § 112 for lack of written description and/or enablement.

17. Claim 19 of U.S. Patent No. 7,225,538 is not invalid based on unenforceability.

18. Claim 21 of U.S. Patent No. 5,994,152 patent is invalid under 35 U.S.C. § 102 for anticipation based on the Kubena '194 patent prior art reference.

19. Claims 21-23, 27-30, and 33-35 of U.S. Patent No. 5,994,152 patent are not invalid under 35 U.S.C. § 112 for lack of written description and/or enablement.

20. The asserted patents are not invalid based on patent misuse and/or unclean hands.

INITIAL DETERMINATION

Based on the foregoing opinion, findings of fact, conclusions of law, the evidence, and the record as a whole, and having considered all pleadings and arguments, including the proposed findings of fact and conclusions of law, it is the Administrative Law Judge's Initial Determination that a violation of Section 337 of the Tariff Act of 1930, as amended, has not been found in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain probe card assemblies, components thereof and certain probe card assemblies, components thereof and certain tested DRAM and NAND flash memory devices and products containing same, in connection with claims 1, 3, 4, 18, 19, 23, 24, 29, 32, 33, 36, 37, and 41 of U.S. Patent No. 6,615,485; claims 1-3, 12, 24, and 25 of U.S. Patent No. 6,509,751; claim 19 of U.S. Patent No. 7,225,538; and claims 21-23, 27-30, and 33-35 of U.S. Patent No. 5,994,152 patent. Furthermore, the Administrative Law Judge hereby determines that a domestic industry in the United States exists that practices U.S. Patent No. 6,509,751 and does not exist that practices U.S. Patent Nos. 6,615,485; 7,225,538; and 5,994,152.

The Administrative Law Judge hereby CERTIFIES to the Commission this Initial Determination, together with the record of the hearing in this investigation consisting of the following: the transcript of the evidentiary hearing, with appropriate corrections as may hereafter be ordered by the Administrative Law Judge; and further the exhibits accepted into evidence in this investigation as listed in the attached exhibit lists.

Pursuant to 19 C.F.R. § 210.42(h), this Initial Determination shall become the determination of the Commission unless a party files a petition for review pursuant to 19 C.F.R. § 210.43(a) or the Commission, pursuant to 19 C.F.R. § 210.44, orders on its own motion a review of the Initial

Determination or certain issues therein.

RECOMMENDED DETERMINATION ON REMEDY AND BOND

Pursuant to Commission Rules 210.36(a) and 210.42(a)(1)(ii), the Administrative Law Judge is to consider evidence and argument on the issues of remedy and bonding and issue a recommended determination thereon.

X. Remedy and Bonding

A. Limited Exclusion Order

Under Section 337(d), the Commission may issue either a limited or a general exclusion order. A limited exclusion order ("LEO") instructs the U.S. Customs Service to exclude from entry all articles that are covered by the patent at issue and that originate from a named respondent in the investigation. The Federal Circuit has held that the Commission has "no statutory authority to issue an LEO against downstream products of non-respondents."[668]

FormFactor requests that a permanent limited exclusion order be issued excluding Respondents' infringing probe card assemblies.[669] Respondents assert that, if a violation is found the remedy should consist of a limited exclusion order against the specific imported probe assemblies of any Respondent where a violation is established.[670] Staff agrees with FormFactor and Respondents that, if a violation is found, there be a limited exclusion order against the parties found to infringe.[671]

While the undersigned agrees with Respondents and Staff that there is no violation, the undersigned finds that if the Commission otherwise finds that there is a violation, a limited exclusion

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[668] *Kyocera*, 545 F.3d at 1345.
[669] CIB 98.
[670] RIB 98; RRB 48.
[671] SIB 73.

order against infringing products is warranted.

B. Cease and Desist Order

Under Section 337(f)(1), the Commission may issue a cease and desist order in addition to, or instead of, an exclusion order. Cease and desist orders are warranted primarily when the respondent maintains a commercially significant inventory of the accused products in the United States.[672]

FormFactor requests a cease and desist order against Respondents because "the Commission has personal jurisdiction over Respondents" and because "Respondents have imported significant quantities of infringing product, components thereof, and products containing the same for sale and distribution."[673] Furthermore, FormFactor asserts that Respondents engage in "repair activities."[674]

Respondents assert that FormFactor has not met its burden in proving that any Respondent has commercially significant inventories in the United States. According to Respondents, FormFactor has failed to introduce any evidence in this investigation to the effect that any of the Respondents maintain in the United States any "commercially significant inventory" of probe card assemblies.[675]

Staff agrees with Respondents that FormFactor has failed to introduce any evidence that any Respondents maintain commercially significant inventories of infringing product in the United States and that no cease and desist order should be issued.[676]

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[672] *Certain Crystalline*, 15 U.S.P.Q.2d at 1277-79.
[673] CIB 99.
[674] CRB 42.
[675] RIB 98-99; RRB 48.
[676] SIB 73 citing RX-380C (Hong Direct) at Q/A 64-66; Hwang, Tr. 1331; RX-689C (Hutton Direct) at Q/A 45.

The undersigned agrees with Respondents and Staff that FormFactor has not met its burden in proving that any Respondent maintains a commercially significant inventory of accused products in the United States. Accordingly, no cease and desist order is warranted against any Respondent.

C. Bond During Presidential Review Period

If the Commission enters an exclusion order or cease and desist order, parties may continue to import and sell their products during the pendency of the Presidential review under a bond in an amount determined by the Commission to be "sufficient to protect the Complainants from any injury."[677]

FormFactor requests bond be set at 100% of the entered value.[678]

Respondents assert that FormFactor has failed to put forth sufficient evidence from which an entry bond during the Presidential review period can be calculated and that no bond should be imposed. Alternatively, Respondents assert that if a bond is found to be appropriate, it should be limited to a reasonable royalty rate of 0.5% or less, but no more than 15%.[679]

Staff asserts that there is no evidence in the record regarding FormFactor's prices for probe cards, but that there is evidence in the record that a reasonable royalty rate would be [ ] As to Respondents' assertion that a reasonable royalty rate would be more like 0.4%-0.5%, Staff finds that [ ][680]

Accordingly, Staff asserts that the bond should be set at 15%.[681]

The Commission frequently sets the bond by attempting to eliminate the difference in sales

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[677] 19 U.S.C. § 1337(e); 19 C.F.R. § 210.50(a)(3).
[678] CIB 99-100.
[679] RIB 98-100 citing RFF IX.C.02; RRB 49-50.
[680] SIB 73-75.
[681] SIB 75.

prices between the patented domestic product and the infringing product.[682] In the absence of reliable price information, the Commission has used other methods to determine an appropriate bond. For example, where a price comparison is unworkable, the Commission has determined that a bond of 100% is appropriate.[683] In other instances where a direct comparison between a patentee's product and the accused product was not possible, the Commission has set the bond at a reasonable royalty rate.[684]

In this case, there is evidence that a reasonable royalty rate is 15%.[685] Accordingly, the undersigned recommends a bond in the amount of 15%.

Within seven days of the date of this document, each party shall submit to the office of the Administrative Law Judge a statement as to whether or not it seeks to have any portion of this document deleted from the public version. The parties' submissions must be made by hard copy by the aforementioned date.

Any party seeking to have any portion of this document deleted from the public version thereof must submit to this office a copy of this document with red brackets indicating any portion asserted to contain confidential business information.[686] The parties' submission concerning the

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[682] *See Certain Microsphere Adhesives*, Commission Opinion at 24.

[683] *See, e.g., Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, U.S.I.T.C. Pub. No. 3003, Comm'n Op. at 27-28 and 40 (U.S.I.T.C., September 23, 1996) ("*Certain Wind Turbines*").

[684] *See, e.g., Certain Digital Satellite System (DSS) Receivers and Components Thereof*, Inv. No. 337-TA-392, U.S.I.T.C. Pub. No. 3418, Initial and Recommended Determinations at 245, *vacated on other grounds*, Comm'n Determination (May 13, 1999), 2001 WL 535427 (U.S.I.T.C., October 20, 1997) ("*Certain DSS Receivers*").

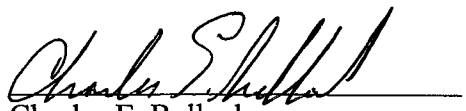
[685] RX-286C (FormFactor-Intel Agreement) at ¶ 4.4.2; RX-285C (FormFactor-Gotoh Agreement) at ¶¶ 6.01-6.02.

[686] Confidential business information is specifically defined in 19 C.F.R. § 201.6(a)(1) and Order No. 1 as

(continued...)

public version of this document need not be filed with the Commission Secretary.

SO ORDERED.



Charles E. Bullock
Administrative Law Judge

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[686](...continued)
information which concerns or relates to the trade secrets, processes, operations, style of works, or apparatus, or to the production, sales, shipments, purchases, transfers, identification of customers, inventories, or amount or source of any income, profits losses, or expenditures of any person, firm, partnership, corporation, or other organization, or other information of commercial value, the disclosure of which is likely to have the effect of either impairing the Commission's ability to obtain such information as is necessary to perform its statutory functions, or causing substantial harm to the competitive position of the person, firm, partnership, corporation, or other organization from which the information was obtained, unless the Commission is required by law to disclose such information. The term "confidential business information" includes "proprietary information" within the meaning of section 777(b) of the Tariff Act of 1930 (19 U.S.C. 1677f(b)). Nonnumerical characterizations of numerical confidential business information (e.g., discussion of trends) will be treated as confidential business information only at the request of the submitter for good cause shown.

Parties should limit their redactions to the fullest extent possible, as excessive redactions that do not fit within the category of "CBI" will only cause delay in releasing a public version of this initial determination.

IN THE MATTER OF CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME **Inv. No. 337-TA-621**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **INITIAL DETERMINATION** has been served upon **Benjamin Levi, Esq.**, Commission Investigative Attorney, and the following parties via first class mail and air mail where necessary on July 20 **2009.**

Marilyn R. Abbott

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112A
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( )Via Hand Delivery
(X)Via Overnight Mail
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IN THE MATTER OF CERTAIN PROBE CARD ASSEMBLIES, COMPONENTS THEREOF AND CERTAIN TESTED DRAM AND NAND FLASH MEMORY DEVICES AND PRODUCTS CONTAINING SAME **Inv. No. 337-TA-621**

PUBLIC MAILING LIST

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